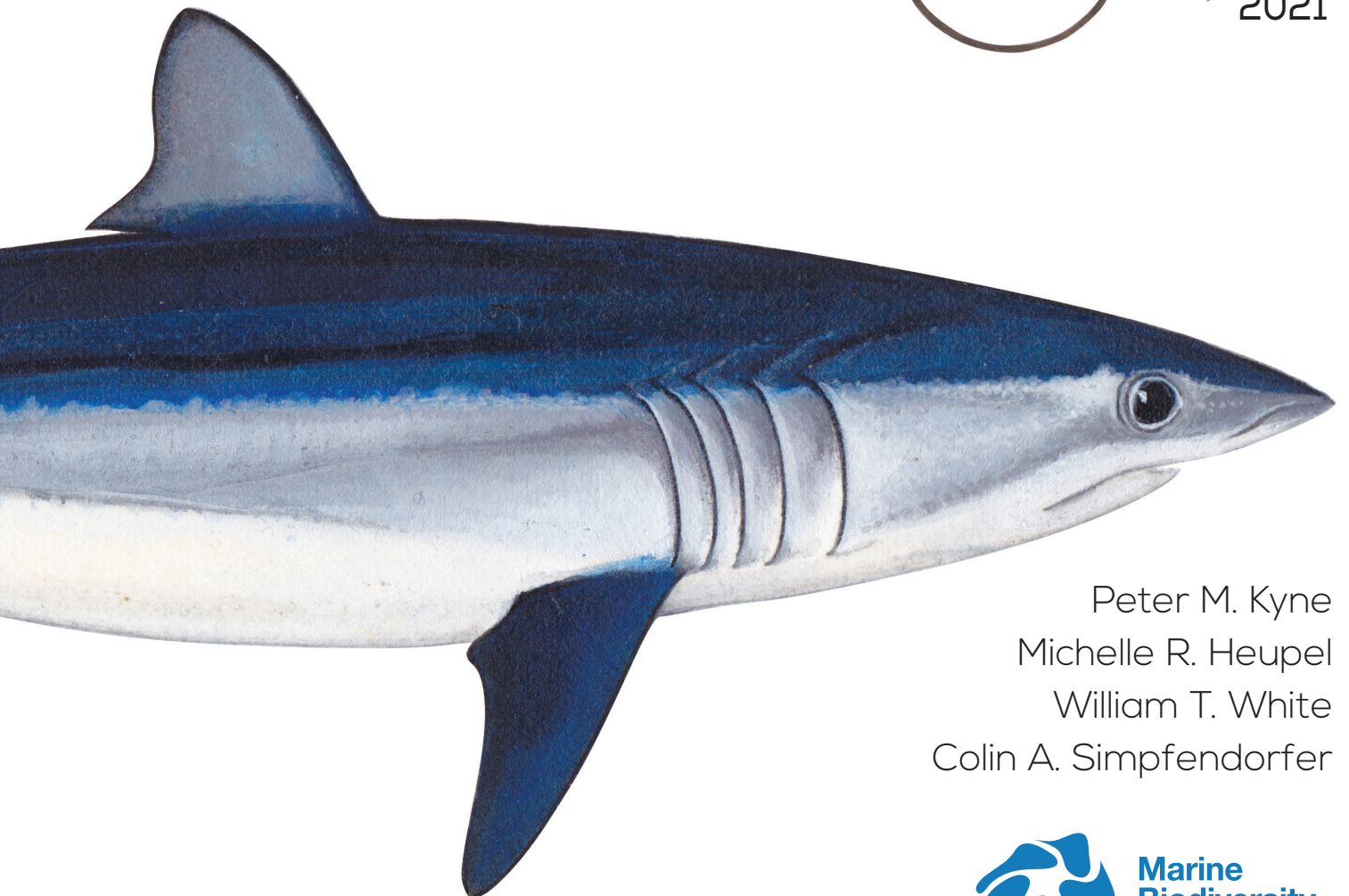




THE **ACTION PLAN** FOR
Australian Sharks and Rays
2021



Peter M. Kyne
Michelle R. Heupel
William T. White
Colin A. Simpfendorfer



National Environmental Science Programme

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Australian Government



AUSTRALIAN INSTITUTE
OF MARINE SCIENCE



JAMES COOK
UNIVERSITY
AUSTRALIA



CHARLES
DARWIN
UNIVERSITY
AUSTRALIA

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Heupel, Michelle R., author.

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Simpfendorfer, Colin A., author.

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EXECUTIVE SUMMARY

Australia is home to a quarter of the world's cartilaginous fishes (Class Chondrichthyes) with 328 species consisting of 182 sharks, 132 rays, and 14 chimaeras. The first *Action Plan for Australian Sharks and Rays* aims to provide a comprehensive and consistent review of the extinction risk of all cartilaginous fishes (hereafter 'sharks') occurring in Australian waters, to provide a benchmark from which changes in population and risk can be measured, and to help guide management for their conservation. This Action Plan also serves to raise the profile of their diversity and conservation needs. This volume includes a taxa profile for each of the 328 species occurring in Australian marine and inland waters, including external territories.

Each species' extinction risk was assessed by applying the IUCN Red List Categories and Criteria at the national level (i.e., Australia only). Assessments of extinction risk consider all available information on a species' taxonomy, distribution, population status, habitat and ecology, major threats, use and trade, and conservation measures. The IUCN Red List Categories and Criteria utilise a series of thresholds to evaluate extinction risk based on population size reduction, geographic range, population size, or the probability of extinction. Species were assessed against the five Red List Criteria; to qualify for one of the three threatened categories (Critically Endangered, Endangered, or Vulnerable), a species had to meet a quantitative threshold for that category in any of the five criteria.

The overall national Red List status of sharks in Australia is characterised by a relatively low level of extinction risk and a high level of secure species. Of the 328 species, 12% are threatened (39 species: 22 sharks, 17 rays; no chimaeras are threatened); 10% are Near Threatened (32 species: 18 sharks, 13 rays, 1 chimaera); 70% are Least Concern (231 species: 123 sharks, 95 rays, 13 chimaeras); and, 8% are Data Deficient (26 species: 19 sharks, 7 rays, no chimaeras are Data Deficient). No species are Extinct or Extinct in the Wild.

Each taxa profile specifies two sets of actions for a species: actions to address knowledge gaps, and actions to maintain, secure, and if necessary, recover the population. To improve the ability to accurately assess the extinction risk status of species, and ultimately, better conserve and manage them, all species treated in this Action Plan require some knowledge gaps be filled. Knowledge gaps are divided into five themes, each of which improves the information base from which to assess status: taxonomy, distribution, population trend, life history, and connectivity.

Conservation actions are provided for each species, regardless of the Red List status assigned them in this Action Plan. While threatened species require immediate action to conserve, manage, and recover their populations, Least Concern species also require action to maintain their secure status. Data Deficient species require action to understand various aspects of their population, but since an assessment as Data Deficient acknowledges the possibility that future research may show that a threatened category is appropriate, action is also needed to minimise or mitigate threats until such time as more information is available to show that the species is not threatened.

Finally, an overarching recommendation is provided for each threatened species. This includes the recommendation that five species be considered for listing on the *Environment Protection and Biodiversity Conservation Act* (EPBC Act), three species be considered for up-listing, and two species be considered for down-listing.

The implementation of the recommendations and actions in this Action Plan will require an ongoing and enhanced investment in science and management which will help secure the future of Australia's sharks, rays, and chimaeras.

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The assessments presented here are based on synthesising all available information on Australian species. A vast number of researchers, fisheries managers, and advocates have made significant contributions to the knowledge base of Australian sharks and we thank them for their dedication to improving our understanding of the shark fauna so that it can be secured for the future. The major contributions of Ken Graham, Peter Last, John Stevens, and Terry Walker are acknowledged here.

The availability of information on Australian Commonwealth and state/territory fisheries provided a solid baseline to assess species. We thank the staff at the Australian Bureau of Agricultural and Resource Economics and Sciences for producing the extremely informative and valuable annual *Fishery Status Reports*. Colleagues from state and territory fishery agencies work tirelessly to ensure the sustainability of fisheries and to continue to improve management for the benefit of species and industry. We particularly thank Grant Johnson and Thor Saunders from the Northern Territory; Mattias Braccini, Alistair Harry, and Rory McAuley from Western Australia; and, Tony Courtney and Lenore Litherfield from Queensland. We thank Bryn Farmer, Tim Lamb, and Gabrielle Nowara from the Australian Antarctic Division for assistance with assessing Antarctic and Sub-Antarctic species.

The assessments presented here have been prepared in a standardised and consistent format for this Action Plan by the authors. To prepare the Assessment Justifications we often drew on published IUCN Red List Assessments for species covered in this Action Plan or sought technical advice from species and fisheries experts. We acknowledge here the contributions of many people through the Red List Assessment process and through the Fisheries Research and Development Corporation (FRDC) project *A Report Card for Australia's Sharks*. A full list of contributors who authored Red List Assessments which we drew upon to prepare the Assessment Justifications for this Action Plan or who provided technical advice on assessments in this Action Plan is provided at the end of the book.

We thank Neville Barrett, Graham Edgar/Reef Life Survey, Brittany Finucci, Andrew Fox, David Harasti, Benjamin Hicks, Nigel Marsh, David Muirhead, Simon Pierce, Ian Shaw, and Garry Warren for supplying photographs used in this book. The vectors used in Figure 1 were created by Zimices (shark) and Tony Ayling (Elephantfish; vectorized by Milton Tan). No additional modifications have been made (<https://creativecommons.org/licenses/by-sa/3.0/>).

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INTRODUCTION

Species Action Plans aim to assess the extinction risk status of groups of Australian biodiversity and to help ensure national lists of threatened species are as accurate and up to date as possible. Australia has Action Plans for a variety of taxa including *The Action Plan for Australian Birds 2010* (Garnett *et al.* 2011), *The Action Plan for Australian Mammals 2012* (Woinarski *et al.* 2014), and *The Action Plan for Australian Lizards and Snakes 2017* (Chapple *et al.* 2019), but there has been an absence of an Action Plan for Australian cartilaginous fishes (Class Chondrichthyes: sharks, rays, and chimaeras; hereafter ‘sharks’).

BACKGROUND TO EXTINCTION RISK ASSESSMENTS FOR AUSTRALIAN SHARKS

A global program to assess the extinction risk status of the world’s sharks for the IUCN Red List of Threatened Species started in the late 1990s and produced the first major publication of Red List assessments in 2000 (Table 1). As part of this global assessment program, an Australasian Red List workshop was held in 2003 resulting in the publication of *The Conservation Status of Australasian Chondrichthyans* (Cavanagh *et al.* 2003). This provided assessments of the Red List status of approximately half of the shark fauna of the Australasian region (encompassing Australia, New Zealand, New Guinea, and Pacific Island

nations). The first global assessment was completed in 2011 and to contribute to a global reassessment (Red List assessments are due for revision every 10 years) a Red List assessment workshop was undertaken in 2015 which considered a larger proportion of species occurring in Australian waters (Table 1). This workshop also contributed to the FRDC-funded *A Report Card for Australia’s Sharks*, which assessed the sustainability status of sharks and a small number of rays.

To undertake a complete national assessment for all 328 chondrichthyans occurring in Australian waters, *The Action Plan for Australian Sharks and Rays 2021* built upon this history of assessment. An Action Plan workshop was convened in 2018 in Hobart, Tasmania (Table 1) to independently review published global Red List assessments and derive consistent national assessments for all species. Individual species accounts were then prepared for the Action Plan by drawing on all available information and the expert knowledge of the authors and consulted colleagues.

This Action Plan differs from previous approaches in that it (a) assesses all 328 species; (b) conducts a full national assessment for each species; (c) provides actions for each species; and, (d) where relevant, provides recommendations in relation to national lists of threatened species.

Table 1: Timeline of major events in assessing the IUCN Red List status of Australian sharks. Each of the listed global status assessments were broader than Australia but included varying numbers of species occurring in Australian waters. National Red List status assessments focus on extinction risk status only in Australian waters. Species Actions Plans have a life-span of 10-years with this Action Plan to be reviewed in 2031.

Year	Event	Scale	Focus
2000	First major batch of global shark assessments published on the IUCN Red List	95 species	Global Red List status
2003	Australasian Red List workshop (Minjerribah, Queensland)	175 species	Global Red List status
2010	New species Red List workshop (Cairns, Queensland)	92 species	Global Red List status
2011	First global Red List assessment complete	1,041 species	Global Red List status
2015	Australian Red List workshop (Townsville, Queensland)	268 species	Global Red List status
2018	Shark Action Plan workshop (Hobart, Tasmania)	328 species	National Red List status
2021	Second global Red List assessment complete	1,235 species	Global Red List status
2021	<i>The Action Plan for Australian Sharks and Rays 2021</i>	328 species	National Red List status
2031	<i>The Action Plan for Australian Sharks and Rays 2031</i>		National Red List status

AIMS OF THIS ACTION PLAN

The objective of this Action Plan is to provide a comprehensive and standardised assessment of the extinction risk status of all Australian cartilaginous fishes. This assessment serves to provide a benchmark from which changes in populations and risk can be measured, and to help guide management for their conservation. This is the first comprehensive assessment focused on the extinction risk of **all** Australian shark species. This Action Plan also serves to raise the profile of Australian shark diversity and conservation needs.

The specific aims of *The Action Plan for Australian Sharks and Rays 2021* are to:

- Provide a national overview of the extinction risk of all sharks occurring in Australian waters, including Sub-Antarctic and Antarctic waters, with extinction risk assessments determined by applying the IUCN Red List Categories and Criteria (IUCN 2012a);
- Identify threats to sharks;
- Identify critical knowledge gaps that compromise extinction risk status assessment, and recommend specific actions to address these;
- Identify those species most urgently requiring conservation and management attention;
- Identify those species which are priorities for research since there is currently inadequate information to make a direct, or indirect, assessment of their extinction risk;
- Identify conservation actions for each species.



METHODS

An overview of the scope, approach, and outcomes of the Action Plan is provided in Box 1. The provides a summary of the key points covered in the following Methods section.

Box 1: Summary of the scope, approach, and outcomes of the Action Plan.

Scope	
Comprehensive standardised extinction risk assessment.	▶ All 328 species of Australian sharks, rays, and chimaeras.
All Australian waters including external territories, Sub-Antarctic, and Antarctic waters.	▶ The Action Plan assesses extinction risk (fisheries assessments may take several other forms including stock assessments, sustainability assessments, and ecological risk assessments; the Action Plan does not present these types of assessments).
Approach	
Extinction risk assessed by applying the IUCN Red List Categories and Criteria.	▶ Assessments undertaken at the national level.
Assessments consider all available information on a species' taxonomy, distribution, population status, habitat and ecology, major threats, use and trade, and conservation measures.	▶ Assessments draw on many information sources combined with the expert judgment of the authors and consulted colleagues.
Information sources include the scientific literature, fishery status reports, fishery management documents, ecological risk assessments, published IUCN Red List Assessments, Recovery Plans, theses, museum records, unpublished reports, and consultation with species and fisheries experts.	▶ Assessment framework allows for the use of inference and suspicion where species-specific data are lacking.
A precautionary approach was taken to the assessment process.	▶ Assessments were prepared in a standardised and consistent format for the Action Plan by the authors.
Outcomes	
The Action Plan provides the national extinction risk status of each species.	▶ Assessments inform species-level actions to address knowledge gaps and conservation needs.
The Action Plan provides an overarching recommendation for each threatened species.	▶ Recommendations include amending the list of threatened species under national environmental legislation to incorporate several species and prioritising data collection for other species to strengthen the evidence-base underlying their status determinations.

OVERVIEW

To undertake national extinction risk assessments, we followed the *Guidelines for Using the IUCN Red List Categories and Criteria* (IUCN Standards and Petitions Committee 2019), and the *Guidelines for Application of IUCN Red List Criteria at Regional and National Levels* (IUCN 2012b). A complete list of species of sharks was prepared and the IUCN Red List Categories and Criteria (IUCN 2012a) applied to each species. The categories and criteria were applied at the **national level** (that is, for Australian waters; we do not provide separate assessments for subsections of a species' range whether that be a region, state, or subpopulation). In general, a precautionary approach was taken to the assessment process.

The assessments presented here have been prepared in a standardised and consistent format for this Action Plan by the authors. Assessments draw on many information sources (see *Information base* and *Taxa profiles* in this *Methods* section) combined with the expert judgment of the authors and consulted colleagues. For each of the 328 species, a taxa profile was prepared which outlines: its assessment category and criteria; the reasons for listing in that category; a summary of its distribution, habitat, depth range, and maximum size; the justification for its assessment; threats facing the species; current management measures; knowledge gaps and actions to address these gaps; and, conservation actions. Finally, a recommendation is provided for each threatened species with regards to the *Environment Protection and Biodiversity Conservation Act 1999*.

GEOGRAPHIC SCOPE

The area covered in this assessment comprises Australia and its external territories: Christmas Island, Cocos (Keeling) Islands, Norfolk Island, Lord Howe Island, Heard Island and McDonald Islands, and the Australian Antarctic Territory. The area covers all inland and marine waters to the edge of the Australian Exclusive Economic Zone (EEZ). The vast majority of sharks are marine species, but a handful are euryhaline, occurring in freshwater as well as marine and brackish water.

Of the 328 shark taxa, 42% (138 species) are endemic to Australian waters; the assessments for such taxa can be considered to represent their extinction risk status at the global scale. For other species, the Australian range comprises only part of their broader global range. In some cases, this involves individuals moving between the Australian part of their range and areas beyond Australian waters. Species may be connected at the ocean-basin or even global level (e.g., some of the highly mobile oceanic species), while others may be connected at the regional level with close neighbours (particularly New Zealand, Papua New

Guinea, and Indonesia). For these, we do not provide a global assessment of their extinction risk, but these are available on the IUCN Red List of Threatened Species website (IUCN 2020). The global Red List status from IUCN (2020) may be referred to in individual taxa profiles if it has a bearing on a species' Australian extinction risk status.

TAXONOMIC SCOPE

The Class Chondrichthyes globally consists of 1,261 species, divided into two subclasses: Elasmobranchii (544 sharks and 665 rays) and Holocephalii (52 chimaeras) (numbers taken from Ebert *et al.* 2021b, although these are dynamic as new species descriptions and taxonomic revisions change the species count). The fauna assessed in this Action Plan represents 26% of the global total (328 species consisting of: 182 sharks, 132 rays, and 14 chimaeras). This comprises a total of 14 orders (9 shark orders, 4 ray orders, 1 chimaera order), further consisting of 58 families (35 shark families, 20 ray families, and 3 chimaera families). The taxa profiles in this Action Plan are presented in taxonomic (phylogenetic) order by family. Sharks are presented first, followed by rays, and finally chimaeras. Within families, taxa are presented alphabetically by genus and species name (collectively referred to as their 'scientific name').

The taxonomy and naming of species used here may differ from that published in preceding texts, particularly in *The Conservation Status of Australasian Chondrichthyans* (Cavanagh *et al.* 2003). In cases where the 'taxonomic concept' has changed (e.g., a species is split into multiple species due to taxonomic resolution), a previous category assignment may not be comparable to the assessment made in this Action Plan.

A full list of all species included in this Action Plan is provided on pages 37–43.

EXTINCTION RISK STATUS

Extinction risk assessments applied the IUCN Red List Categories and Criteria which is widely recognised as the most appropriate tool to assess species extinction risk. Assessments of extinction risk consider all available information on a species' taxonomy, distribution, population status, habitat and ecology, major threats, use and trade, and conservation measures. The IUCN Red List Categories and Criteria utilise a series of thresholds to evaluate extinction risk based on population size reduction, geographic range, population size, or the probability of extinction (IUCN 2012a, IUCN Standards and Petitions Committee 2019). In this Action Plan, the IUCN Red List Categories and Criteria (Version 3.1; IUCN 2012a) were applied to all sharks known to occur in Australian waters following the *Guidelines for Using the IUCN Red List Categories and Criteria* (IUCN Standards and Petitions Committee 2019).

The IUCN Red List applies eight extinction risk categories (definitions from Mace *et al.* 2008, IUCN 2012a):

- **Extinct (EX):** 'there is no reasonable doubt that the last individual has died';
- **Extinct in the Wild (EW):** a species 'is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range';
- **Critically Endangered (CR):** a species 'is facing an *extremely high* risk of extinction in the wild';
- **Endangered (EN):** a species 'is facing a *very high* risk of extinction in the wild';
- **Vulnerable (VU):** a species 'is facing a *high* risk of extinction in the wild';
- **Near Threatened (NT):** a species 'does not qualify for CR, EN or VU now, but is close to qualifying for or is likely to qualify for a threatened category in the near future';
- **Least Concern (LC):** a species does not qualify for CR, EN, VU, or NT;
- **Data Deficient (DD):** species for which there is 'inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status.

Each species is assessed against the five Red List Criteria (Mace *et al.* 2008, IUCN 2012a, IUCN Standards and Petitions Committee 2019):

- **Criterion A:** population size reduction;
- **Criterion B:** geographic range size;
- **Criterion C:** small population size and decline;
- **Criterion D:** very small or restricted population;
- **Criterion E:** quantitative analysis (for example, population viability analysis).

To qualify for one of the three threatened categories (CR, EN, or VU), a species has to meet a quantitative threshold for that category in any of the five criteria listed above (A–E; Table 2; IUCN 2012a). Only one of the five criteria need to be met for a species to qualify for a particular category. If species meet multiple criteria, it is assigned the highest category for which it qualifies. The IUCN Red List Criteria are 'designed to identify taxa that exhibit symptoms of endangerment, and not simply depletion or conservation priority' (IUCN Standards and Petitions Committee 2019). Where there is insufficient information available, a species may be assigned the category DD, although this category is used sparingly in this Action Plan. A DD assessment is not a category of threat, although future research may find that a threatened category is appropriate (IUCN 2012a).

Time-based measures in the IUCN Red List Criteria (such as population reduction) are scaled for the different rates at which different species survive and reproduce (IUCN Standards and Petitions Committee 2019). Generation length is used for this scaling. Under Criterion A, the quantitative thresholds consider population reduction scaled over the longer of 10 years or three generation lengths (3 GL) (Mace *et al.* 2008, IUCN Standards and Petitions Committee 2019). Given their generally limited biological productivity (see Smith *et al.* 1998, Simpfendorfer & Kyne 2009, Pardo *et al.* 2016), the 3 GL period is nearly always greater than 10 years in sharks.

There are a range of approaches to calculating generation length, many of which are data intensive (see IUCN Standards and Petitions Committee 2019). A simple measure to derive generation length (GL) was used here, that requires only female age-at-maturity and maximum age:

$$GL = ((\text{maximum age} - \text{age-at-maturity})/2) + \text{age-at-maturity}$$

This value represents the median age of parents of the current cohort. To derive population reduction over 3 GL, the proportional decline over the x years of available data (such as catch rates or catch landings) was calculated and this was used to calculate annual proportional change, which was then scaled across the 3 GL period.

Life history parameters are poorly-known for many sharks. Where female age-at-maturity and maximum age were lacking for a particular species, GL was estimated using age data available from closely-related species. Thus, estimates of GL may have low reliability. A table of calculated generation lengths and corresponding information sources is provided at the end of this book for all threatened and Near Threatened species (pages 410–413).

MAPPING

The distributions used to produce the maps in this Action Plan are based on those provided in Last and Stevens (2009) and adjusted using improved data developed during the Chondrichthyan Tree of Life project (<https://sharksrays.org/>) and relevant species-specific taxonomic publications published over the last decade. The distributions displayed on the maps reflect the best estimation of the geographic range for each species. The distributions of many species remain poorly-defined and further research and surveys will no doubt expand the range of some species. This is particularly the case for species known from limited specimens. These have been noted in the taxa profiles with the specific action *clarify range* in the *Knowledge Gaps* section.

INFORMATION BASE

Many and varied sources of information were used to assess the extinction risk status of Australian sharks. At the species-level, there is a wealth of information available on some popular charismatic species (e.g., Whale Shark *Rhincodon typus*, White Shark *Carcharodon carcharias*), while for other smaller more cryptic species there is an absence of information (e.g., Bareskin Dogfish *Centroscyllium kamoharai*, Short-tail Catshark *Parmaturus bigus*). Likewise, information on shark catches in fisheries is variable. Species-level catch data for bycatch species is largely absent, and species identification, monitoring, and reporting are ongoing issues that require improvement.

Quantitative data from which to determine population trend was largely absent as long time-series are virtually non-existent (with the exception of some targeted species). This is a particularly important point as most threatened and Near Threatened sharks meet Criterion A (the population reduction criterion). The work of Graham *et al.* (2001) (*Changes in the relative abundances of sharks and rays on Australian South East Fishery trawl grounds after twenty years of fishing*) and Walker and Gason (2007) (*Shark and other chondrichthyan byproduct and bycatch estimation in the Southern and Eastern Scalefish and Shark Fishery*) were pivotal in understanding changes in southeast Australia. While Graham *et al.* (2001) provides a comparison of catch rates over a 20-year period, the time-series in Walker and Gason (2007) are shorter. Thus, some trends used

in this Action Plan were derived from relatively short time-series and there are issues with scaling population reduction from annual proportional change calculated from short time-series. Both of these works are ageing, and given the dynamic nature of fisheries (e.g., changes in management, changes in effort, shifts in fishing grounds) additional information sources (see *Taxa profiles* in this *Methods* section) and some inference had to be used to understand more recent fishing pressure and levels of catch. Species-specific long-term monitoring of catches to understand trend is probably the most vital action needed for Australian sharks.

The species assessments in this Action Plan drew on extensive sources of information including the scientific literature, fishery status reports, fishery management documents, ecological risk assessments, published IUCN Red List Assessments, documents associated with species listing under Australian legislation (e.g., Recovery Plans), theses, museum records, unpublished reports, and consultation with species and fisheries experts. The individual taxa profiles do not provide citations to specific information but rather a *Key Literature* list is provided at the end of this Action Plan (the *Supporting Information* pages for threatened species do however provide specific references). This literature list is not exhaustive but provides much of the central work consulted in the preparation of the Action Plan. Further useful literature lists are provided in Last and Stevens (2009), Last *et al.* (2016a), and for specific species, in their published IUCN Red List Assessments (IUCN 2020).



Table 2: Summary of the five criteria (A–E) used to evaluate if a taxon belongs in an IUCN Red List threatened Category (Critically Endangered, Endangered or Vulnerable) (from IUCN 2012a). Use of this summary table requires full understanding of the *IUCN Red List Categories and Criteria* (IUCN 2012a) and *Guidelines for Using the IUCN Red List Categories and Criteria* (IUCN Standards and Petitions Committee 2019). Refer to both documents for explanations of terms and concepts used here.

	CRITICALLY ENDANGERED	ENDANGERED	VULNERABLE
A. Population size reduction	<i>Population reduction (measured over the longer of 10 yrs or 3 generations) based on any of A1–A4</i>		
A1	≥90%	≥70%	≥50%
A2, A3 & A4	≥80%	≥50%	≥30%
A1. Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction are clearly reversible AND understood AND ceased, based on and specifying any of the following: (a) direct observation; (b) an index of abundance appropriate to the taxon; (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat; (d) actual or potential levels of exploitation; (e) effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites			
A2. Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible, based on any of (a) to (e) under A1			
A3. Population reduction projected or suspected to be met in the future (up to a maximum of 100 years) based on any of (b) to (e) under A1			
A4. An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a maximum of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible, based on any of (a) to (e) under A1			
B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)			
B1. Extent of occurrence (EOO)	<100 km ²	<5,000 km ²	<20,000 km ²
B2. Area of occupancy (AOO)	<10 km ²	<500 km ²	<2,000 km ²
<i>AND at least 2 of the following 3 conditions:</i>			
(a) Severely fragmented OR number of locations	=1	≤5	≤10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			
C. Small population size and decline			
Number of mature individuals	<250	<2,500	<10,000
<i>AND at least one of C1 or C2</i>			
C1. An observed, estimated or projected continuing decline of at least (up to a maximum of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2. An observed, estimated, projected or inferred continuing decline AND at least 1 of the following 3 conditions			
(a) (i) Number of mature individuals in each subpopulation	≤50	≤250	≤1,000
(a) (ii) % mature individuals in 1 subpopulation =	90–100%	95–100%	100%
(b) Extreme fluctuations in the number of mature individuals			
D. Very small or restricted population			
D1. Number of mature individuals	<50	<250	<1,000
D2. Restricted area of occupancy (AOO) or number of locations	-	-	typically: AOO <20 km ² or number of locations ≤5
E. Quantitative analysis			
Indicating the probability of extinction in the wild to be:	≥50% in 10 years or 3 generations, whichever is longer (100 years maximum)	≥20% in 20 years or 5 generations, whichever is longer (100 years maximum)	≥10% in 100 years

TAXA PROFILES

The bulk of this Action Plan is dedicated to standardised accounts of the extinction risk status of individual shark taxa. Such an account is provided for all 328 species. An explanation of the information presented in each account is provided below. While each assessment relates to the species' Australian range, some information (habitat, depth range, maximum size, and life history) is drawn from overseas sources where local knowledge is lacking.

Names: The scientific and common name of each family is given in the top corner of each profile; profiles are presented in taxonomic (phylogenetic) order by family. Sharks are presented first, followed by rays, and finally chimaeras. Within families, taxa are presented alphabetically by genus and species name (collectively referred to as their 'scientific name'). The scientific name of each species is provided under its common name.

There is broad consensus on the common names of sharks, although some species have multiple names which vary geographically (for example, the School Shark *Galeorhinus galeus* which is referred to as Tope or Soupfin Shark in other parts of its range). Only a single accepted common name is provided for each species here, and names generally follow *Sharks and Rays of Australia 2nd Edition* (Last and Stevens 2009) and *Rays of the World* (Last *et al.* 2016a).

Opposite the common name is the species' Code for Australian Aquatic Biota (CAAB Code). This is a unique code for each species used for data recording. Each code consists of eight digits: two for the major fauna or flora group (37 = fishes), three for the family, and three for the species.

IUCN Red List Category & Criteria: This presents the IUCN Red List category for each species along with the criteria for threatened species (those in the categories Critically Endangered, Endangered, or Vulnerable) or the criteria that are close to being met for Near Threatened species. Categories and criteria are explained in the previous section *Extinction risk status*.

Reasons for Listing: This presents a short concise statement on why the species meets the assigned category. Language and terminology follow the IUCN Red List Categories and Criteria and regularly used terms (e.g., population reduction, continuing decline, suspected, inferred) have specific meaning; see IUCN (2012a) and IUCN Standards and Petitions Committee (2019).

For species meeting Criterion B (the geographic range criterion), an estimated extent of occurrence (EOO) is provided. EOO is defined 'as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy'

(IUCN 2012a). EOO was calculated using the GeoCAT geospatial conservation assessment tool (Bachman *et al.* 2011) based on the distribution in the species' accompanying range map. For one species, an estimated area of occupancy (AOO) is provided. AOO is defined 'as the area within its extent of occurrence which is occupied by a taxon, excluding cases of vagrancy' (IUCN 2012a). See IUCN (2012a) and IUCN Standards and Petitions Committee (2019) for information on calculating EOO and AOO.

The terms *observed*, *estimated*, *projected*, *inferred*, and *suspected* are used in the IUCN criteria to describe the nature of the evidence used for specific criteria (IUCN Standards and Petitions Committee 2019). The terms *estimated*, *inferred*, and *suspected* are used throughout the *Reasons for Listing* and *Assessment Justification* sections of each taxa profile. Definitions of these terms are provided below with these taken directly from IUCN Standards and Petitions Committee (2019). An additional comment is provided on each regarding their use in shark assessments:

- **Observed:** 'information that is directly based on well-documented observations of all known individuals in the population (i.e., effectively a census of the known individuals)'. Use in shark assessments: not possible for sharks.
- **Estimated:** 'information that is based on calculations that may include statistical assumptions about sampling, or biological assumptions about the relationship between an observed variable (e.g., an index of abundance) and the variable of interest (e.g., number of mature individuals)'. Use in shark assessments: population trend that is estimated from stock assessments, mark-recapture, or standardized surveys; a specific example is catch-per-unit-effort.
- **Projected:** 'same as "estimated", but the variable of interest is extrapolated in time towards the future, or in space. Projected variables require a discussion of the method of extrapolation (e.g., justification of the statistical assumptions or the population model used) as well as the extrapolation of current or potential threats into the future, including their rates of change'.
- **Inferred:** 'information that is in the same general type of units but not a direct measure of the variable of interest (refer to definition of 'Suspected' below for examples that are not measured in the same general type of units)'. Use in shark assessments: population trend that is inferred from a change in catch, landings, or trade data. Where these lack data on associated effort, they can be used to *infer* a population reduction but they rely on assumptions regarding how effort or changes in fishing activity could be driving the trends.

- *Suspected*: 'information that is based on variables in different types of units...or on circumstantial evidence'. 'In general, a suspected population reduction can be based on any factor related to population abundance or distribution, including the effects of (or dependence on) other taxa, so long as the relevance of these factors can be reasonably supported'. Use in shark assessments: examples include population trend that is suspected from increasing fishing effort, increasing retention and marketing, or loss of habitat.

Distribution: This describes the species' global range. Distribution was categorised as: Australian endemic (found only in Australia); Australasia (Australia, New Zealand, New Guinea, South Pacific island nations); Australia & Indonesia; Australasia & Indonesia; specific ocean basins (Indo-Pacific, Indo-West Pacific, Indo-West & Central Pacific, Pacific, Western Pacific, Eastern Indian, Atlantic, North Atlantic, Southern Ocean); Southern Hemisphere; Antitropical (ranging globally except in tropical waters); or, Cosmopolitan (ranging globally throughout the major ocean basins, although ranges are often patchy).

Habitat: This describes the primary broad habitat(s) that a species occurs in. Broad classifications are used without specific detail of substrate (for example, a species inhabiting the continental shelf may show a preference for sandy, muddy, or rocky substrates, but this level of detail is not provided here). Habitat was categorised as:

- *Rivers*: channels flowing from inland to the ocean; includes freshwater upper reaches and tidal brackish lower reaches (some overlap with estuaries);
- *Estuaries*: the interface between river and marine environments; tidal; generally brackish, but can be marine in the dry season and freshwater in the wet season in northern Australia (species denoted as occurring in estuaries, including euryhaline species, follows Grant *et al.* 2019);
- *Continental shelf*: the submerged area of continental Australia that is relatively shallow; considered here to be from the inshore coastal zone to ~200 m depth (i.e., the 'shelf break' or 'shelf edge');
- *Continental slope*: the steep slope of continental Australia from the shelf edge (~200 m) to ~2,000–2,250 m depth (i.e., the abyssal plain); divided into upper slope (200–750 m), mid slope (750–1,500 m) and deep slope (1,500–2,250 m);

- *Insular shelf*: the shelf surrounding islands (e.g., Lord Howe Island, Norfolk Island);
- *Insular slope*: the slope surrounding islands;
- *Abyssal plain*: deep oceanic plains at ~2,000–2,250 to 6,000 m depth;
- *Seamounts*: an underwater mountain rising from the ocean floor but not breaking the ocean surface;
- *Reefs*: rocky or coral underwater structures resulting from either abiotic or biotic processes;
- *Pelagic*: the open ocean; divided into epipelagic (0–200 m), mesopelagic (200–1,000 m), and bathypelagic (1,000–4,000 m).

A species may also occur marginally in other habitats not specified in its taxa profile. For example, the Port Jackson Shark *Heterodontus portusjacksoni* has been recorded from depths of 0–275 m but occurs primarily in shallow shelf waters and its habitat is here denoted as continental shelf. The continental slope is not denoted as its habitat here as its occurrence at depths >200 m is rare and marginal. Some species are likely to occupy habitats not yet fully defined. The Arafura Skate *Okamejei arafurensis* is a poorly-known species which is likely to have a broader depth range than currently recorded (180–300 m). Its habitat is here denoted as continental slope, as its occurrence on the continental shelf (i.e., <200 m) is marginal.

Depth: This describes the upper (i.e., shallower) and lower (i.e., deeper) depth range that a species occupies. As noted above, the full depth range may not be fully defined for many poorly-known species including those recorded from only a few specimens. Understanding depth range is important for assessing extinction risk as it provides information on the degree of overlap with fishing activities.

Maximum size: This describes the maximum recorded size of a species. Sizes are taken from the literature and are generally the largest known size for a species globally. Sizes are presented as total length (TL; for all sharks, shark-like rays, electric rays, skates, sixgill stingrays, giant stingaree, stingarees, and elephantfishes), disc width (DW; for stingrays, butterfly rays, eagle rays, cownose rays, and devilrays), or pre-caudal filament length (PCFL; shortnose chimaeras and spookfishes). TL is measured from the tip of the snout to the posterior tip of the tail (caudal fin); DW is measured between the outer margins of the pectoral fins (the 'disc' or 'wings'); and, PCFL is measured as per TL but excluding the caudal filament (which is often damaged).

Assessment Justification: This provides a standardised account to support the IUCN Red List category assigned to each species. Each is intended to provide a concise summary of the species' extinction risk status and detailed information is purposely excluded due to space limitations. Each account can broadly be broken down into the following components (with some variation):

- *Relative abundance:* qualitative terms are used to describe relative abundance (rare, common, abundant, and in some cases, historically common); for many species, a perception of rarity could be biased by a lack of records and the term rarely-encountered is used here for species which, for whatever reason, are not regularly caught or seen in Australian waters;
- *Broad distribution:* a general statement on the species' Australian geographic range with further detail in the accompanying range map; for species with restricted ranges, an estimated extent of occurrence (EOO) is provided relative to the threshold for meeting Vulnerable i.e., <20,000 km²; if the species is not endemic to Australia, its global range is summarised; for more detail on global ranges see Ebert *et al.* (2021a), IUCN (2020), Last *et al.* (2016a), and Last and Stevens (2009).
- *Life history:* biological parameters that define a species' intrinsic productivity and therefore its ability to sustain exploitation or recover from population depletion are provided. The parameters provided are: age-at-maturity (Amat; specified for females where available, although a handful of values are from males or combined sexes); maximum age (Amax); generation length (GL; see *Extinction risk status* section); reproductive cycle (how often a species reproduces); and, litter size (how many offspring a female produces). Parameters are taken from Australian studies where available, otherwise they are drawn from overseas work. Where there are multiple estimates for a parameter, a range may be given. Where parameters are unavailable for a species, a comment may be made on suspected productivity based on other species in the family. These parameters are provided as a guide to biological productivity only, and the scientific literature should be consulted for more detail.
- *Threats and risk:* commercial fisheries that are known to or suspected to catch the species along with other major threats where relevant (see *Threats* section for further information on sources used). In relation to commercial fisheries, the term *target* is generally used

where the species is sought after by the fishery, *byproduct* is used where the species is not directly sought after by the fishery but is regularly retained and marketed, and *bycatch* is used where the species is not sought after, is not retained, and is discarded. This part of the justification does not specify every fishery that catches the species, but rather focuses on the major fisheries or those that overlap significantly with the range of the species. For bycatch species of the Northern Prawn Fishery, reference may be made to fishing mortality rates which are taken from Zhou and Griffiths (2008). Mortality rates may have changed since that study, but this provides a good indication of the sustainability of catches of individual species in this fishery. Significant refugia from fishing activities (the extent of areas with low levels of fishing effort or with no fishing effort, major marine protected areas, or unfished deeper water) may also be specified where suspected to have a major influence on threats and extinction risk.

- *Population trend and assessment category:* population trend scaled to three generation lengths where data are available. In other cases, suspected or inferred trend is stated. Assessment justifications conclude with standardised statements on category. Language and terminology follow the IUCN Red List Categories and Criteria and regularly used terms (e.g., population reduction, continuing decline, suspected, inferred) have specific meaning; see IUCN (2012a) and IUCN Standards and Petitions Committee (2019).

Threats: Threats operating in the present, or those that have the potential to be significant future threats, were considered. Fishing activities are the major threat facing sharks in Australian waters. This table outlines a summarised level of threat (extent) from four fishing sectors: (1) commercial; (2) recreational; (3) Indigenous; and, (4) shark control. Extent is a simple relative qualitative ranking for that particular threat: High, moderate (mod.), low, and none (essentially none, but may be negligible, i.e., very rare capture events). Intent specifies if the species is a *target* (including for the aquarium trade), *byproduct*, or *bycatch* species (following terms outlined above). A species may be a target of one fishery but is a byproduct or a bycatch of another, and the most representative term across the species' range is listed. Both extent and intent therefore represent an estimate across the species' entire Australian range, although it may be driven by the primary fishery interacting with the species. Bycatch which is discarded after capture may still be subject to mortality, which can be at-vessel

mortality (i.e., the individual is dead upon retrieval of the fishing gear) or post-release mortality (i.e., the individual dies after discarding). Both types of mortality vary across species and fishing gear; a review is provided by Ellis *et al.* (2017).

Commercial fishing: Information on catch levels of sharks varies considerably between fisheries. Catches also vary over time given the dynamic nature of fisheries.

The two most significant Commonwealth fisheries which interact with sharks are the Southern and Eastern Scalefish and Shark Fishery (SESSF) and the Northern Prawn Fishery (NPF). For the SESSF, a starting point to categorise intent and rank extent was Walker and Gason (2007). This report gives mean annual catch masses for all species which was representative of that time. To adjust for changes in the fishery we consulted other sources such as the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) annual *Fishery Status Reports* (e.g., Patterson *et al.* 2019 and previous volumes) to understand the spatial extent of fisheries and changes over time, as well as online resources from the Australian Fisheries Management Authority (AFMA; <https://www.afma.gov.au/>). Combined, these sources also allowed categorisation of non-target species as *byproduct* or *bycatch* but noting that a species can be both *byproduct* and *bycatch*. In the NPF, the retention of sharks and rays is not permitted and all species are *bycatch*. For the NPF, the starting point to rank extent was Stobutzki *et al.* (2002) and Zhou and Griffiths (2008) who characterised the bycatch of the fishery. It is important to note that extent rankings are a relative qualitative measure and will vary in time given the dynamic nature of fisheries, although in general, the most abundant species in the environment will interact more with fisheries than rarer species (with factors such as habitat and catchability also being important in determining levels of interaction). We have attempted to provide a simple snapshot of the relative level of interaction with commercial fisheries across a species' entire Australian range.

Sharks are taken in commercial fisheries managed by all states and the Northern Territory. There are extensive peer-reviewed and 'grey' scientific literature for these fisheries from which information was drawn (see the *Key Literature* list provided at the end of the Action Plan). For example, Harry *et al.* (2011b) for the Queensland East Coast Inshore Finfish Fishery; Heupel *et al.* (2009) for reef sharks on the Great Barrier Reef; Courtney *et al.* (2008), Kyne *et al.* (2002), and Rigby *et al.* (2016c) for the Queensland East Coast Trawl Fishery; and, Nowara *et al.* (2017) for skates at Heard Island and McDonald Islands.

Overall, there is limited reporting of catch, byproduct, or bycatch to species level. Where there was no available information on specific catches, these were inferred from the overlap between a species' geographic and depth range, the level of fishing effort, and the likely catchability of the species to the particular fishing gear(s) deployed. Fishery status reports from Commonwealth, state, and territory agencies were important sources of information for understanding the current spatial footprint and effort level of fisheries. Intent and extent rankings were reviewed by AFMA.

Recreational fishing: There is limited information available on recreational fishing and harvest of sharks. There are a relatively small number of target species including School Shark *Galeorhinus galeus*, Gummy Shark *Mustelus antarcticus*, Elephantfish *Callorhynchus millii*, a variety of temperate and tropical whaler sharks (family Carcharhinidae), and some large pelagic game species (Shortfin Mako *Isurus oxyrinchus*, thresher sharks *Alopias* spp etc.). Species-specific catch data are generally unavailable. *The National Recreational and Indigenous Fishing Survey* (undertaken during 2000–2001; Henry and Lyle 2003) estimated the annual recreational catch of 'sharks/rays' but did not give any lower resolution of catch by species. Importantly, they showed that 82% of sharks/rays caught by recreational fishers were released. Ongoing recreational fishing surveys should provide an update of catch intent and extent at the broad level. However, there is a critical need to better understand catch trends of individual species (particularly those with a *high* extent ranking).

Since species-specific data are lacking, inshore and continental shelf species occurring in depths of <50 m were assumed to have some interaction with recreational fishing and intent was categorised as *bycatch* for species that are not known to be *target* species. A depth of <50 m is an arbitrary value, and other deeper occurring species are also possible catches of recreational fishing, although it was generally considered that deepwater species are subject to little or no recreational fishing activities.

Indigenous fishing: There is little information available on Indigenous fishing and harvest of sharks. *The National Recreational and Indigenous Fishing Survey* (undertaken during 2000–2001; Henry and Lyle 2003) estimated the annual Indigenous catch of 'sharks/rays' in northern Australia but did not give any lower resolution of catch by species. The extent and intent of Indigenous fishing given in this Action Plan is based on a number of assumptions and is intended to provide a preliminary assessment that will require validation. Because the majority of Indigenous fishing occurs in coastal, inshore, and riverine

habitats using line and spear (Henry and Lyle 2003), it was assumed that any species occurring in shallow inshore waters was potentially subject to Indigenous harvest or bycatch.

Sharks and stingrays are a target of Indigenous fishing in northern Australia and most catches are retained. Given the vast Indigenous Land and Sea-Country estate of northern Australia, it was assumed that any coastal and riverine species was a target species. The actual species-specific level of catch and retention is unknown, although some species are known to be preferred in some areas, for example the Bull Shark *Carcharhinus leucas* in northern Australian rivers. Overall, the level of Indigenous harvest is far lower than the national recreational (Henry and Lyle 2003) or commercial harvest of sharks and is often very localised.

Shark control: Both Queensland and New South Wales have long-standing shark control programs and Western Australia has a sporadic program aimed at bather protection. Target species are large sharks (some of which have not been implicated in human bites) which are either euthanised upon capture or tagged and released offshore; bycatch species are released. Catch intent and extent was obtained from the Queensland Government's Open Data Portal (Queensland Government 2019) and available reports and scientific literature.

Other threats: This field lists non-fishing threats which pose a significant risk to the species. While there may be a long list of threats that potentially impact individual sharks, only significant threats which pose a risk at the population level are included here. Listed threats are:

- **Habitat degradation:** A threat generally impacting shallow inshore species especially where the species' range overlaps with areas of high human population density and development activities (agricultural, energy, urban, and industrial developments);
- **Freshwater flow alteration:** The severity of this threat may increase in the future with the northern Australian development agenda. Flow may be altered through large infrastructure such as dams (which can also pose a barrier to migration patterns) or from extraction of water for agricultural use. Freshwater flow alteration has the potential to impact those species using river systems, i.e., euryhaline sharks, sawfishes, and stingrays of northern Australia;
- **Aquaculture:** Specifically listed for the Maugean Skate *Zearaja maugeana* where the expansion of salmon aquaculture within the species' very restricted range has resulted in ongoing anoxic events in response to nutrient loading, placing stress on the population and on egg development.

Climate change is operating across marine and freshwater systems. Species range shifts, habitat loss (particularly in coral reef environments), food web alteration, and physiological changes are potential outcomes of a shifting climate, although the implications to shark species are not yet well understood (Heupel *et al.* 2018). The cumulative impact of climate change on top of the major threat of fishing has the potential to drive further population reduction, or constrain recovery, of threatened species. A review of climate change impacts, effects on habitats, research gaps, and management considerations in the context of Australian sharks is provided by Heupel *et al.* (2018). Because of the ubiquitous nature of this threat, climate change is not listed in the *Threats* section of the individual taxa profiles (although the *Assessment Justification* may refer to vulnerability to climate change effects as determined by Chin *et al.* 2010).

Knowledge Gaps: This table outlines specific actions and their priority rankings to address current knowledge gaps for a species. Knowledge gaps are divided into five themes, each of which improves the information base from which to assess status and manage species: taxonomy, distribution, population trend, life history, and connectivity. Explanations of the actions associated with each theme is provided in the section *Summary of extinction risk status and actions*. The selection of actions for a species was made by considering the available published and unpublished literature (including theses) and identifying gaps. Priorities are specified as high, medium, or low. These are relative rankings based on how vital the filling of the knowledge gap is to more accurately assess extinction risk and to monitor and manage the species.

Current Management: This lists management and conservation measures that are currently in place that are likely to have a bearing on a species' extinction risk. The actual effectiveness of specific measures will depend on many factors including compliance, enforcement, adaptiveness, and data reporting. Management measures specified here are related to commercial fisheries management, listings on legislation which provides some form of protection, or listings on international conservation agreements.

There are some higher-level initiatives which aim to improve conservation and management of sharks broadly which are not listed in the taxa profiles. One is the *National Plan of Action for the Conservation and Management of Sharks* (Shark-plan). Australia developed Shark-plan 1 in 2004 (DAFF 2004) followed by Shark-plan 2 in 2012 (DAFF 2012). These plans provide 'guidance to fisheries and conservation managers and the public to improve conservation and management of sharks,

and details actions to encourage the effective and sustainable management of Australia's shark populations' (DAFF 2012). Despite the similar titles, Shark-plans outline broad-level conservation and management issues for sharks in Australia, while this *Action Plan for Australian Sharks and Rays 2021* aims to assess the extinction risk status of individual species and recommends actions for their conservation at the species level.

For the vast majority of sharks there are no species-specific management measures in place. In these cases, these species may still benefit from general fisheries management which aims to ensure the sustainability of fisheries resources. Management is generally directed at target species (which are sharks in only a small number of cases), although measures to manage byproduct, bycatch, and broader impacts on the ecosystem have increasingly been implemented. In general, Australia has a reputation for strong fisheries management which benefits many sharks. Fisheries management is complex and varies widely between Commonwealth and state/territory-managed fisheries, and also between fisheries. This is because management is tailored to the specific target species, bycatch species, fishing gear deployed, geographic location and habitat being fished, and socio-economic factors of the fishery.

For Commonwealth fisheries, the most up-to-date information can be sourced from the annual *Fishery Status Reports* produced by ABARES (Patterson *et al.* 2019) and the Status of Australian Fish Stocks Reports website (www.fish.gov.au). Some states produce similar annual reports, e.g., Western Australia's *The State of the Fisheries* (Gaughan and Santoro 2018), and these combined with state/territory fishery agency websites are valuable sources of information on how particular fisheries are managed.

Australia has an extensive system of marine protected areas in the form of the Australian Marine Parks, the Great Barrier Reef Marine Park, the Heard Island and McDonald Islands Marine Reserve, and state and territory marine protected areas. The zoning, and therefore the activities permitted in these reserves, is complex and variable across the marine protected area estate, but no-take zones ('green zones') provide refuge for many species. Most sharks are likely to occur in one or more marine protected area, however the level of occurrence in the marine park estate is unknown for the majority of species. A simple analysis overlaying the distribution of threatened species with Australian Marine Parks show that all but the Maugean Skate *Zearaja maugeana* occur within at least one Australian Marine Park (Heupel *et al.* 2018). However, when considering overlap with park

zones closed to fishing activities, most species had <10% overlap, suggesting limited protection from fishing for threatened species in Australian Marine Parks (Heupel *et al.* 2018). Marine protected areas are not listed under *Current management* in the taxa profiles due to their widespread nature and the fact that these were not designed specifically for sharks. The role of the national marine protected area estate, including those in state and territory coastal waters, in the conservation and management of sharks is an area that requires further study.

A variety of controls are in place at the state and territory level to manage the recreational catch of sharks. These primarily consist of possession limits and/or size limits and may be species-specific (e.g., a possession limit of one Elephantfish *Callorhinchus millii* in Victoria or one Smooth Hammerhead *Sphyrna zygaena* in New South Wales) or broad (e.g., a possession limit of one shark in Queensland or three sharks in the Northern Territory, regardless of species). Recreational fishing controls are outlined in Woodhams and Harte (2018) and are not individually listed under *Current management* due to the non-species-specific nature of most regulations (with the exception of protected no-take species).

The current management measures specified in this Action Plan are outlined below (jurisdictions: AUS: Australian Commonwealth-managed fisheries; NSW, New South Wales; NT, Northern Territory; QLD, Queensland; SA, South Australia; TAS, Tasmania; VIC, Victoria; WA, Western Australia):

- *No species-specific management*: no direct measures in place for the species;
- *General commercial fishery controls* (*see notes below): management directed at the fishery and not specifically at the shark species being treated in the profile. These are broad level management measures, which are generally divisible into two types: fishery input controls and fishery output controls. Fishery input controls specify the amount of effort that goes into a fishery e.g., the number of vessels, the number of licences, the number of hooks or length of net. Fishery output controls specify the amount of resource that is removed by the fishery e.g., catch quotas. These will benefit sharks in different ways depending on the fishery and geographic location, but in general these controls effectively manage how much fishing effort a species may be subject to;
- *Species-specific commercial catch management* (*see notes below): several different management items that are either specific to the species being treated in the taxa profile or to a mixed group of similar species

(e.g., deepwater sharks of southeast Australia) are listed depending on the jurisdiction and fishery (these apply only to a small number of Australian sharks):

- *Commercial fishery quota* (AUS, QLD);
 - *Commercial fishery incidental catch limit* (AUS);
 - *Commercial fishery retention ban* (AUS);
 - *Commercial fishery daily catch limit* (SA, VIC);
 - *Commercial fishery input controls* (WA);
 - *Commercial fishery mixed-species quota* (AUS, NSW, NT);
 - *Commercial fishery mixed-species daily catch limit* (NSW);
 - *Commercial fishery trip catch limit* (QLD);
 - *Commercial fishery mixed-species trip catch limit* (QLD).
- *Species-specific spatial closures*: areas specifically closed to certain fisheries have been implemented for a small number of species to permit their recovery; these areas differ from marine protected areas as they are a fishery management tool, rather than a biodiversity conservation tool;
 - *EPBC Act-listed category*: this notes where a species is listed on the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* as Critically Endangered, Endangered, Vulnerable, Conservation Dependent, or Migratory; all threatened species (Critically Endangered, Endangered, Vulnerable) have Conservation Advices and most are subject to Recovery Plans; Conservation Dependent species are subject to *Plans of Management* (relevant plans are mentioned under *Current Management*). Threatened and Migratory species are known as Matters of National Environmental Significance. Under the EPBC Act, it is an offence to kill, take, trade, keep, or move a listed species in a Commonwealth area, unless you have a permit.
 - *State and territory protections*: this notes where a species is protected under state or territory conservation or fisheries legislation; this generally means that the species cannot be retained if caught by commercial or recreational fishers; relevant legislation for each jurisdiction is:
 - NSW: Fisheries Management Act 1994;
 - NT: Territory Parks and Wildlife Conservation Act 2000;
 - QLD: Nature Conservation Act 1992;

- SA: Fisheries Management Act 2007;
- TAS: Threatened Species Protection Act 1995;
- VIC: Flora and Fauna Guarantee Act 1988;
- WA: Wildlife Conservation Act 1950.

- *CMS Appendices I & II*: this notes where a species is listed on the *Convention on the Conservation of Migratory Species of Wild Animals* (CMS; an international conservation agreement aiming to conserve migratory species); Appendix I lists species threatened with extinction; Parties which are Range States to these species are required to offer them strict protection; Appendix II lists migratory species requiring international cooperation. Note that the term Migratory is used only in the context of CMS and the EPBC Act with the specific CMS definition: 'Migratory species means the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries' (CMS 2020). The terms 'mobile' or 'highly-mobile' are used in the biological sense for species which undertake regular large-scale movements.
- *CITES Appendices I & II*: this notes where a species is listed on the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES; an international conservation agreement aiming to ensure international trade in specimens of wild animals and plants does not threaten the survival of the species); Appendix I lists species threatened with extinction (resulting in an export restriction for Australian fisheries); Appendix II lists species 'not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival'. Species listed on Appendix II can only be traded if Australia has a *Non-Detriment Finding* in place. A *Non-Detriment Finding* has set national harvest levels for Porbeagle *Lamna nasus*, Oceanic Whitetip Shark *Carcharhinus longimanus*, Scalloped Hammerhead *Sphyrna lewini*, Great Hammerhead *Sphyrna mokarran*, and Smooth Hammerhead *Sphyrna zygaena* (DoE 2014a). The Largetooth Sawfish *Pristis pristis* is also subject to a *Non-Detriment Finding* (DSEWPac 2011).

Species listed on the CMS Appendices are considered for listing as Migratory under the EPBC Act and are afforded similar protection to listed threatened species. However, Australia has taken exemptions for ten CMS Appendix II

listed species: all three species of thresher shark (Pelagic Thresher *Alopias pelagicus*, Bigeye Thresher *Alopias superciliosus*, Common Thresher *Alopias vulpinus*), three species of hammerhead (Scalloped Hammerhead *Sphyrna lewini*, Great Hammerhead *Sphyrna mokarran*, Smooth Hammerhead *Sphyrna zygaena*), Dusky Shark *Carcharhinus obscurus*, Blue Shark *Prionace glauca*, School Shark *Galeorhinus galeus*, and Bottlenose Wedgefish *Rhynchobatus australiae*. The Australian Government has taken this approach because the EPBC Act or domestic fisheries management delivers stronger provisions than is required under the CMS listings (Appendix II listed species requires parties to cooperate together to improve management). These taxa profiles include the modified text: 'CMS Appendix II (EPBC listing exemption)'. For three other CMS Appendix II listed species (Shortfin Mako *Isurus oxyrinchus*, Longfin Mako *Isurus paucus*, Porbeagle *Lamna nasus*), legislation has been passed to allow the continuation of recreational fishing in Commonwealth waters. These taxa profiles include the modified text: 'EPBC Act-listed Migratory (rec. fish. permitted)'.

**Notes concerning commercial fisheries management:*

Capturing the extent of relevant commercial management measures related to sharks or potentially beneficial to sharks is challenging. The section *Species-specific commercial catch management* above refers to species-specific measures which are included in the taxa profiles (e.g., catch quotas for species such as Gummy Shark *Mustelus antarcticus* and Elephantfish *Callorhynchus milii* in the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery). Additionally, some fisheries have high-level catch limits which are not listed under *Current management* in the taxa profiles due to their non-specific nature. Catches of sharks may also be managed through gear restrictions rather than quotas or catch limits. Some relevant management is worth mentioning here (the following paragraphs are by no means exhaustive).

Amongst Commonwealth-managed fisheries, in the Eastern Tuna and Billfish Fishery there is a 20-shark trip limit. This restricts the catch of oceanic pelagic species and is likely to benefit species such as the Blue Shark *Prionace glauca*. In the Northern Prawn Fishery, the retention of any sharks or rays is prohibited and these must be discarded.

In the Queensland East Coast Inshore Finfish Fishery, as well as the specific catch limits for Grey Reef Shark *Carcharhinus amblyrhynchos* and Whitetip Reef Shark *Triaenodon obesus*, there are non-specific limits for 'guitarfish and shovel-nosed rays' which covers a variety of rhinopristoid rays (shark-like rays of the order Rhinopristiformes). In addition, there is a 'total permitted sharks and rays' possession limit of 10 for all commercial fishers that do not have a *Shark Symbol* attached to their license. Fishers with

a *Shark Symbol* attached to their license have no restriction on their level of shark catch provided the fishery-wide shark catch remains below the competitive Total Allowable Catch (TAC). The one exception to this is for Scalloped Hammerhead *Sphyrna lewini* which were subject to a species-specific TAC and other provisions following the species' listing as Conservation Dependent under the EPBC Act. Similar management is in place for the Gulf of Carpentaria Inshore Finfish Fishery, except that there is currently no TAC in place, with catches managed by effort restrictions. In the Queensland East Coast Trawl Fishery, the retention of any sharks or rays is prohibited and these must be discarded.

In the Northern Territory Offshore Net and Line Fishery, there are Total Allowable Commercial Catch (TACC) quotas in place for (1) 'Blacktip Sharks' (Common Blacktip Shark *Carcharhinus limbatus* and Australian Blacktip Shark *Carcharhinus tilstoni*); (2) Spot-tail Sharks *Carcharhinus sorrah*; (3) 'Combined Shark Species' (several whaler sharks and hammerhead sharks); and (4) 'Combined Other Shark Group' (primarily, Australian Blackspot Shark *Carcharhinus coatesi*, Hardnose Shark *Carcharhinus macloti*, and Milk Shark *Rhizoprionodon acutus*). The quota for the Spot-tail Shark is species-specific, so it is listed under *Current management* as *Commercial fishery quota (NT)*, whereas for all other species, the TACCs are listed as *Commercial fishery mixed-species quota (NT)* as they are not species-specific. There are additional species that make up a small proportion of the catch; these quotas are not listed under *Current management* for those as they are minor components of catch.

In Western Australia, all sharks and rays are commercially protected, limiting the retention of sharks and rays to vessels permitted to operate in the state's managed shark fishery which have specific effort limits for shark-targeted fishing.

In southeast states (South Australia, Victoria, Tasmania, New South Wales), most shark catch is managed as part of the Southern and Eastern Scalefish and Shark Fishery through shared arrangements under Offshore Constitutional Settlement provisions. Hence, there are limited species-specific regulations in these states and state-level management is generally not cited under *Current management* in each taxa profile but falls within *General commercial fishery controls*. There are some exceptions, such as catch limits for School Shark *Galeorhinus galeus* and Gummy Shark *Mustelus antarcticus* in South Australia.

The New South Wales Ocean Trap and Line Fishery includes daily catch limits for 'wobbegongs' and this is included under *Current management* for those *Orectolobus* species occurring in that state. This fishery also includes a TACC quota for species of whaler shark (family Carcharhinidae),

Smooth Hammerhead *Sphyrna zygaena* (Scalloped Hammerhead *Sphyrna lewini* and Great Hammerhead *Sphyrna mokarran* are now protected species in New South Wales), and mackerel sharks (family Lamnidae; except White Shark *Carcharodon carcharias* which is protected) (see Macbeth *et al.* 2009). The TACC is included under *Current management* for each relevant species as *Commercial fishery mixed-species quota*.

Bycatch mitigation through modifications to fishing gear is a major management tool used in Australian fisheries and provides significant benefit for many sharks. The use of Turtle Exclusion Devices in tropical trawl fisheries has been shown to significantly reduce the capture of many species, reducing bycatch rates in the Northern Prawn Fishery as well as state and territory prawn trawl fisheries. Turtle Exclusion Devices and other bycatch reduction devices are not specifically mentioned under *Current management* in each taxa profile but fall within *General commercial fishery controls*.

Finally, note that the EPBC Act requires the Australian Government to assess the environmental performance of fisheries and promote ecologically sustainable fisheries management. The Department of Agriculture, Water and the Environment is responsible for the assessment of fisheries managed under Commonwealth legislation and state export fisheries in accordance with the Act. The primary role is to evaluate the environmental performance of fisheries, including: (a) the strategic assessment of fisheries under Part 10 of the EPBC Act; (b) assessments relating to impacts on protected marine species under Part 13; and, (c) assessments for the purpose of export approval under Part 13A.

Conservation Actions: This lists the actions required to conserve, manage, and where appropriate, recover, a species. Detailed explanations of each conservation action is provided in Table 8. Conservation actions were selected for each species based on their extinction risk status, threats, and current management measures.

SUPPORTING INFORMATION FOR THREATENED TAXA

A *Supporting Information* page follows the taxa profile for most threatened species. These pages provide information regarding these species' eligibility against the IUCN Red List Criteria for: (a) threatened taxa where it is recommended that they be considered for listing, up-listing, or down-listing under the EPBC Act; (b) threatened taxa where it is recommended that management be maintained and improved (these are currently listed under the EPBC Act but this Action Plan outlines eligibility against the IUCN Red List Criteria); and, (c) those where it is recommended that data collection be prioritised to strengthen the evidence-base underlying their status determinations (Table 9).

Terms used in *Supporting Information* pages follow IUCN (2012a) and IUCN Standards and Petitions Committee (2019). Many of these have been outlined in this section of the book. Citations for information sources are provided in the *Key Literature* section. Area of occupancy (AOO) has not been reliably calculated for most Australian sharks given a lack of habitat and residency data. However, AOO is generally given here as above the Criterion B threshold of <2,000 km² since the majority of species included here have broad occupancy patterns well above the threshold. There is one exception, the Maugean Skate *Zearaja maugeana*, where AOO is provided. It may also be below the threshold for the Spotted Shovelnose Ray *Aptychotrema timorensis* but data are lacking due to limited sampling and records.

For threatened species, the most plausible threat is fishing activities. Therefore, locations are counted based on the spatial footprint of the major fisheries interacting with a species. Unaffected areas are counted as 1 location where they are continuous or >1 location if spatially separated. For species subject to other plausible threats (such as coastal habitat loss and degradation due to urban development), locations are also counted based on these threats. See IUCN Standards and Petitions Committee (2019) for guidelines on defining locations.

Information available to support threatened assessments varies between species. A precautionary approach has been applied here where supporting information may be limited quantitatively and population reductions or continuing declines may have been *inferred* or suspected. For those species where it is recommended that data collection be prioritised it is noted that further data are required to strengthen the evidence-base underlying this assessment.



SUMMARY OF EXTINCTION RISK STATUS AND ACTIONS

EXTINCTION RISK STATUS

The overall Red List status of Australian sharks is characterised by a relatively low level of extinction risk and a high level of secure species. Of 328 species, 39 are threatened with extinction (22 sharks, 17 rays; no chimaeras are threatened); 32 are Near Threatened (18 sharks, 13 rays, 1 chimaera); 231 are Least Concern (123 sharks, 95 rays, 13 chimaeras); and, 26 are Data Deficient (19 sharks, 7 rays, no chimaeras are Data Deficient) (Table 3, Figure 1). No sharks are Extinct or Extinct in the Wild.

Table 3: The number and percentage (in parentheses) of Australian sharks, rays, and chimaeras assigned to each IUCN Red List Category. Categories: CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient. *THR (threatened) is not a category, but a summation of species assigned to the threatened categories CR, EN, and VU.

	Category						
	CR	EN	VU	THR*	NT	LC	DD
All species (n = 328)	5 (1.5%)	14 (4.3%)	20 (6.1%)	39 (11.9%)	32 (9.8%)	231 (70.4%)	26 (7.9%)
Sharks (n = 182)	2 (1.1%)	9 (4.9%)	11 (6.0%)	22 (12.0%)	18 (9.9%)	123 (67.6%)	19 (10.4%)
Rays (n = 132)	3 (2.3%)	5 (3.8%)	9 (6.8%)	17 (12.9%)	13 (9.8%)	95 (72.0%)	7 (5.3%)
Chimaeras (n = 14)	0	0	0	0	1 (7.1%)	13 (92.9%)	0

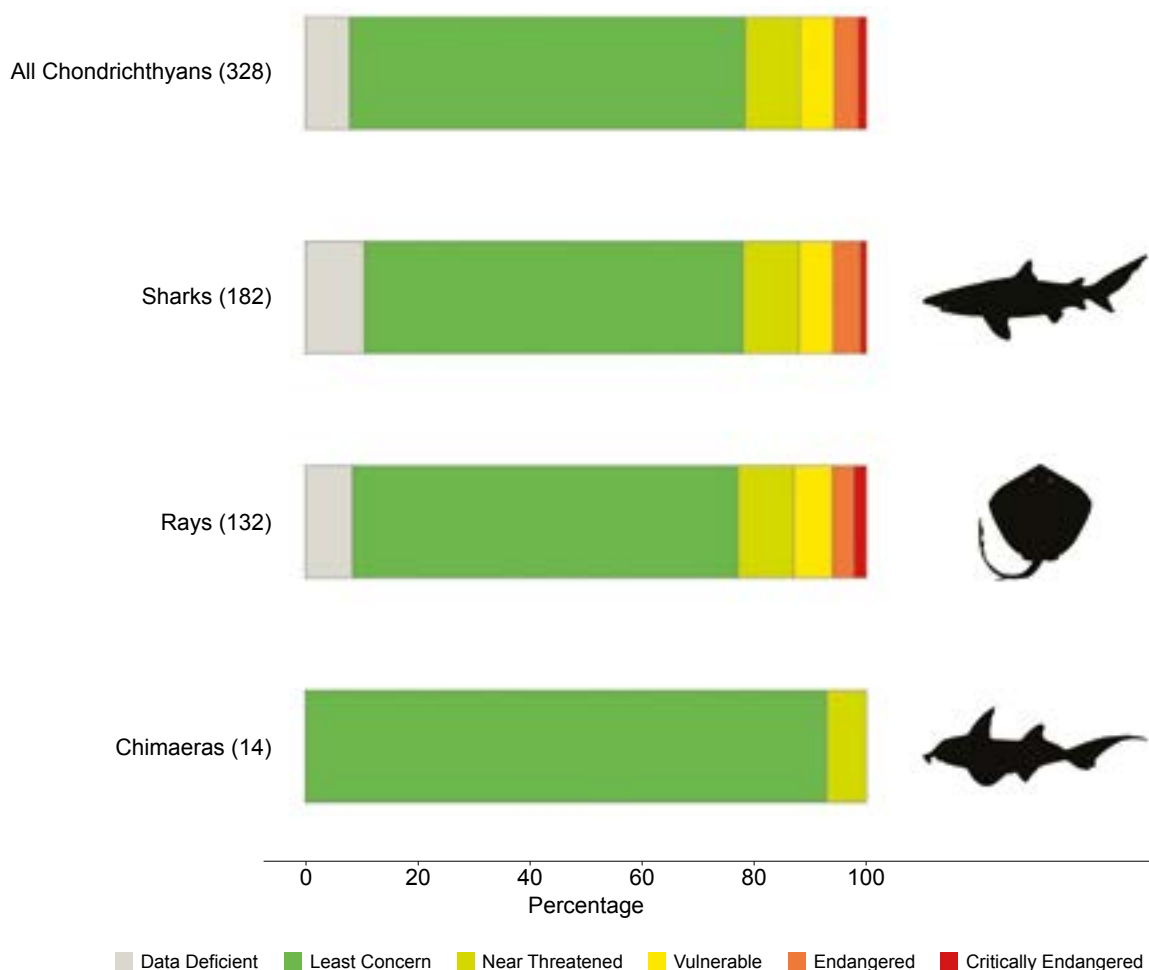


Figure 1: The extinction risk status of Australian sharks, rays, and chimaeras according to their assigned IUCN Red List Category. 'All chondrichthyans' represents sharks, rays, and chimaeras combined.

THREATENED SPECIES

Thirty-nine species, or 11.9% of the Australian shark fauna was assessed in threatened categories (Table 4).

Critically Endangered (CR) species face an extremely high risk of extinction and are a priority for conservation and management. The five CR species (Table 4) are divisible into two species-groups and an additional pelagic species. The first group consists of two small endemic species of temperate southeast Australia, the Whitetip Swellshark *Cephaloscyllium albiginum* and the Australian Longnose Skate *Dentiraja confusus*. Both species were historically abundant, with the Whitetip Swellshark one of the most abundant benthic sharks of southern Australia. They have been variably discarded as unwanted bycatch or retained as byproduct. Severe population reductions have been documented for both species due to a long history of demersal fishing. Their depth ranges (Whitetip Swellshark, 125–555 m; Australian Longnose Skate, 20–390 m) overlaps extensively with fishing operations and they have no refuge in deepwater like some species that range deeper on the continental slope. Fishing effort is not even across their range, and areas of lower fishing pressure, along with Australian Marine Parks, will be important for their conservation and recovery. Neither species are currently listed under the EPBC Act.

The second group consists of two large species of tropical northern Australia, the Largetooth Sawfish *Pristis pristis* and the Green Sawfish *Pristis zijsron*. Sawfishes globally have undergone severe population reductions and range contractions, and although declines have occurred locally, northern Australia is now the remaining population stronghold for the four Indo-West Pacific species. They are the only non-monospecific family of shark in Australia where all species are threatened. Severe population reduction in northern Australia has not been quantified but is suspected based on historical information regarding their previous abundance relative to contemporary times. All sawfishes continue to be caught as bycatch in tropical net fisheries, although considerable effort has been made to reduce catches and limit mortality in trawl fisheries. The Largetooth Sawfish is euryhaline, with large northern Australian rivers serving as critical nursery areas. The ongoing northern Australian development agenda potentially threatens these nursery areas through water extraction and storage activities. Both the Largetooth Sawfish and the Green Sawfish are listed as threatened under the EPBC Act but at a lower category (VU) than assessed here (they are also listed as Migratory).

Lastly, the globally-distributed pelagic Oceanic Whitetip Shark *Carcharhinus longimanus* is a highly-mobile and regionally connected species; its extinction risk status here reflects its global status (>98% population reduction over the last three generations). Catches in Australian waters are low, but Australia will need to continue to work regionally and internationally with existing conservation instruments and fisheries management to secure the species globally. This species is not currently listed under the EPBC Act.

Endangered (EN) species face a very high risk of extinction and, like CR species, are a priority for conservation and management. The 14 EN species (Table 4) are divisible into two species-groups facing similar situations, and a further group of species each with different reasoning for their threatened status. The first group consists of deepwater temperate species which have declined as a result of the long history of demersal fishing off southeast Australia. These species, the Greeneye Spurdog *Squalus chloroculus*, Harrison's Dogfish *Centrophorus harrissoni*, Southern Dogfish *Centrophorus zeehaani*, and the Grey Skate *Dipturus canutus*, overlap with the CR Whitetip Swellshark and Australian Longnose Skate and have been impacted by the same threats. However, each of these EN species has some refuge due to either a wider depth or geographic range, and as such, the population reductions recorded on southeast Australian fishing grounds are not representative of their entire Australian range. The Southern Dogfish and Harrison's Dogfish are listed as Conservation Dependent under the EPBC Act. The nomenclature of the former requires updating on the EPBC Act.

The second group consists of globally-distributed pelagic species. Like the CR Oceanic Whitetip Shark, these species, the Whale Shark *Rhincodon typus*, Pelagic Thresher *Alopias pelagicus*, Basking Shark *Cetorhinus maximus*, Scalloped Hammerhead *Sphyrna lewini*, Great Hammerhead *Sphyrna mokarran*, and Giant Manta Ray *Mobula birostris*, are highly-mobile and regionally connected; their extinction risk status here reflects their global status.

In the case of the Scalloped Hammerhead and Great Hammerhead however, some management measures that are in place in Australia along with areas of refuge from fishing resulted in a lower category than the global assessment of CR. Again, regional and international conservation instruments and fisheries management measures are vital to securing these species locally, although domestic fisheries management is also critical for the hammerhead sharks. The Whale Shark is listed as VU and Migratory, the Scalloped Hammerhead as Conservation Dependent (with state and territory

Table 4: Threatened Australian sharks. These species are categorised as Critically Endangered, Endangered, or Vulnerable under IUCN Red List criteria. An asterisk (*) denotes an Australian endemic species. For non-endemic species, the assigned Red List status is for the Australian range only. Australian range specifies the mainland Australian states and territories that the species occur in, or immediately adjacent to.

Family	Scientific Name	Common Name	Australian Range	Page No.
CRITICALLY ENDANGERED				
SCYLORHINIDAE	* <i>Cephaloscyllium albiginum</i>	Whitefin Swellshark	NSW, SA, TAS, VIC	182
CARCHARHINIDAE	<i>Carcharhinus longimanus</i>	Oceanic Whitetip Shark	NSW, NT, QLD, SA, WA	217
PRISTIDAE	<i>Pristis pristis</i>	Large-tooth Sawfish	NT, QLD, WA	246
	<i>Pristis zijsron</i>	Green Sawfish	NSW ¹ , NT, QLD, SA ² , WA	248
RAJIDAE	* <i>Dentiraja confusus</i>	Australian Longnose Skate	NSW, TAS, VIC	294
ENDANGERED				
SQUALIDAE	* <i>Squalus chloroculus</i>	Greeneye Spurdog	NSW, SA, TAS, VIC	58
CENTROPHORIDAE	<i>Centrophorus harrissoni</i>	Harrisson's Dogfish	NSW, QLD, TAS, VIC	68
	* <i>Centrophorus zeehaani</i>	Southern Dogfish	NSW, SA, TAS, VIC, WA	72
RHINCODONTIDAE	<i>Rhincodon typus</i>	Whale Shark	All (except SA)	137
ALOPIIDAE	<i>Alopias pelagicus</i>	Pelagic Thresher	NSW, NT, QLD, WA	145
CETORHINIDAE	<i>Cetorhinus maximus</i>	Basking Shark	NSW, SA, TAS, VIC, WA	148
TRIAKIDAE	<i>Galeorhinus galeus</i>	School Shark	All (except NT)	193
SPHYRNIDAE	<i>Sphyrna lewini</i>	Scalloped Hammerhead	NSW, NT, QLD, WA	238
	<i>Sphyrna mokarran</i>	Great Hammerhead	NSW, NT, QLD, WA	239
PRISTIDAE	<i>Pristis clavata</i>	Dwarf Sawfish	NT, QLD, WA	244
RAJIDAE	* <i>Dipturus canutus</i>	Grey Skate	NSW, SA, TAS, VIC	306
	* <i>Zearaja maugeana</i>	Maugean Skate	TAS	320
UROLOPHIDAE	* <i>Urolophus orarius</i>	Coastal Stingaree	SA	372
MOBULIDAE	<i>Mobula birostris</i>	Giant Manta Ray	NSW, NT, QLD, WA	389
VULNERABLE				
SQUATINIDAE	* <i>Squatina albigunctata</i>	Eastern Angelshark	NSW, QLD, VIC	104
BRACHAELURIDAE	* <i>Brachaelurus colcloughi</i>	Colclough's Shark	NSW, QLD	118
CARCHARIIDAE	<i>Carcharias taurus</i>	Grey Nurse Shark	All	140
ALOPIIDAE	<i>Alopias superciliosus</i>	Bigeye Thresher	NSW, NT, QLD, SA, WA	146
LAMNIDAE	<i>Carcharodon carcharias</i>	White Shark	All	150
	<i>Isurus oxyrinchus</i>	Shortfin Mako	All (except NT)	152
	<i>Isurus paucus</i>	Longfin Mako	NSW, NT, QLD, WA	153
CARCHARHINIDAE	<i>Carcharhinus falciformis</i>	Silky Shark	NSW, NT, QLD, WA	212
	<i>Glyphis garricki</i>	Northern River Shark	NT, WA	224
	<i>Glyphis glyphis</i>	Speartooth Shark	QLD, NT, WA	226
SPHYRNIDAE	<i>Eusphyra blochii</i>	Winghead Shark	QLD, NT, WA	236
PRISTIDAE	<i>Anoxypristis cuspidata</i>	Narrow Sawfish	QLD, NT, WA	242
TRYGONORRHINIDAE	<i>Aptychotrema timorensis</i>	Spotted Shovelnose Ray	NT	256
RAJIDAE	* <i>Dentiraja australis</i>	Sydney Skate	NSW, QLD	290
	* <i>Spiniraja whitleyi</i>	Melbourne Skate	NSW, SA, TAS, VIC, WA	318
DASYATIDAE	* <i>Hemirhynchus fluviorum</i>	Estuary Stingray	NSW, NT, QLD	330
UROLOPHIDAE	<i>Urolophus bucculentus</i>	Sandyback Stingaree	NSW, QLD, SA, TAS, VIC	362
	* <i>Urolophus sufflavus</i>	Yellowback Stingaree	NSW, QLD	376
	* <i>Urolophus viridis</i>	Greenback Stingaree	NSW, QLD, TAS, VIC	378
MYLIOBATIDAE	<i>Myliobatis hamlyni</i>	Purple Eagle Ray	NSW, QLD, WA	384

¹ Extinct in NSW

² Historical record only (probable vagrant)

management in place that restricts catch levels), and the Basking Shark and Giant Manta Ray as Migratory, under the EPBC Act.

The School Shark *Galeorhinus galeus* has been a target species of commercial fishing since the 1920s. It is now subject to considerable management measures (e.g., listed as Conservation Dependent under the EPBC Act; incidental take limits to enable rebuilding) with some signs of recovery. However, biomass is still likely to be <20% of virgin levels. Some of the historical population reduction occurred outside of the last three generations (pre-1943), so it does not meet CR. Continued catch monitoring and management measures should allow a more favourable assessment in the future.

Three ray species round out the EN species. The significant population reduction in the Dwarf Sawfish *Pristis clavata* largely occurred prior to the last three generations (pre-1970), noting that protection and management measures have reduced mortality over the last 1–2 decades. This means that its three generation length population reduction is not suspected to be as severe as other *Pristis* sawfishes. The Dwarf Sawfish is listed under the EPBC Act but at a lower category (VU) than assessed here (it is also listed as Migratory).

Both the Maugean Skate *Zearaja maugeana* and the Coastal Stingaree *Urolophus orarius* are restricted range endemics, the former to Tasmania and the latter to South Australia. The Maugean Skate has a limited extent of occurrence and area of occupancy, both of which are under the thresholds for EN. Of concern is that it has not been recorded from one (Bathurst Harbour) of two locations it occurs in and may be extinct there. While the species is protected, it will not be secure until threats within the second location (Macquarie Harbour) are adequately mitigated. About half of the range of the Coastal Stingaree overlaps with trawling which has been ongoing since the 1960s. Surveys have shown that it is only recorded at sites with low trawling intensity with only a single individual recorded in recent surveys. The Maugean Skate is currently listed as EN under the EPBC Act while the Coastal Stingaree is not listed.

Vulnerable (VU) species face a high risk of extinction and, like CR and EN species, are a priority for conservation and management, although their threatened status is not as severe. Most VU species met thresholds under Criterion A with their population reduction the result of fishing activities. These species (Table 4) are listed for similar reasons as some of the CR and EN species, but often some form of refuge means that population reductions are not as severe. Several species have undergone population reduction from southeast Australian fishing activities, including the Eastern Angelshark

Squatina albipunctata, Sydney Skate *Dentiraja australis*, Melbourne Skate *Spiniraja whitleyi*, and the stingarees. Like wide-ranging pelagic species mentioned above, the assessment of several VU species reflects their global extinction risk status including the Silky Shark *Carcharhinus falciformis* and the Bigeye Thresher *Alopias superciliosus*. For the Shortfin Mako *Isurus oxyrinchus*, despite a global EN assessment, regional information supports VU due to contrasting situations in adjacent areas (declining in the Indian Ocean and increasing in New Zealand).

Some VU species are very poorly-known and further information is required to better understand their extinction risk status. These include the rarely-encountered Colclough's Shark *Brachaelurus colcloughi*, Spotted Shovelnose Ray *Aptychotrema timorensis*, and Purple Eagle Ray *Myliobatis hamlyni*. These species are priorities for understanding their full distributions, interactions with fisheries, and level of population reduction. Recent work on the Estuary Stingray *Hemitrygon fluviorum* suggests that its population status in New South Wales is not as dire as previously thought. Further surveys are a priority to ascertain if the species is more secure than suggested by its VU assessment here.

Considerable research effort to improve our baseline understanding of the euryhaline river sharks (*Glyphis* species) has resulted in differences in category from their current EPBC Act listings. Both the Speartooth Shark *Glyphis glyphis* and the Northern River Shark *Glyphis garricki* are wider-ranging than previously known. Population size estimates for parts of their range highlight that they don't meet thresholds for their current EPBC Act listings of CR and EN, respectively.

Under the EPBC Act, the Grey Nurse Shark *Carcharias taurus* has separate listings for eastern Australia (CR) and western Australia (VU). It has been assessed here as VU, balancing severe population declines in eastern Australia with low catch levels in western Australia (with an historical stable trend) and a lack of significant threats across its wide northern Australian range (albeit where records are sparse). Significant population reduction outside of eastern Australia is therefore unlikely.

Since the EPBC Act listings, considerable new information is available on this species in eastern Australia. For example, the application of close-kin mark-recapture estimated a population size of 2,167 (95% confidence interval: 1,257–3,078) mature individuals (assuming age-at-maturity of 10 years for females and 7 years for males) or 686 (956 to 2,417) mature individuals (assuming age-at-maturity of 14 years for females and 11 years for males) (Bradford *et al.* 2018). These scenarios estimated an increasing population trend with annual rates of increase of 3.4–4.5% (Bradford *et al.* 2018).

While these population size point estimates are below the threshold for EN under Criterion C (<2,500 mature individuals), the species does not meet C1 or C2 due to the increasing population trend implying that there is no 'continuing decline' (see Table 2). As such, this species would not be eligible for listing under Criterion C in eastern Australia. However, data from New South Wales and Queensland shark control programs showed significant population reductions of >97% over the last three generations (75 years), and therefore the Grey Nurse Shark in eastern Australia (Queensland and New South Wales) would still meet CR under Criterion A if that subpopulation was assessed separately. It is encouraging to see signs of recovery in eastern Australia, but given the long generation length of the species, it will be some time until the species recovers to a level that it no longer meets CR in eastern Australia.

New national population size estimates for the White Shark *Carcharodon carcharias* applying close-kin mark-recapture (Bruce *et al.* 2018) indicate possible eligibility for listing under Criterion C. The available point estimate (2,210 mature individuals) and lower bound estimate are below the EN threshold (<2,500) while the upper bound estimate is above the threshold for EN but below the threshold for VU (<10,000) (Bruce *et al.* 2018). However, several lines of evidence point to either a stable or increasing trend with little support for a 'continuing decline'. The species therefore does not meet eligibility under Criterion C for any threatened category. The White Shark has undergone historical population reductions and still meets a Vulnerable assessment under Criterion A (the 'population size reduction' criterion).

With the exception of Grey Nurse Shark *Carcharias taurus*, the White Shark *Carcharodon carcharias*, and the two *Glyphis* species, no other species assessed here as VU are currently listed as threatened under the EPBC Act. Shortfin Mako *Isurus oxyrinchus*, Longfin Mako *Isurus paucus*, and Narrow Sawfish *Anoxypristis cuspidata* are listed as Migratory under the EPBC Act.

LIFEBOAT SPECIES

Lifeboat species represent a unique opportunity for Australia to secure the population status of globally threatened species. Forty-five species (27 sharks, 18 rays) which are threatened globally were assessed as Near Threatened (18 species) or Least Concern (27 species) in Australia (Table 5) (as of Red List update 2020.3 on 10 December 2020; refer to the IUCN Red List website for up-to-date global assessments: IUCN 2020). These are species for which heavy exploitation outside of Australian waters has caused population reduction but which do not face comparable levels of fishing pressure in Australia. Lifeboat species broadly fall into three groups: (1) deepwater sharks; (2) tropical coastal and shelf sharks and rays; and, (3) pelagic sharks and devilrays.

While many deepwater species occurring on the upper continental slope of southeast Australia have undergone severe population reduction, their wider Australian range faces little to no fishing pressure. As a result, most deepwater lifeboat species are assessed as Near Threatened. Deepwater sharks have some of the lowest levels of biological productivity due to their life history (late age-at-maturity, long lifespan, low fecundity). Where they are fished, some species have collapsed rapidly (particularly the gulper sharks *Centrophorus* spp).

Catches of inshore coastal and shelf tropical sharks and rays across northern Australia are generally at levels that are not causing, or likely to cause, population reduction. This is a combination of the vastness of northern Australia, low human population density, and well-managed and regulated fisheries. The mandatory use of bycatch reduction devices (including Turtle Exclusion Devices) in tropical prawn trawl fisheries has significantly reduced bycatch levels of large sharks and rays. While a number of commercial fisheries operate across northern Australia, there are large areas which receive little fishing effort or are closed to certain fishing gear types.

The Commonwealth-managed Northern Prawn Fishery (NPF) is the largest northern fishery, but despite having a management area stretching widely across northern Australia from Cape York, Queensland to Cape Londonberry, Western Australia, fishing effort is concentrated in inshore areas of the Gulf of Carpentaria, parts of the Top End, and parts of Joseph Bonaparte Gulf. Spatial management arrangements in Western Australia's North Coast Bioregion and in the Northern Territory include considerable areas closed to trawling, and marine reserves provide further refuge. This includes Australian Marine Parks, although areas completely closed to commercial fishing are relatively small in the North Marine Parks Network. More significant protection is provided in the Great Barrier Reef Marine Park and the Coral Sea Marine Park.

The situation in northern Australia is in stark contrast to adjacent parts of the Indo-West Pacific which includes some of the world's largest shark fishing nations. Many tropical species occurring in northern Australia range widely throughout the Indo-West Pacific where they face extremely high levels of exploitation in often unregulated or poorly-regulated fisheries. Lifeboat Australia is becoming increasingly important for these species, including the rays listed in Table 5. Notable are the contrasting extinction risk status of wedgefishes (family Rhinidae) and the Giant Guitarfish *Glaucostegus typus* which are CR globally due to steep population reductions, including in adjacent Indonesia. These species face little threat in northern Australia, although assuming some connectivity of the wedgefishes with the populations occurring in Indonesia, local declines are also suspected.

Table 5: Australian 'lifeboat' sharks. These species are globally threatened with extinction on the IUCN Red List of Threatened Species (Global Category) but are not threatened in Australian waters (Action Plan Category; these species have been assessed as Near Threatened or Least Concern in Australia). Australia therefore acts as a 'lifeboat' for the global population. IUCN Red List Categories: CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern.

Family	Scientific Name	Common Name	Action Plan Category	Global Category	Page No.
HEXANCHIDAE	<i>Notorynchus cepedianus</i>	Broadnose Sevengill Shark	LC	VU	50
SQUALIDAE	<i>Squalus acanthias</i>	Whitespotted Spurdog	LC	VU	54
	<i>Squalus montalbani</i>	Philippine Spurdog	NT	VU	64
CENTROPHORIDAE	<i>Centrophorus granulosus</i>	Gulper Shark	LC	EN	67
	<i>Centrophorus moluccensis</i>	Endeavour Dogfish	LC	VU	69
	<i>Centrophorus squamosus</i>	Leafscale Gulper Shark	LC	EN	70
	<i>Deania quadrispinosa</i>	Longsnout Dogfish	NT	VU	74
SOMNIOSIDAE	<i>Centroscymnus owstonii</i>	Owston's Dogfish	NT	VU	88
DALATIIDAE	<i>Dalatias licha</i>	Black Shark	NT	VU	96
HEMISCYLLIIDAE	<i>Hemiscyllium hallstromi</i>	Papuan Epaulette Shark	LC	VU	132
GINGLYMOSTOMATIDAE	<i>Nebrius ferrugineus</i>	Tawny Shark	LC	VU	135
STEGOSTOMIDAE	<i>Stegostoma tigrinum</i>	Zebra Shark	LC	EN	136
ODONTASPIDIDAE	<i>Odontaspis ferox</i>	Smalltooth Sandtiger Shark	NT	VU	142
ALOPIIDAE	<i>Alopias vulpinus</i>	Common Thresher	NT	VU	147
LAMNIDAE	<i>Lamna nasus</i>	Porbeagle	LC	VU	154
HEMIGALEIDAE	<i>Hemipristis elongata</i>	Fossil Shark	LC	VU	202
CARCHARHINIDAE	<i>Carcharhinus albimarginatus</i>	Silvertip Shark	LC	VU	203
	<i>Carcharhinus amblyrhynchos</i>	Grey Reef Shark	NT	EN	206
	<i>Carcharhinus brachyurus</i>	Bronze Whaler	LC	VU	208
	<i>Carcharhinus brevipinna</i>	Spinner Shark	LC	VU	209
	<i>Carcharhinus melanopterus</i>	Blacktip Reef Shark	LC	VU	219
	<i>Carcharhinus obscurus</i>	Dusky Shark	NT	EN	220
	<i>Carcharhinus plumbeus</i>	Sandbar Shark	NT	VU	221
	<i>Negaprion acutidens</i>	Sharptooth Lemon Shark	LC	VU	229
	<i>Rhizoprionodon acutus</i>	Milk Shark	LC	VU	231
	<i>Triaenodon obesus</i>	Whitetip Reef Shark	NT	VU	234
SPHYRNIDAE	<i>Sphyrna zygaena</i>	Smooth Hammerhead	NT	VU	240
RHINIDAE	<i>Rhina ancylostoma</i>	Shark Ray	NT	CR	250
	<i>Rhynchobatus australiae</i>	Bottlenose Wedgefish	NT	CR	251
	<i>Rhynchobatus palpebratus</i>	Eyebrow Wedgefish	NT	CR	252
GLAUCOSTEGIDAE	<i>Glaucostegus typus</i>	Giant Guitarfish	LC	CR	253
DASYATIDAE	<i>Himantura leoparda</i>	Leopard Whipray	LC	VU	334
	<i>Pateobatis fai</i>	Pink Whipray	LC	VU	345
	<i>Pateobatis jenkinsii</i>	Jenkins' Whipray	LC	VU	347
	<i>Taeniurops meyeri</i>	Blotched Fantail Ray	LC	VU	350
	<i>Urogymnus asperrimus</i>	Porcupine Ray	LC	VU	352
	<i>Urogymnus granulatus</i>	Mangrove Whipray	LC	VU	354
AETOBATIDAE	<i>Aetobatus ocellatus</i>	Spotted Eagle Ray	LC	VU	381
MYLIOBATIDAE	<i>Aetomylaeus vesperilio</i>	Ornate Eagle Ray	NT	EN	383
MOBULIDAE	<i>Mobula alfredi</i>	Reef Manta Ray	LC	VU	388
	<i>Mobula eregoodoo</i>	Long-horned Pygmy Devilray	LC	EN	390
	<i>Mobula kuhlii</i>	Kuhl's Devilray	LC	EN	391
	<i>Mobula mobular</i>	Giant Devilray	NT	EN	392
	<i>Mobula tarapacana</i>	Chilean Devilray	NT	EN	393
	<i>Mobula thurstoni</i>	Bentfin Devilray	NT	EN	394

Globally, the devilrays (family Mobulidae) have been increasingly targeted for their gill-plates and utilised for the medicinal trade. However, in Australia they face little threat with generally limited interactions with Australian fisheries. Some species which are highly-mobile are suspected to have declined here due to their regional connectivity and threats operating outside of Australian waters.

NEAR THREATENED SPECIES

Species which are close to qualifying for, or is likely to qualify for, a threatened category in the near future represent about 10% of Australian sharks (Table 6). This group also includes some species that have been recovering from historic depletion and do not meet criteria for a threatened category but have not recovered sufficiently to meet Least Concern. It is important to remember that these species are not threatened but that there is some concern regarding their population status. Monitoring of these species is a priority to ensure that they do not meet a listing of threatened in the future or that their recovery continues. Such monitoring and research may in fact show that these species are Least Concern in future assessments, especially some exploited species which are now under sustainable management. Near Threatened species broadly fall into three groups: (1) deepwater species; (2) regionally-connected species; and, (3) targeted sharks under management.

The severe population reduction of upper continental slope species off southeast Australia has been described under the threatened species section above. Numerous NT species have declined considerably off the southeast but that decline is not considered representative of their entire Australian range. The Eastern Longnose Spurdog *Squalus grahami* has a wide eastern Australian range with ~20% of its range subject to heavy fishing. Outside this area fishing pressure is much lower. The deeper water sharks and the skates listed in Table 6, along with Ogilby's Chimaera *Chimaera ogilbyi*, were assessed as NT for similar reasons.

For some wide-ranging pelagic and demersal species, their NT status in Australia reflects their global extinction risk status. In the case of the Blue Shark *Prionace glauca*, a highly-mobile species, its assessment reflects the global category of NT under the assumption of connectivity with the regional subpopulation(s). The wedgefishes (family Rhinidae) are not highly-mobile but assumed to have some connectivity with adjacent countries where they are heavily exploited and have suffered steep declines. Their NT assessment reflects reduced threat in northern Australia, but some level of decline due to regional connectivity. The levels of this connectivity need to be defined in order to better understand the risk to these globally threatened species.

Some targeted sharks have historically undergone population reductions due to exploitation but are now recovering. The Dusky Shark *Carcharhinus obscurus*, which is commercially targeted off Western Australia, experienced historic declines but the trend stabilised and the population is now increasing since the implementation of management measures. The Sandbar Shark *Carcharhinus plumbeus* was also fished at unsustainable levels in Western Australia, but again, management is now allowing the species to recover.

LEAST CONCERN SPECIES

Species which currently do not qualify or are not close to qualifying for a threatened category, represent the majority of Australian sharks. Least Concern species account for 70% of all species (68% of sharks, 72% of rays, 93% of chimaeras). This level is the highest for any complete regional extinction risk assessment for sharks, including New Zealand (60% LC), Europe (37% LC), and the Arabian Seas region (12% LC) (see Finucci *et al.* 2019).

There are a number of factors that can result in a LC status. Wide-ranging and abundant species often qualify for a LC assessment. These species generally do not meet Criteria B (small geographic range), C (small population size), or D (very small or restricted population). However, some do meet Criterion A (population reduction) and some previously abundant sharks are currently threatened. A lack of threats or threats at a scale not likely to cause population reduction is the central pillar of LC assessments. It is worth noting though that the focus here is primarily on fishing activities, the major threat facing sharks, and the impacts of a shifting climate on species is largely unknown.

Many LC species occur in deepwater and a general lack of deepwater fishing beyond the upper continental slope means that their population status can be inferred to be stable, even without quantitative data. That is, if there are no threats operating at the depths which they occur, population reduction is not likely. Deeper water fishing activities are centred around the southeast, where significant population reductions of many upper slope species have occurred. Outside of that region, deepwater fishing effort is very low and localised spatially. For example, the Commonwealth-managed western trawl fisheries (Western Deepwater Trawl Fishery and the North West Slope Trawl Fishery) have few active vessels and very little fishing effort. The level of deepwater refuge is a significant factor in the high proportion of LC species. The closure to trawling of most waters deeper than 700 m within the Southern and Eastern Scalefish and Shark Fishery of southeast Australia is a major management measure influencing the LC status of many species.

Table 6: Near Threatened Australian sharks. An asterisk (*) denotes an Australian endemic species. For non-endemic species, the assigned Red List status is for the Australian range only. Australian range specifies the mainland Australian states and territories that the species occur in, or immediately adjacent to.

Family	Scientific Name	Common Name	Australian Range	Page No.
SQUALIDAE	* <i>Squalus grahamei</i>	Eastern Longnose Spurdog	NSW, QLD	62
	<i>Squalus montalbani</i>	Philippine Spurdog	NSW, QLD, WA	64
CENTROPHORIDAE	<i>Deania calcea</i>	Brier Shark	NSW, SA, TAS, VIC, WA	73
	<i>Deania quadrispinosa</i>	Longsnout Dogfish	All (except NT)	74
SOMNIOSIDAE	<i>Centroscymnus owstonii</i>	Owston's Dogfish	NSW, SA, TAS, VIC, WA	88
	<i>Scymnodon macracanthus</i>	Largespine Velvet Dogfish	NSW, SA, TAS, VIC, WA	92
OXYNOTIDAE	<i>Oxynotus bruniensis</i>	Prickly Dogfish	NSW, SA, TAS, VIC, WA	95
DALATIIDAE	<i>Dalatias licha</i>	Black Shark	All (except NT)	96
ODONTASPIDIDAE	<i>Odontaspis ferox</i>	Smalltooth Sandtiger Shark	NSW, VIC, WA	142
ALOPIIDAE	<i>Alopias vulpinus</i>	Common Thresher	All	147
SCYLIORHINIDAE	* <i>Cephaloscyllium variegatum</i>	Saddled Swellshark	NSW, QLD	189
CARCHARHINIDAE	<i>Carcharhinus amblyrhynchos</i>	Grey Reef Shark	NT, QLD, WA	206
	<i>Carcharhinus obscurus</i>	Dusky Shark	All	220
	<i>Carcharhinus plumbeus</i>	Sandbar Shark	NSW, QLD, WA	221
	<i>Prionace glauca</i>	Blue Shark	All	230
	<i>Triaenodon obesus</i>	Whitetip Reef Shark	NT, QLD, WA	234
GALEOCERDIDAE	<i>Galeocerdo cuvier</i>	Tiger Shark	NT, QLD, WA	235
SPHYRNIDAE	<i>Sphyrna zygaena</i>	Smooth Hammerhead	NSW, SA, TAS, VIC, WA	240
RHINIDAE	<i>Rhina ancylostoma</i>	Shark Ray	NSW, NT, QLD, WA	250
	<i>Rhynchobatus australiae</i>	Bottlenose Wedgefish	NSW, NT, QLD, WA	251
	<i>Rhynchobatus palpebratus</i>	Eyebrow Wedgefish	NT, QLD, WA	252
RAJIDAE	* <i>Dentiraja cerva</i>	Whitespotted Skate	NSW, SA, TAS, VIC, WA	292
	* <i>Dentiraja endeavouri</i>	Endeavour Skate	NSW, QLD	296
	* <i>Dipturus gudgeri</i>	Bight Skate	NSW, SA, TAS, VIC, WA	309
DASYATIDAE	<i>Neotrygon annotata</i>	Plain Maskray	NT, QLD, WA	338
UROLOPHIDAE	* <i>Trygonopectera testacea</i>	Common Stingaree	NSW, QLD	361
	* <i>Urolophus kapalensis</i>	Kapala Stingaree	NSW, QLD	369
MYLIOBATIDAE	<i>Aetomylaeus vespertilio</i>	Ornate Eagle Ray	NT, QLD, WA	383
MOBULIDAE	<i>Mobula mobular</i>	Giant Devilray	NSW, QLD, WA	392
	<i>Mobula tarapacana</i>	Chilean Devilray	NSW, TAS	393
	<i>Mobula thurstoni</i>	Bentfin Devilray	QLD, WA	394
CHIMAERIDAE	<i>Chimaera ogilbyi</i>	Ogilby's Chimaera	All	401

The level of spatial refuge was an important driver of many LC assessments, not only in the deep, but also for coastal and shelf species. This includes areas of little to no fishing pressure, fishery closed areas (for example, considerable areas of Western Australia's North Coast Bioregion and the Northern Territory which are closed to trawling), state and territory marine protected areas, and Australian Marine Parks.

Fisheries management is another key driver of LC assessments. There are several exploited species which are managed at sustainable levels, for example the Whiskery Shark *Furgaleus macki*, a commercially targeted species of the southwest.

The management of exploited species relies on data to understand the level of exploitation that can be sustained without compromising the population. In reality, the level of data to undertake a stock assessment – a synthesis of biological and fishery information to estimate stock size and harvest rate – is available for only a handful of sharks (for more information on these species see: www.fish.gov.au). Thus, the level of exploitation or bycatch that the majority of sharks can sustain is not known. It is therefore important to use other information on general fisheries management measures, life history, catchability, fishing effort, and post-release survivorship of discarded bycatch species to understand their likely population trend.

DATA DEFICIENT SPECIES

Species for which there is inadequate information to make an assessment of their extinction risk are priorities for research to understand their population status. These species may range anywhere along the spectrum from CR to LC. The small number of DD species (n=26; 19 sharks, 7 rays; Table 7) highlights the sufficiency of information available to assess the extinction risk status of most (92.1%) species. Having said that, knowledge gaps for most species remain significant, and many data-sufficient assessments are based on inferred or suspected population trends.

For all species assessed as DD, it is unknown if fishing is causing a population reduction. That is, there is a lack of information on the level of interaction with fisheries. Some species are known only from a limited number of records, or even a single record. In these cases, the full distribution of the species is unknown, both geographically and in terms of its depth range. This is essential information to assess the level of overlap between the species and fishing activities. Monitoring of bycatch levels and the accurate identification of species will be essential to gather this information and make an accurate assessment of extinction risk status in the future.

Those species known from few records could be shown to have a small geographic range and/or a small population size. This is not necessarily an issue with respect to extinction risk in the absence of any threats, and several species known from only a single or a limited number of records in Australia have been assessed as LC where their known range does not overlap with any threats. Delineating the extent of occurrence for several DD species will be important to accurately assess population status. For example, the Elongate Carpetshark *Parascyllium elongatum*, recorded from a single specimen collected from the stomach of a School Shark *Galeorhinus galeus* off southwest Australia, may have a very small geographic range in an area subject to fishing pressure. In contrast, the globally distributed Megamouth Shark *Megachasma pelagios*, which is known locally from a single beached specimen in Western Australia, is not likely to have a small geographic range. In fact, the Australian record could even represent a case of vagrancy. Until its local occurrence and interactions with fisheries are better defined, its national Red List status cannot be accurately assessed.

KNOWLEDGE AND CONSERVATION ACTIONS

Each taxa profile specifies two sets of actions for a species: actions to address knowledge gaps, and actions to maintain, secure, and if necessary, recover the population. The responsibility for each action may fall with different parts of the research, management, policy, and advocacy community, or indeed to a combination of these.

Knowledge actions

To improve the ability to accurately assess the extinction risk status of species, and ultimately, better conserve and manage them, all species treated in this Action Plan require some knowledge gaps be filled. Knowledge gaps are divided into five themes, each of which improves the information base from which to assess status.

Taxonomy: Taxonomy is the very foundation of understanding what species 'unit' needs to be assessed, managed, and conserved. Major advances in resolving the taxonomy and nomenclature (naming) of sharks has been made over the last two decades, including the description of many new species. Therefore, only a relatively small number of species have actions stated in this Action Plan to resolve outstanding issues.

The action *resolve nomenclature* is required for 8 species, where the current names of these species may not be correct for the species occurring in Australian waters: Western Gulper Shark *Centrophorus westraliensis*, Southern Dogfish *Centrophorus zeehaani*, Southern Sleeper Shark *Somniosus antarcticus*, Zebra Hornshark *Heterodontus zebra*, Short-tail Catshark *Parmaturus bigus*, False Catshark *Pseudotriakis microdon*, Blackspotted Whipray *Maculabatis astra*, and Brown Whipray *Maculabatis toshi*.

In some cases, a currently used name may not be the correct name available in the literature for a species. A recent example is the Zebra Shark. The widely-used scientific name was *Stegostoma fasciatum* (described and named as such in 1783). However, the species was actually first described in 1781 as *Stegostoma tigrinum*, a name which takes precedence (Dahl *et al.* 2019) and which is used in this Action Plan.

The action *resolve species complex* is required for nine species: Piked Spurdog *Squalus megalops*, Short-tail Lanternshark *Etmopterus brachyurus*, Moller's Lanternshark *Etmopterus molleri*, Northern Wobbegong *Orectolobus wardi*, Brownbanded Bambooshark *Chiloscyllium punctatum*, Roughskin Catshark *Apristurus ampliceps*, Fleshynose Catshark *Apristurus melanoasper*, Freckled Catshark *Apristurus sinensis*, and Sawtail Shark *Figaro boardmani*.

In these cases, what is currently referred to as a single-species may in fact represent two or more species. Morphometric and genetic examination and comparison of museum specimens should be undertaken to resolve species-boundaries and this may result in the description and naming of new species. For example, the Piked Spurdog *Squalus megalops* was previously considered to be a globally-ranging species found throughout tropical and temperate oceans. Long thought to represent a species complex, the description of several new species from the '*megalops*-complex' is refining the

Table 7: Data Deficient Australian sharks. An asterisk (*) denotes an Australian endemic species. For non-endemic species, the assigned Red List status is for the Australian range only. Australian range specifies the mainland Australian states and territories that the species occur in, or immediately adjacent to.

Family	Scientific Name	Common Name	Australian Range	Page No.
ECHINORHINIDAE	<i>Echinorhinus brucus</i>	Bramble Shark	SA, TAS, VIC, WA	51
	<i>Echinorhinus cookei</i>	Prickly Shark	QLD, SA, TAS, VIC	52
SQUALIDAE	<i>Cirrhigaleus australis</i>	Southern Mandarin Dogfish	NSW, QLD, TAS, VIC	53
SOMNIOSIDAE	<i>Scymnodalatias albicauda</i>	Whitetail Dogfish	QLD, TAS	90
	<i>Scymnodalatias sherwoodi</i>	Sherwood's Dogfish	TAS	91
HETERODONTIDAE	<i>Heterodontus zebra</i>	Zebra Hornshark	WA	111
PARASCYLLIIDAE	* <i>Parascyllium elongatum</i>	Elongate Carpetshark	WA	113
	* <i>Parascyllium sparsimaculatum</i>	Ginger Carpetshark	WA	115
ORECTOLOBIDAE	* <i>Orectolobus reticulatus</i>	Network Wobbegong	NT, WA	128
MEGACHASMIDAE	<i>Megachasma pelagios</i>	Megamouth Shark	WA	144
PENTANCHIDAE	* <i>Asymbolus funebris</i>	Blotched Catshark	WA	165
	* <i>Bythaelurus incanus</i>	Dusky Catshark	WA	172
	* <i>Galeus gracilis</i>	Slender Sawtail Shark	NT, QLD, WA	175
	* <i>Parmaturus bigus</i>	Short-tail Catshark	QLD	177
SCYLIIORHINIDAE	<i>Cephaloscyllium cooki</i>	Cook's Swellshark	NT	184
	* <i>Cephaloscyllium zebrum</i>	Narrowbar Swellshark	QLD	190
PSEUDOTRIAKIDAE	<i>Pseudotriakis microdon</i>	False Catshark	QLD, WA	191
TRIAKIDAE	* <i>Hemitriakis abdita</i>	Darksnout Houndshark	QLD	194
CARCHARHINIDAE	<i>Rhizoprionodon oligolinx</i>	Grey Sharpnose Shark	NT, QLD	232
ARHYNCHOBATIDAE	<i>Bathyraja maccaini</i>	McCain's Skate	Antarctica	271
	* <i>Pavoraja arenaria</i>	Sandy Skate	SA, VIC, WA	283
RAJIDAE	* <i>Dentiraja flindersi</i>	Pygmy Thornback Skate	SA	298
DASYATIDAE	<i>Hemirhynchus parvonigra</i>	Dwarf Black Stingray	WA	332
	<i>Megatrygon microps</i>	Smalleye Stingray	NT, QLD	337
	<i>Pateobatis hortlei</i>	Hortle's Whipray	NT, WA	346
	<i>Urogymnus acanthobothrium</i>	Mumburarr Whipray	NT	351

species concept of the true *Squalus megalops*. While the name is still used in various parts of the world, the species appears to be an Australian endemic and is treated as such in this Action Plan.

Distribution: The full geographic range is poorly-defined for a considerable number of species. The action *clarify range* is required for species with a limited number of records in Australian waters and those where the range is suspected to be wider than currently recorded. Poorly-defined ranges may reflect a lack of fisheries, scientific surveys, or ongoing monitoring in areas where species are likely to occur. This is particularly the case for many deepwater species outside of southeast Australia.

Where species have been reported from a limited number of specimens, their range is not fully defined. An example is the Blotched Catshark *Asymbolus funebris* which is known from only a single record collected off southwest Australia.

It is therefore unknown if it has a very localised geographic range, is wider-spread off the southwest, or even off southern Australia. Small species like these may be overlooked in the field due to their potentially cryptic behaviour and occurrence in habitats which are not regularly fished or surveyed.

A number of regionally or globally wide-ranging species are known from a limited number of Australian records and are likely to occur in more places than currently recorded. The False Catshark *Pseudotriakis microdon* has a wide but patchy global distribution, but locally is known only from single records off southwest and northeast Australia. The global distribution of records suggests it occurs more widely, at least off Western Australia and Queensland. Similarly, some devilrays (*Mobula* spp), many of which are highly-mobile pelagic species, are likely distributed widely which does not reflect their currently-known ranges. Within Australia,

devilrays have generally limited interactions with fisheries, but any bycatch should be carefully examined to provide further clarification of ranges.

For some species which currently show a disjunct range, a broader understanding of habitat, biogeography, and the general distribution patterns suggest that their ranges are not fully defined. In some cases, it is a matter of logically connecting the dots. The Slender Sawtail Shark *Galeus gracilis* is known from several isolated and separated locations across northern Australia. While it is possible that these may represent different subpopulations, it is more likely that they are part of a continuous range. The Brown Stingaree *Urolophus westraliensis*, was known only from northwest Western Australia, but was recently recorded from the Northern Territory. It is most likely that the species occurs in the gap between these two areas but has not yet been recorded there.

Poorly-delineated ranges may also result from identification difficulties. This may be the case for morphologically-similar groups of species, including the devilrays mentioned above. Other examples are the lanternsharks (*Etmopterus* spp) and the *Apristurus* catsharks, of which there are nine of these catsharks and 11 lanternsharks in Australian waters, and ranges are considered poorly-defined for many of these. These species occur primarily outside of fishing activities so opportunities to gather more records and refine distributions are limited (in the absence of directed scientific surveys).

While defining the full geographic range is a lower priority for Least Concern species which currently face little to no threat where they occur, it is a high priority for species which do overlap or potentially overlap with fishing activities. Geographic range defines how much a species overlaps with a threat or where it may have refuge. It is also vital for accurately applying the IUCN Red List Criterion B (the small geographic range criterion).

Population trend: Most threatened sharks meet Criterion A (the population size reduction criterion). Therefore, understanding the trend in population over time is crucial to accurate assessments of extinction risk, particularly given that exploitation by fisheries (either targeted or through bycatch) is the main threat facing most threatened species. Species-specific population trend is available for very few sharks. Most threatened assessments rely on population trend being inferred or suspected from information other than abundance or catch rates, such as levels of fishing effort.

The action *monitor catch* is required for all sharks that interact with fisheries. For some targeted commercial species, catch rates are monitored through fisheries management arrangements, but the overwhelming majority of species do not have catch data accurately recorded. The action is not

required for species which do not currently interact with fisheries, but this would change should fishing patterns change and begin to catch these species.

To accurately assess species against Criterion A, long-term trend data are needed. To obtain such data, even if only for higher risk or Data Deficient species, would require a significant investment in species identification training, fishery observer programs, and data reporting. Fisheries interacting with EPBC Act or state/territory-listed threatened species are required to record catches in logbooks, however there are serious issues with the accuracy of data recorded. For example, species identification of sawfishes recorded in logbooks is problematic and catches recorded generically as 'sawfish' may mask population trends for individual species.

The action *monitor sightings* is used in place of monitor catches for large-bodied species which have limited interactions with commercial fisheries. Four species require this action: Whale Shark *Rhincodon typus*, Basking Shark *Cetorhinus maximus*, Reef Manta Ray *Mobula alfredi*, and Giant Manta Ray *Mobula birostris*. Long-term visual surveys of these species can be informative for understanding population trend of the Whale Shark and the Reef Manta Ray which aggregate seasonally at predictable sites. For the Basking Shark and the Giant Manta Ray, monitoring incidental sightings will be useful in defining occurrence and seasonality.

Life history: Information on a species' life history provides an understanding of biological productivity and therefore, a species' ability to sustain exploitation or recover from population depletion. Age and growth (how fast a species grows, when it reaches sexual maturity, and how long it lives for) and reproductive biology (how often it reproduces and how many offspring it has) are the critical parameters to understand productivity. In its simplest form, a more productive species (one that grows quickly, reaches sexual maturity at an early age, reproduces regularly, and produces many offspring) is more likely to sustain higher levels of mortality than a less productive species. In general, sharks are considered to have limited biological productivity, which increases susceptibility to population depletion and therefore extinction risk.

The actions *assess reproduction* and *assess age* are required for many sharks. For example, the only chimaera for which there is reproductive biology and age data available for is the Elephantfish *Callorhynchus millii*; all other chimaeras require studies into their life history. Age data are also used to calculate generation length – a required parameter for assessing species against Criterion A – but in many instances in this Action Plan, this data had to be borrowed from other species to at least provide a generation length estimate.

To address this massive knowledge gap, basic life history studies are required across species groups. This will require an investment in projects that focus on researching the biology of many poorly-known or even 'difficult' to sample species. Projects on shark life history are well suited to postgraduate research. Partnerships between universities, fisheries management agencies, and the fishing industry itself can improve sample sourcing, and ensure study results are fed back into management.

Connectivity: The extinction risk status of regionally or globally distributed species can be influenced by threatening processes operating outside of Australian waters. The Red List status in this Action Plan of many highly-mobile pelagic species reflects their global status. For example, the circumglobal Blue Shark *Prionace glauca* is considered to be one global population, with no or only weak genetic differences within and between major ocean basins. There are many ways to assess connectivity including genetic approaches, tagging, telemetry, and comparisons of parasite fauna. Each of these approaches provides information at different spatial and evolutionary scales. Advances in molecular ecology has allowed studies into the population structure or connectivity of populations to become commonplace. These studies rely on the collection of biological material from individual sharks from which DNA can be extracted and compared to individuals from other geographic locations. Tagging and telemetry studies are the next most commonly used approach to assessing connectivity, providing contemporary data on connectivity compared to the more evolutionary time frames of genetic approaches.

The action *assess connectivity* is required for many species which range outside of Australia. The level of connectivity can have a significant bearing on a species' Australian extinction risk status even in the absence of local threats. Understanding if the regional footprint of threat (for example intense and largely unregulated fisheries in Southeast Asia or pelagic longline fisheries in the Western Pacific) impact the portion of the population which resides in, transits through, or visits Australian waters will drive more accurate assessments of national extinction risk status. This is particularly important

for 'lifeboat' species which are under threat outside of Australian waters but are secure here. A priority is to understand the connectivity of the globally Critically Endangered wedgefishes and the Giant Guitarfish *Glaucostegus typus* between northern Australia and Indonesia where severe declines have been documented.

Understanding local connectivity is also valuable for management, although here we have applied the action *assess connectivity* in this Action Plan only to regionally or globally distributed species. A good example to demonstrate the wider value of delineating population structure is the Northern River Shark *Glyphis garricki*. This species is found only in southern Papua New Guinea and northern Australia. It is an euryhaline species which uses macrotidal tropical rivers as nursery areas. Adults also occur in rivers, but marine records in between rivers suggest some movement between systems. Molecular research has shown that each of the five major regions of its range (Papua New Guinea, Van Diemen Gulf and the Daly River in the NT, and Cambridge Gulf and King Sound in WA) are genetically distinct populations (Feutry *et al.* 2020). The movement rates between neighbouring populations is very low and if the stock of adults in one area was depleted, it would not be repopulated via immigration. Each region therefore needs to be treated as a separate management unit.

Conservation actions

Conservation actions are provided for each species, regardless of the Red List status assigned them in this Action Plan. While threatened species require immediate action to conserve, manage, and recover their populations, Least Concern species also require action to maintain their secure status. Data Deficient species require action to understand various aspects of their population, but since an assessment as Data Deficient acknowledges the possibility that future research may show that a threatened category is appropriate, action is also needed to minimise or mitigate threats until such time as more information is available to show that the species is not threatened. Conservation actions are outlined in Table 8.

Table 8: Actions required to conserve, manage, and where appropriate, recover, Australia’s sharks. Threatened species are those assessed in the categories Critically Endangered, Endangered, or Vulnerable. International instruments: CITES, Convention on International Trade in Endangered Species of Wild Fauna and Flora; CMS, Convention on the Conservation of Migratory Species of Wild Animals; RFMOs, regional fisheries management organisations.

Threatened Species
<p>Recover population. For species estimated, inferred, or suspected to have undergone a population reduction meeting the thresholds under Criterion A (the population size reduction criterion), management actions are required to recover the population so that the species no longer meets the thresholds for listing as threatened. This may include a suite of measures including those listed in the following rows.</p>
<p>Protect species. For species not listed on the Commonwealth EPBC Act and/or relevant state/territory legislation, these require assessment against the listing criteria of the relevant legislation.</p>
<p>Mitigate catch. A suite of measures can help reduce interactions between threatened species and fisheries. In many cases, research is required to identify the appropriate measures, and these include, but are not limited to, spatial management (marine protected areas, spatial or temporal fishery closures), fishing gear modification (e.g., Turtle Exclusion Devices in prawn trawl fisheries), fishery input measures (i.e., fishing effort reduction), or bycatch trigger levels (i.e., when a fishery reaches a specified bycatch level of a threatened species, management rules (such as move-on rules) are triggered).</p>
<p>Reduce post-release mortality. Fishing gear modifications and best practice safe handling techniques can improve the likelihood of survival of discarded bycatch species. Training commercial fishers in safe handling and release measures is required where fisheries interact with threatened species. This also needs to include species identification so fishers are aware of and can identify threatened species.</p>
<p>Identify and protect critical habitat. Critical habitat includes areas used for breeding, nurseries, and feeding, and each of these may be different for a single species. In most cases, critical habitat is yet to be identified for Australia’s threatened species, or at best is partially understood.</p>
<p>Engage internationally to recover population. For species connected to regional subpopulation(s) or the global population as a whole, and whose Australian Red List status reflects their broader regional or global status, the effective implementation of existing international instruments, specifically RFMOs, CITES, and CMS, is essential. Where species are not listed on these instruments, consideration needs to be given to their eligibility for listing, or if other international or regional measures are appropriate.</p>
Near Threatened
<p>Monitor population. Since Near Threatened species may be close to qualifying for a threatened category in the near future, catch and effort levels should be monitored in fisheries to understand population trend for future assessment against the categories and criteria.</p>
<p>Manage catch at sustainable levels. Directly related to the above, for species that are targeted or retained as byproduct, fisheries management should aim to ensure catches are sustainable without the risk that the species would meet a listing in a threatened category in the future.</p>
<p>Mitigate catch. As defined above to ensure these species do not undergo a population reduction or continuing decline that may result in a threatened assessment in the near future, by ensuring catches remain at sustainable levels.</p>
<p>Reduce post-release mortality. Where the species is not a target or byproduct species, fishing gear modifications and best practice safe handling techniques can improve the likelihood of survival of discarded bycatch species. Training commercial fishers in safe handling and release measures is required where fisheries interact with Near Threatened species.</p>
<p>Identify and protect critical habitat. Critical habitat includes areas used for breeding, nurseries, and feeding, and each of these may be different for a single species. Identifying critical habitat will assist in implementing management that will ensure populations do not move into a threatened category.</p>
Least Concern
<p>Maintain population. Least Concern species may be wide-ranging, abundant, face few threats, or have life history characteristics that enable them to withstand current levels of threats. Current management measures (including spatial management, refuges, fisheries input and output controls) that result in a Least Concern assessment should be maintained to ensure the population remains stable.</p>
<p>Manage catch at sustainable levels. For species that are targeted or retained as byproduct, fisheries management should aim to ensure catches are sustainable without the risk that the species would meet a listing in a threatened category in the future.</p>
<p>Limit bycatch. For species that are taken as bycatch, fisheries management should aim to ensure interactions are limited as much as possible.</p>
Data Deficient
<p>Understand population. Since there is inadequate information to assess Data Deficient species, action is required to understand (a) distribution; (b) life history; (c) the level of interactions with fisheries; (d) the effects of any other threats; and, (e) population status and trends.</p>

Mitigate catch. Since an assessment as Data Deficient acknowledges the possibility that future research may show that a threatened category is appropriate, catch should be mitigated until such time as more information is available to show that the species is not threatened (measures may then need to be ongoing).

Reduce post-release mortality. Since an assessment as Data Deficient acknowledges the possibility that future research may show that a threatened category is appropriate, post-release mortality should be reduced until such time as more information is available to show that the species is not threatened (measures may then need to be ongoing).

Identify and protect critical habitat. Critical habitat includes areas used for breeding, nurseries, and feeding, and each of these may be different for a single species. Identifying critical habitat will assist in the future assessment of Data Deficient species.

All categories where relevant

Maintain deepwater refuge. The extinction risk status of many Australian species is wholly or partially a result of deepwater refuge beyond any fishing activities or with only limited fishing activities. Of importance is to maintain the trawling closure of most Southern and Eastern Scalefish and Shark Fishery waters deeper than 700 m.

Maintain river-estuary connectivity. For euryhaline species that utilise, and move between, marine and riverine environments and for some estuarine specialists, maintaining the connectivity between the estuary and river reaches is vital.



THREATENED SPECIES RECOMMENDATIONS

An overarching recommendation is provided for each threatened species (Table 9). These recommendations consider a species' current EPBC Act listing, fisheries management measures and management plans that are currently in place, the role of international conservation instruments, and the evidence-base underlying the assessment. The recommendations are:

Consider listing (5 species):

These species are currently not listed under the EPBC Act. A Threatened Species Nomination for amending the list of threatened species under the EPBC Act should be considered for each of these species;

Consider up-listing (3 species):

These species are currently listed under the EPBC Act at a lower category than the category assigned in this Action Plan. A Threatened Species Nomination for amending the list of threatened species under the EPBC Act should be considered for each of these species;

Consider down-listing (2 species):

These species are currently listed on the EPBC Act at a higher category than the category assigned in this Action Plan. A Threatened Species Nomination for amending the list of threatened species under the EPBC Act should be considered for each of these species;

Maintain & improve management (3 species):

These species are listed under the EPBC Act and conservation measures in place are expected to allow for the recovery of the Grey Nurse Shark *Carcharias taurus* and the White Shark *Carcharodon carcharias*. The status of the Maugean Skate *Zearaja maugeana* however is more precarious and extra measures are needed to secure the population (including the preparation of a Recovery Plan);

Maintain Plan of Management (4 species):

These species are listed as Conservation Dependent under the EPBC Act. Conservation Dependent is not an IUCN category and is unique to the EPBC Act. The category is currently only applied to commercially harvested marine species that have been shown to meet the criteria for EPBC Act threatened species listing. To qualify for Conservation Dependent, a species must be the focus of a *Plan of Management* aiming to cease its

decline and support recovery. These species have an existing rebuilding strategy or management strategy (AFMA 2012, AFMA 2015b), or in the case of the Scalloped Hammerhead *Sphyrna lewini*, have state and territory management in place that restricts catch levels;

Maintain & improve fisheries management (1 species):

This species is not listed under the EPBC Act but is subject to management measures in the fisheries which primarily interact with it. These measures are considered adequate to permit its recovery, although improved measures such as bycatch reduction, improving post-release survivorship, and the definition and protection of critical habitat (e.g. nursery areas) will aid recovery;

Engage internationally (9 species):

These species are regionally or globally connected and the category assigned in this Action Plan reflects their globally threatened status. Australia should engage internationally to ensure the effective implementation of existing international instruments, specifically regional fisheries management organisations (RFMOs), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the Convention on the Conservation of Migratory Species of Wild Animals (CMS);

Prioritise data collection (12 species):

These species have been assessed as meeting a threatened category noting the precautionary lens of the Action Plan assessment process. This includes assessment based on inferred or suspected population reduction or continuing decline. It is recognised that further data are required to strengthen the evidence-base underlying these status determinations. These species are priorities for research and monitoring to provide data to support inferred or suspected population reductions or continuing declines identified in the Action Plan.

The implementation of the recommendations and actions in this Action Plan will require an ongoing and enhanced investment in science and management which will help secure the future of sharks in Australia.

Table 9: Recommendations for Australian sharks assigned to an IUCN Red List threatened category (Action Plan Category) in relation to their current threatened listing under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act Category). An asterisk (*) denotes an Australian endemic species. For non-endemic species, the assigned Action Plan Category is for the Australian range only. Categories: CR, Critically Endangered; EN, Endangered; VU, Vulnerable; CD, Conservation Dependent (EPBC Act only).

Scientific Name	Common Name	Action Plan Category	EPBC Act Category
Consider listing			
<i>*Cephaloscyllium albiginum</i>	Whitefin Swellshark	CR	-
<i>*Dentiraja confusus</i>	Australian Longnose Skate	CR	-
<i>*Squalus chloroculus</i>	Greeneye Spurdog	EN	-
<i>*Squatina albipunctata</i>	Eastern Angelshark	VU	-
<i>Anoxypristis cuspidata</i>	Narrow Sawfish	VU	-
Consider up-listing			
<i>Pristis pristis</i>	Largetooth Sawfish	CR	VU
<i>Pristis zijsron</i>	Green Sawfish	CR	VU
<i>Pristis clavata</i>	Dwarf Sawfish	EN	VU
Consider down-listing			
<i>Glyphis garricki</i>	Northern River Shark	VU	EN
<i>Glyphis glyphis</i>	Speartooth Shark	VU	CR
Maintain & improve management			
<i>*Zearaja maugeana</i>	Maugean Skate	EN	EN
<i>Carcharias taurus</i>	Grey Nurse Shark	VU	East: CR West: VU
<i>Carcharodon carcharias</i>	White Shark	VU	VU
Maintain Plan of Management			
<i>Centrophorus harrissoni</i>	Harrisson's Dogfish	EN	CD
<i>Centrophorus zeehaani</i>	Southern Dogfish	EN	CD
<i>Galeorhinus galeus</i>	School Shark	EN	CD
<i>Sphyrna lewini</i>	Scalloped Hammerhead	EN	CD
Maintain & improve fisheries management			
<i>Sphyrna mokarran</i>	Great Hammerhead	EN	-
Engage internationally			
<i>Carcharhinus longimanus</i>	Oceanic Whitetip Shark	CR	-
<i>Rhincodon typus</i>	Whale Shark	EN	VU
<i>Alopias pelagicus</i>	Pelagic Thresher	EN	-
<i>Cetorhinus maximus</i>	Basking Shark	EN	-
<i>Mobula birostris</i>	Giant Manta Ray	EN	-
<i>Alopias superciliosus</i>	Bigeye Thresher	VU	-
<i>Isurus oxyrinchus</i>	Shortfin Mako	VU	-
<i>Isurus paucus</i>	Longfin Mako	VU	-
<i>Carcharhinus falciformis</i>	Silky Shark	VU	-
Prioritise data collection			
<i>*Dipturus canutus</i>	Grey Skate	EN	-
<i>*Urolophus orarius</i>	Coastal Stingaree	EN	-
<i>*Brachaelurus colcloughi</i>	Colclough's Shark	VU	-
<i>Eusphyra blochii</i>	Winghead Shark	VU	-
<i>Aptychotrema timorensis</i>	Spotted Shovelnose Ray	VU	-
<i>*Dentiraja australis</i>	Sydney Skate	VU	-
<i>*Spiniraja whitleyi</i>	Melbourne Skate	VU	-
<i>*Hemirhynchus fluviorum</i>	Estuary Stingray	VU	-
<i>Urolophus bucculentus</i>	Sandyback Stingaree	VU	-
<i>*Urolophus sufflavus</i>	Yellowback Stingaree	VU	-
<i>*Urolophus viridis</i>	Greenback Stingaree	VU	-
<i>Myliobatis hamlyni</i>	Purple Eagle Ray	VU	-



THE IUCN RED LIST CATEGORY OF EACH AUSTRALIAN SHARK, RAY, AND CHIMAERA

This list tabulates the IUCN Red List Category assigned to all Australian shark taxa (328 species). The following section provides accounts for each of these species. Those accounts follow the taxonomic order listed here. An asterisk (*) denotes an Australian endemic species. For non-endemic species, the assigned Action Plan Category is for the Australian range only. IUCN Red List Categories (Action Plan Category): CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient.

Family	Scientific Name	Common Name	Action Plan Category	Page No.
CHLAMYDOSELACHIDAE	<i>Chlamydoselachus anguineus</i>	Frill Shark	LC	46
HEXANCHIDAE	<i>Heptranchias perlo</i>	Sharpnose Sevengill Shark	LC	47
	<i>Hexanchus griseus</i>	Bluntnose Sixgill Shark	LC	48
	<i>Hexanchus nakamurai</i>	Bigeye Sixgill Shark	LC	49
	<i>Notorynchus cepedianus</i>	Broadnose Sevengill Shark	LC	50
ECHINORHINIDAE	<i>Echinorhinus brucus</i>	Bramble Shark	DD	51
	<i>Echinorhinus cookei</i>	Prickly Shark	DD	52
SQUALIDAE	<i>Cirrhigaleus australis</i>	Southern Mandarin Dogfish	DD	53
	<i>Squalus acanthias</i>	Whitespotted Spurdog	LC	54
	* <i>Squalus albifrons</i>	Eastern Highfin Spurdog	LC	55
	<i>Squalus altipinnis</i>	Western Highfin Spurdog	LC	56
	* <i>Squalus chloroculus</i>	Greeneye Spurdog	EN	58
	<i>Squalus crassispinus</i>	Fatspine Spurdog	LC	60
	<i>Squalus edmundsi</i>	Edmunds' Spurdog	LC	61
	* <i>Squalus grahami</i>	Eastern Longnose Spurdog	NT	62
	* <i>Squalus megalops</i>	Piked Spurdog	LC	63
	<i>Squalus montalbani</i>	Philippine Spurdog	NT	64
	<i>Squalus nasutus</i>	Western Longnose Spurdog	LC	65
	* <i>Squalus notocaudatus</i>	Bartail Spurdog	LC	66
CENTROPHORIDAE	<i>Centrophorus granulosus</i>	Gulper Shark	LC	67
	<i>Centrophorus harrissoni</i>	Harrisson's Dogfish	EN	68
	<i>Centrophorus moluccensis</i>	Endeavour Dogfish	LC	69
	<i>Centrophorus squamosus</i>	Leafscale Gulper Shark	LC	70
	* <i>Centrophorus westraliensis</i>	Western Gulper Shark	LC	71
	* <i>Centrophorus zeehaani</i>	Southern Dogfish	EN	72
	<i>Deania calcea</i>	Brier Shark	NT	73
	<i>Deania quadrispinosa</i>	Longsnout Dogfish	NT	74
ETMOPTERIDAE	<i>Centroscyllium kamoharai</i>	Bareskin Dogfish	LC	75
	<i>Etmopterus bigelowi</i>	Blurred Smooth Lanternshark	LC	76
	<i>Etmopterus brachyurus</i>	Short-tail Lanternshark	LC	77
	<i>Etmopterus dianthus</i>	Pink Lanternshark	LC	78
	* <i>Etmopterus dislineatus</i>	Lined Lanternshark	LC	79
	<i>Etmopterus evansi</i>	Blackmouth Lanternshark	LC	80
	<i>Etmopterus fusus</i>	Pygmy Lanternshark	LC	81
	<i>Etmopterus granulosus</i>	Southern Lanternshark	LC	82
	<i>Etmopterus lucifer</i>	Blackbelly Lanternshark	LC	83
	<i>Etmopterus molleri</i>	Moller's Lanternshark	LC	84
	<i>Etmopterus pusillus</i>	Smooth Lanternshark	LC	85
	<i>Etmopterus unicolor</i>	Bristled Lanternshark	LC	86
SOMNIOSIDAE	<i>Centroscymnus coelolepis</i>	Portuguese Dogfish	LC	87
	<i>Centroscymnus owstonii</i>	Owston's Dogfish	NT	88

Family	Scientific Name	Common Name	Action Plan Category	Page No.
SOMNIOSIDAE (cont.)	<i>Centroselachus crepidater</i>	Golden Dogfish	LC	89
	<i>Scymnodalatias albicauda</i>	Whitetail Dogfish	DD	90
	<i>Scymnodalatias sherwoodi</i>	Sherwood's Dogfish	DD	91
	<i>Scymnodon macracanthus</i>	Largespine Velvet Dogfish	NT	92
	<i>Somniosus antarcticus</i>	Southern Sleeper Shark	LC	93
	<i>Zameus squamulosus</i>	Velvet Dogfish	LC	94
OXYNOTIDAE	<i>Oxynotus bruniensis</i>	Prickly Dogfish	NT	95
DALATIIDAE	<i>Dalatias licha</i>	Black Shark	NT	96
	<i>Euprotomicrus bispinatus</i>	Pygmy Shark	LC	97
	<i>Isistius brasiliensis</i>	Smalltooth Cookiecutter Shark	LC	98
	<i>Isistius plutodus</i>	Large-tooth Cookiecutter Shark	LC	99
	<i>Squaliolus aliae</i>	Smalleye Pygmy Shark	LC	100
PRISTIOPHORIDAE	<i>*Pristiophorus cirratus</i>	Common Sawshark	LC	101
	<i>*Pristiophorus delicatus</i>	Tropical Sawshark	LC	102
	<i>*Pristiophorus nudipinnis</i>	Southern Sawshark	LC	103
SQUATINIDAE	<i>*Squatina albipunctata</i>	Eastern Angelshark	VU	104
	<i>*Squatina australis</i>	Australian Angelshark	LC	106
	<i>*Squatina pseudocellata</i>	Western Angelshark	LC	107
	<i>*Squatina tergocellata</i>	Ornate Angelshark	LC	108
HETERODONTIDAE	<i>*Heterodontus galeatus</i>	Crested Hornshark	LC	109
	<i>*Heterodontus portusjacksoni</i>	Port Jackson Shark	LC	110
	<i>Heterodontus zebra</i>	Zebra Hornshark	DD	111
PARASCYLLIIDAE	<i>*Parascyllium collare</i>	Collared Carpetshark	LC	112
	<i>*Parascyllium elongatum</i>	Elongate Carpetshark	DD	113
	<i>*Parascyllium ferrugineum</i>	Rusty Carpetshark	LC	114
	<i>*Parascyllium sparsimaculatum</i>	Ginger Carpetshark	DD	115
	<i>*Parascyllium variolatum</i>	Varied Carpetshark	LC	116
BRACHAELURIDAE	<i>*Brachaelurus colcloughi</i>	Colclough's Shark	VU	118
	<i>*Brachaelurus waddi</i>	Blind Shark	LC	120
ORECTOLOBIDAE	<i>Eucrossorhinus dasypogon</i>	Tasselled Wobbegong	LC	121
	<i>*Orectolobus floridus</i>	Floral Banded Wobbegong	LC	122
	<i>*Orectolobus halei</i>	Gulf Wobbegong	LC	123
	<i>*Orectolobus hutchinsi</i>	Western Wobbegong	LC	124
	<i>*Orectolobus maculatus</i>	Spotted Wobbegong	LC	125
	<i>Orectolobus ornatus</i>	Ornate Wobbegong	LC	126
	<i>*Orectolobus parvimaclatus</i>	Dwarf Spotted Wobbegong	LC	127
	<i>*Orectolobus reticulatus</i>	Network Wobbegong	DD	128
	<i>Orectolobus wardi</i>	Northern Wobbegong	LC	129
	<i>*Sutorectus tentaculatus</i>	Cobbler Wobbegong	LC	130
HEMISCYLLIIDAE	<i>Chiloscyllium punctatum</i>	Brownbanded Bambooshark	LC	131
	<i>Hemiscyllum hallstromi</i>	Papuan Epaulette Shark	LC	132
	<i>Hemiscyllum ocellatum</i>	Epaulette Shark	LC	133
	<i>Hemiscyllum trispeculare</i>	Speckled Carpetshark	LC	134
GINGLYMOSTOMATIDAE	<i>Nebrius ferrugineus</i>	Tawny Shark	LC	135
STEGOSTOMIDAE	<i>Stegostoma tigrinum</i>	Zebra Shark	LC	136
RHINCODONTIDAE	<i>Rhincodon typus</i>	Whale Shark	EN	137
MITSUKURINIDAE	<i>Mitsukurina owstoni</i>	Goblin Shark	LC	138
CARCHARIIDAE	<i>Carcharias taurus</i>	Grey Nurse Shark	VU	140

Family	Scientific Name	Common Name	Action Plan Category	Page No.
ODONTASPIDIDAE	<i>Odontaspis ferox</i>	Smalltooth Sandtiger Shark	NT	142
PSEUDOCARCHARIIDAE	<i>Pseudocarcharias kamoharai</i>	Crocodile Shark	LC	143
MEGACHASMIDAE	<i>Megachasma pelagios</i>	Megamouth Shark	DD	144
ALOPIIDAE	<i>Alopias pelagicus</i>	Pelagic Thresher	EN	145
	<i>Alopias superciliosus</i>	Bigeye Thresher	VU	146
	<i>Alopias vulpinus</i>	Common Thresher	NT	147
CETORHINIDAE	<i>Cetorhinus maximus</i>	Basking Shark	EN	148
LAMNIDAE	<i>Carcharodon carcharias</i>	White Shark	VU	150
	<i>Isurus oxyrinchus</i>	Shortfin Mako	VU	152
	<i>Isurus paucus</i>	Longfin Mako	VU	153
	<i>Lamna nasus</i>	Porbeagle	LC	154
PENTANCHIDAE	<i>Apristurus albisoma</i>	White-bodied Catshark	LC	155
	<i>Apristurus ampliceps</i>	Roughskin Catshark	LC	156
	* <i>Apristurus australis</i>	Pinocchio Catshark	LC	157
	* <i>Apristurus bucephalus</i>	Bighead Catshark	LC	158
	<i>Apristurus longicephalus</i>	Smoothbelly Catshark	LC	159
	<i>Apristurus melanoasper</i>	Fleshynose Catshark	LC	160
	<i>Apristurus pinguis</i>	Bulldog Catshark	LC	161
	<i>Apristurus platyrhynchus</i>	Bigfin Catshark	LC	162
	<i>Apristurus sinensis</i>	Freckled Catshark	LC	163
	* <i>Asymbolus analis</i>	Grey Spotted Catshark	LC	164
	* <i>Asymbolus funebris</i>	Blotched Catshark	DD	165
	* <i>Asymbolus occiduus</i>	Western Spotted Catshark	LC	166
	* <i>Asymbolus pallidus</i>	Pale Spotted Catshark	LC	167
	* <i>Asymbolus parvus</i>	Dwarf Catshark	LC	168
	* <i>Asymbolus rubiginosus</i>	Orange Spotted Catshark	LC	169
	* <i>Asymbolus submaculatus</i>	Variiegated Catshark	LC	170
	* <i>Asymbolus vincenti</i>	Gulf Catshark	LC	171
	* <i>Bythaelurus incanus</i>	Dusky Catshark	DD	172
	* <i>Figaro boardmani</i>	Sawtail Shark	LC	173
	* <i>Figaro striatus</i>	Northern Sawtail Shark	LC	174
* <i>Galeus gracilis</i>	Slender Sawtail Shark	DD	175	
* <i>Halaelurus sellus</i>	Speckled Catshark	LC	176	
* <i>Parmaturus bigus</i>	Short-tail Catshark	DD	177	
SCYLIIORHINIDAE	* <i>Atelomycterus fasciatus</i>	Banded Catshark	LC	178
	* <i>Atelomycterus macleayi</i>	Marbled Catshark	LC	179
	<i>Atelomycterus marnkalha</i>	Eastern Banded Catshark	LC	180
	* <i>Aulohalaelurus labiosus</i>	Blackspotted Catshark	LC	181
	* <i>Cephaloscyllium albipinnum</i>	Whitfin Swellshark	CR	182
	<i>Cephaloscyllium cooki</i>	Cook's Swellshark	DD	184
	* <i>Cephaloscyllium hiscosellum</i>	Reticulate Swellshark	LC	185
	* <i>Cephaloscyllium laticeps</i>	Draughtboard Shark	LC	186
	<i>Cephaloscyllium signourum</i>	Flagtail Swellshark	LC	187
	* <i>Cephaloscyllium speccum</i>	Speckled Swellshark	LC	188
* <i>Cephaloscyllium variegatum</i>	Saddled Swellshark	NT	189	
* <i>Cephaloscyllium zebrum</i>	Narrowbar Swellshark	DD	190	
PSEUDOTRIAKIDAE	<i>Pseudotriakis microdon</i>	False Catshark	DD	191
TRIAKIDAE	* <i>Furgaleus macki</i>	Whiskery Shark	LC	192

Family	Scientific Name	Common Name	Action Plan Category	Page No.
TRIAKIDAE (cont.)	<i>Galeorhinus galeus</i>	School Shark	EN	193
	* <i>Hemitriakis abdita</i>	Darksnout Houndshark	DD	194
	* <i>Hemitriakis falcata</i>	Sicklefin Houndshark	LC	195
	<i>Hypogaleus hyugaensis</i>	Pencil Shark	LC	196
	<i>Iago garricki</i>	Longnose Houndshark	LC	197
	* <i>Mustelus antarcticus</i>	Gummy Shark	LC	198
	* <i>Mustelus ravidus</i>	Grey Gummy Shark	LC	199
	* <i>Mustelus stevensi</i>	Western Spotted Gummy Shark	LC	200
HEMIGALEIDAE	<i>Hemigaleus australiensis</i>	Australian Weasel Shark	LC	201
	<i>Hemipristis elongata</i>	Fossil Shark	LC	202
CARCHARHINIDAE	<i>Carcharhinus albimarginatus</i>	Silvertip Shark	LC	203
	<i>Carcharhinus altimus</i>	Bignose Shark	LC	204
	<i>Carcharhinus amblyrhynchoides</i>	Graceful Shark	LC	205
	<i>Carcharhinus amblyrhynchos</i>	Grey Reef Shark	NT	206
	<i>Carcharhinus amboinensis</i>	Pigeeye Shark	LC	207
	<i>Carcharhinus brachyurus</i>	Bronze Whaler	LC	208
	<i>Carcharhinus brevipinna</i>	Spinner Shark	LC	209
	<i>Carcharhinus cautus</i>	Nervous Shark	LC	210
	<i>Carcharhinus coatesi</i>	Australian Blackspot Shark	LC	211
	<i>Carcharhinus falciformis</i>	Silky Shark	VU	212
	<i>Carcharhinus fitzroyensis</i>	Creek Whaler	LC	213
	<i>Carcharhinus galapagensis</i>	Galapagos Shark	LC	214
	<i>Carcharhinus leucas</i>	Bull Shark	LC	215
	<i>Carcharhinus limbatus</i>	Common Blacktip Shark	LC	216
	<i>Carcharhinus longimanus</i>	Oceanic Whitetip Shark	CR	217
	<i>Carcharhinus macloti</i>	Hardnose Shark	LC	218
	<i>Carcharhinus melanopterus</i>	Blacktip Reef Shark	LC	219
	<i>Carcharhinus obscurus</i>	Dusky Shark	NT	220
	<i>Carcharhinus plumbeus</i>	Sandbar Shark	NT	221
	<i>Carcharhinus sorrah</i>	Spot-tail Shark	LC	222
	<i>Carcharhinus tilstoni</i>	Australian Blacktip Shark	LC	223
	<i>Glyphis garricki</i>	Northern River Shark	VU	224
	<i>Glyphis glyphis</i>	Speartooth Shark	VU	226
	<i>Loxodon macrorhinus</i>	Sliteye Shark	LC	228
	<i>Negaprion acutidens</i>	Sharptooth Lemon Shark	LC	229
	<i>Prionace glauca</i>	Blue Shark	NT	230
	<i>Rhizoprionodon acutus</i>	Milk Shark	LC	231
	<i>Rhizoprionodon oligolinx</i>	Grey Sharpnose Shark	DD	232
	<i>Rhizoprionodon taylori</i>	Australian Sharpnose Shark	LC	233
	<i>Triaenodon obesus</i>	Whitetip Reef Shark	NT	234
GALEOCERDIDAE	<i>Galeocerdo cuvier</i>	Tiger Shark	NT	235
SPHYRNIDAE	<i>Eusphyrna blochii</i>	Winghead Shark	VU	236
	<i>Sphyrna lewini</i>	Scalloped Hammerhead	EN	238
	<i>Sphyrna mokarran</i>	Great Hammerhead	EN	239
	<i>Sphyrna zygaena</i>	Smooth Hammerhead	NT	240
PRISTIDAE	<i>Anoxypristis cuspidata</i>	Narrow Sawfish	VU	242
	<i>Pristis clavata</i>	Dwarf Sawfish	EN	244

Family	Scientific Name	Common Name	Action Plan Category	Page No.
PRISTIDAE (cont.)	<i>Pristis pristis</i>	Large-tooth Sawfish	CR	246
	<i>Pristis zijsron</i>	Green Sawfish	CR	248
RHINIDAE	<i>Rhina ancylostoma</i>	Shark Ray	NT	250
	<i>Rhynchobatus australiae</i>	Bottlenose Wedgefish	NT	251
	<i>Rhynchobatus palpebratus</i>	Eye-brow Wedgefish	NT	252
GLAUCOSTEGIDAE	<i>Glaucostegus typus</i>	Giant Guitarfish	LC	253
RHINOBATIDAE	<i>Rhinobatos sainsburyi</i>	Goldeneye Shovel-nose Ray	LC	254
TRYGONORRHINIDAE	* <i>Aptychotrema rostrata</i>	Eastern Shovel-nose Ray	LC	255
	<i>Aptychotrema timorensis</i>	Spotted Shovel-nose Ray	VU	256
	* <i>Aptychotrema vincentiana</i>	Western Shovel-nose Ray	LC	258
	* <i>Trygonorrhina dumerilii</i>	Southern Fiddler Ray	LC	259
	* <i>Trygonorrhina fasciata</i>	Eastern Fiddler Ray	LC	260
NARCINIDAE	* <i>Narcinops lasti</i>	Western Numbfish	LC	261
	* <i>Narcinops nelsoni</i>	Eastern Numbfish	LC	262
	* <i>Narcinops ornata</i>	Ornate Numbfish	LC	263
	* <i>Narcinops tasmaniensis</i>	Tasmanian Numbfish	LC	264
	* <i>Narcinops westraliensis</i>	Banded Numbfish	LC	265
HYPNIDAE	* <i>Hypnos monopterygius</i>	Coffin Ray	LC	266
TORPEDINIDAE	<i>Tetronarce nobiliana</i>	Great Torpedo	LC	267
ARHYNCHOBATIDAE	<i>Bathyraja eatoni</i>	Eaton's Skate	LC	268
	<i>Bathyraja irrasa</i>	Kerguelen Skate	LC	269
	* <i>Bathyraja ishiharai</i>	Abyssal Skate	LC	270
	<i>Bathyraja maccaini</i>	McCain's Skate	DD	271
	<i>Bathyraja murrayi</i>	Murray's Skate	LC	272
	<i>Bathyraja richardsoni</i>	Richardson's Skate	LC	273
	* <i>Insentiraja laxipella</i>	Eastern Looseskin Skate	LC	274
	<i>Insentiraja subtilispinosa</i>	Western Looseskin Skate	LC	275
	* <i>Irolita waitii</i>	Southern Round Skate	LC	276
	* <i>Irolita westraliensis</i>	Western Round Skate	LC	277
	* <i>Notoraja azurea</i>	Blue Skate	LC	278
	* <i>Notoraja hirticauda</i>	Ghost Skate	LC	279
	* <i>Notoraja ochroderma</i>	Pale Skate	LC	280
	* <i>Notoraja sticta</i>	Blotched Skate	LC	281
	* <i>Pavoraja alleni</i>	Allen's Skate	LC	282
	* <i>Pavoraja arenaria</i>	Sandy Skate	DD	283
	* <i>Pavoraja mosaica</i>	Mosaic Skate	LC	284
* <i>Pavoraja nitida</i>	Peacock Skate	LC	285	
* <i>Pavoraja pseudonitida</i>	False Peacock Skate	LC	286	
* <i>Pavoraja umbrosa</i>	Dusky Skate	LC	287	
RAJIDAE	<i>Amblyraja hyperborea</i>	Boreal Skate	LC	288
	* <i>Dentiraja australis</i>	Sydney Skate	VU	290
	* <i>Dentiraja cerva</i>	Whitespotted Skate	NT	292
	* <i>Dentiraja confusus</i>	Australian Longnose Skate	CR	294
	* <i>Dentiraja endeavouri</i>	Endeavour Skate	NT	296
	* <i>Dentiraja falloargus</i>	False Argus Skate	LC	297
	* <i>Dentiraja flindersi</i>	Pygmy Thornback Skate	DD	298
	* <i>Dentiraja healdi</i>	Heald's Skate	LC	299
* <i>Dentiraja lemprieri</i>	Australian Thornback Skate	LC	300	

Family	Scientific Name	Common Name	Action Plan Category	Page No.
RAJIDAE (cont.)	<i>*Dentiraja oculus</i>	Australian Ocellate Skate	LC	301
	<i>*Dentiraja polyommata</i>	Argus Skate	LC	302
	<i>*Dipturus acrobelus</i>	Australian Deepwater Skate	LC	303
	<i>*Dipturus apricus</i>	Pale Tropical Skate	LC	304
	<i>*Dipturus canutus</i>	Grey Skate	EN	306
	<i>*Dipturus grahami</i>	Graham's Skate	LC	308
	<i>*Dipturus gudgeri</i>	Bight Skate	NT	309
	<i>*Dipturus melanospilus</i>	Blacktip Skate	LC	310
	<i>*Dipturus queenslandicus</i>	Queensland Deepwater Skate	LC	311
	<i>*Dipturus wengi</i>	Weng's Skate	LC	312
	<i>*Leucoraja pristispina</i>	Sawback Skate	LC	313
	<i>Okamejei arafurensis</i>	Arafura Skate	LC	314
	<i>*Okamejei leptoura</i>	Australian Thintail Skate	LC	315
	<i>*Rajella challengerii</i>	Challenger Skate	LC	316
	<i>*Spiniraja whitleyi</i>	Melbourne Skate	VU	318
	<i>*Zearaja maugeana</i>	Maugean Skate	EN	320
ANACANTHOBATIDAE	<i>Sinobatis bulbicauda</i>	West Australian Legskate	LC	322
	<i>*Sinobatis caerulea</i>	Indigo Legskate	LC	323
	<i>*Sinobatis filicauda</i>	East Australian Legskate	LC	324
HEXATRYGONIDAE	<i>Hexatrygon bickelli</i>	Sixgill Stingray	LC	325
PLESIOBATIDAE	<i>Plesiobatis daviesi</i>	Giant Stingaree	LC	326
DASYATIDAE	<i>Bathytoshia brevicaudata</i>	Smooth Stingray	LC	327
	<i>Bathytoshia lata</i>	Brown Stingray	LC	328
	<i>*Hemistrygon fluviarium</i>	Estuary Stingray	VU	330
	<i>Hemistrygon parvonigra</i>	Dwarf Black Stingray	DD	332
	<i>Himantura australis</i>	Australian Whipray	LC	333
	<i>Himantura leoparda</i>	Leopard Whipray	LC	334
	<i>Maculabatis astra</i>	Blackspotted Whipray	LC	335
	<i>Maculabatis toshi</i>	Brown Whipray	LC	336
	<i>Megatrygon microps</i>	Smalleye Stingray	DD	337
	<i>Neotrygon annotata</i>	Plain Maskray	NT	338
	<i>Neotrygon australiae</i>	Aust. Bluespotted Maskray	LC	339
	<i>*Neotrygon leylandi</i>	Painted Maskray	LC	340
	<i>*Neotrygon ningalooensis</i>	Ningaloo Maskray	LC	341
	<i>Neotrygon picta</i>	Speckled Maskray	LC	342
	<i>Neotrygon trigonoides</i>	Coral Sea Maskray	LC	343
	<i>Pastinachus ater</i>	Broad Cowtail Ray	LC	344
	<i>Pateobatis fai</i>	Pink Whipray	LC	345
	<i>Pateobatis hortlei</i>	Hortle's Whipray	DD	346
	<i>Pateobatis jenkinsii</i>	Jenkins' Whipray	LC	347
	<i>Pteroplatytrygon violacea</i>	Pelagic Stingray	LC	348
	<i>Taeniura lymma</i>	Bluespotted Fantail Ray	LC	349
	<i>Taeniurops meyeri</i>	Blotched Fantail Ray	LC	350
	<i>Urogymnus acanthobothrium</i>	Mumburarr Whipray	DD	351
	<i>Urogymnus asperrimus</i>	Porcupine Ray	LC	352
	<i>Urogymnus dalyensis</i>	Freshwater Whipray	LC	353
	<i>Urogymnus granulatus</i>	Mangrove Whipray	LC	354
GYMNURIDAE	<i>Gymnura australis</i>	Australian Butterfly Ray	LC	355

Family	Scientific Name	Common Name	Action Plan Category	Page No.
UROLOPHIDAE	<i>*Trygonoptera galba</i>	Yellow Shovelnose Stingaree	LC	356
	<i>*Trygonoptera imitata</i>	Eastern Shovelnose Stingaree	LC	357
	<i>*Trygonoptera mucosa</i>	Western Shovelnose Stingaree	LC	358
	<i>*Trygonoptera ovalis</i>	Striped Stingaree	LC	359
	<i>*Trygonoptera personata</i>	Masked Stingaree	LC	360
	<i>*Trygonoptera testacea</i>	Common Stingaree	NT	361
	<i>Urolophus bucculentus</i>	Sandyback Stingaree	VU	362
	<i>*Urolophus circularis</i>	Circular Stingaree	LC	364
	<i>*Urolophus cruciatus</i>	Banded Stingaree	LC	365
	<i>*Urolophus expansus</i>	Wide Stingaree	LC	366
	<i>*Urolophus flavomosaicus</i>	Patchwork Stingaree	LC	367
	<i>*Urolophus gigas</i>	Spotted Stingaree	LC	368
	<i>*Urolophus kapalensis</i>	Kapala Stingaree	NT	369
	<i>*Urolophus lobatus</i>	Lobed Stingaree	LC	370
	<i>*Urolophus mitosis</i>	Mitotic Stingaree	LC	371
	<i>*Urolophus orarius</i>	Coastal Stingaree	EN	372
	<i>*Urolophus paucimaculatus</i>	Sparsely-spotted Stingaree	LC	374
	<i>*Urolophus piperatus</i>	Coral Sea Stingaree	LC	375
	<i>*Urolophus sufflavus</i>	Yellowback Stingaree	VU	376
	<i>*Urolophus viridis</i>	Greenback Stingaree	VU	378
	<i>*Urolophus westraliensis</i>	Brown Stingaree	LC	380
AETOBATIDAE	<i>Aetobatus ocellatus</i>	Spotted Eagle Ray	LC	381
MYLIOBATIDAE	<i>Aetomylaeus caeruleofasciatus</i>	Bluebanded Eagle Ray	LC	382
	<i>Aetomylaeus vespertilio</i>	Ornate Eagle Ray	NT	383
	<i>Myliobatis hamlyni</i>	Purple Eagle Ray	VU	384
	<i>Myliobatis tenuicaudatus</i>	Southern Eagle Ray	LC	386
RHINOPTERIDAE	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	LC	387
MOBULIDAE	<i>Mobula alfredi</i>	Reef Manta Ray	LC	388
	<i>Mobula birostris</i>	Giant Manta Ray	EN	389
	<i>Mobula eregoodoo</i>	Long-horned Pygmy Devilray	LC	390
	<i>Mobula kuhlii</i>	Kuhl's Devilray	LC	391
	<i>Mobula mobular</i>	Giant Devilray	NT	392
	<i>Mobula tarapacana</i>	Chilean Devilray	NT	393
	<i>Mobula thurstoni</i>	Bentfin Devilray	NT	394
CALLORHINCHIDAE	<i>Callorhinchus milii</i>	Elephantfish	LC	395
CHIMAERIDAE	<i>*Chimaera argiloba</i>	Whitefin Chimaera	LC	396
	<i>*Chimaera fulva</i>	Southern Chimaera	LC	397
	<i>Chimaera lignaria</i>	Giant Chimaera	LC	398
	<i>*Chimaera macrospina</i>	Longspine Chimaera	LC	399
	<i>*Chimaera obscura</i>	Shortspine Chimaera	LC	400
	<i>Chimaera ogilbyi</i>	Ogilby's Chimaera	NT	401
	<i>Hydrolagus homonycteris</i>	Black Ghostshark	LC	402
	<i>*Hydrolagus marmoratus</i>	Marbled Ghostshark	LC	403
	<i>Hydrolagus trolli</i>	Abyssal Ghostshark	LC	404
RHINOCHIMAERIDAE	<i>Harriotta haeckeli</i>	Smallspine Spookfish	LC	405
	<i>Harriotta raleighana</i>	Bigspine Spookfish	LC	406
	<i>Rhinochimaera africana</i>	Paddlenose Spookfish	LC	407
	<i>Rhinochimaera pacifica</i>	Pacific Spookfish	LC	408



TAXA PROFILES

The following section provides standardised accounts for all 328 Australian cartilaginous fishes (sharks, rays, and chimaeras). The IUCN Red List Category (and Criteria for threatened and Near Threatened species) assigned to each species is justified with supporting details. Knowledge actions and conservation actions are also provided for each species.



Frill Shark

CAAB Code 37 006001

Chlamydoselachus anguineus Garman, 1884

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Pacific & Atlantic

Habitat: Continental shelf & slope

Depth: 20–1,500 m

Maximum size: 196 cm TL



Assessment Justification: The Frill Shark is a rare and poorly-known shark with a relatively restricted southeast Australian range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it has a wide but patchy tropical and temperate Pacific and Atlantic distribution. Despite a wide depth range, it typically occurs at 500–1,000 m. This viviparous species has limited biological productivity (probable gestation period of 1–2 years; litter size, 2–15 pups). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF). This is likely to be the only Australian fishery which even irregularly interacts with this species. It may have limited catchability in most fishing gear due to its benthopelagic and occasionally pelagic nature in deep waters. The closure to trawling of most SESSF waters deeper than 700 m provides the species with a refuge. Given this refuge and limited interaction with fisheries, there is nothing to infer or suspect population reduction at this time and the Frill Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Sharpnose Sevengill Shark

CAAB Code 37 005001

Heptranchias perlo (Bonnaterre, 1788)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Cosmopolitan (but patchy)

Habitat: Continental shelf & slope

Depth: 27–1,000 m

Maximum size: 139 cm TL



Assessment Justification: The Sharpnose Sevengill Shark is a common shark with a wide Australian range. Outside of Australian waters, it has a wide but patchy global tropical and temperate distribution. This viviparous species is suspected to have limited biological productivity (litter size, 6–20 pups). It is a bycatch or byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) where a small part of the catch has historically been retained. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented a 91% decline in the catch rate of the Sharpnose Sevengill Shark. Information on catches in other fisheries is not available, but it is likely to be a bycatch where line gear is used. There are significant areas of its distribution (e.g., western Great Australian Bight; Western Australian continental slope) with limited or no fishing effort, which would provide the species with some refuge. It also has refuge in deep waters of southern Australia given the closure to trawling of most SESSF waters deeper than 700 m. While it has clearly declined in areas with a long history of fishing (i.e., southeast Australia), given the more extensive refuges, it is not suspected to be close to reaching the population reduction threshold and the Sharpnose Sevengill Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Maintain deepwater refuge

Bluntnose Sixgill Shark

CAAB Code 37 005005

Hexanchus griseus (Bonnaterre, 1788)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Cosmopolitan (but patchy)

Habitat: Continental shelf & slope

Depth: 0–2,500 m

Maximum size: 482 cm TL



Assessment Justification: The Bluntnose Sixgill Shark is a rarely-encountered shark with a wide but patchy eastern and Western Australian range. Outside of Australian waters, it has a wide but patchy global tropical and temperate distribution. Despite having a large litter size (22–108 pups), this viviparous species is suspected to have limited biological productivity due to other life history parameters. It has a sluggish nature, making it susceptible to capture in a variety of fishing gear. It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF). Information on catches in other fisheries is not available, but it is possibly a rare bycatch where line gear is used. However, there are significant areas of its distribution (e.g., western Great Australian Bight; Western Australian continental slope) with limited or no fishing effort, which would provide the species with some refuge from major fishing gear. It also has considerable refuge in deep waters of southern and southeast Australia given the closure to trawling of most SESSF waters deeper than 700 m. While it is possible that some declines have occurred in areas with a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Bluntnose Sixgill Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable level
- Maintain deepwater refuge

Bigeye Sixgill Shark

CAAB Code 37 005004

Hexanchus nakamurai Teng, 1962

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Cosmopolitan (but patchy)

Habitat: Continental shelf & slope

Depth: 90–621 m

Maximum size: 180 cm TL



Assessment Justification: The Bigeye Sixgill Shark is a rare and poorly-known shark with a wide but patchy eastern and Western Australian range. Outside of Australian waters, it has a wide but patchy global tropical and warm-temperate distribution (except for the Eastern Pacific). This viviparous species is suspected to have limited biological productivity (litter size, 13–26 pups). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery, although its range overlaps only marginally with that fishery. Information on catches in other fisheries is not available, but it is possibly a rare bycatch where line gear is used. However, there are significant areas of its distribution (e.g., Western Australian and northeast continental slopes) with limited or no fishing effort, which would provide the species with some refuge from major fishing gear. While there is some uncertainty regarding its extinction risk status in Australian waters given that it is rarely-encountered, it is not suspected to be close to reaching the population reduction threshold and the Bigeye Sixgill Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Broadnose Sevengill Shark

CAAB Code 37 005002

Notorynchus cepedianus (Péron, 1807)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Cosmopolitan (but patchy)

Habitat: Continental shelf

Depth: 0–136 m

Maximum size: 296 cm TL



Assessment Justification: The Broadnose Sevengill Shark is a common shark with a wide southern Australian range. Outside of Australian waters, it has a wide but patchy global temperate distribution. Despite a large litter size, this viviparous species has limited biological productivity due to other life history parameters (Amat, 11–21 years; Amax, 32 years; GL, 21.5–26.5 years; biennial or triennial reproductive cycle; litter size, <40–82 pups). Unlike other cowsharks, this is primarily a shallow water species (usually <50 m depth). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery, where most of the catch has historically been retained. It has benefited from gear restrictions (gillnet mesh size limits) in that fishery. Its mobile nature (moving between Tasmania and New South Wales) exposes it to other fisheries. Despite this, the species has considerable refuge in shallow coastal waters and other areas which receive little commercial fishing effort (e.g., Bass Strait where there is a lack of trawling; the western Great Australian Bight). While it is possible that some declines have occurred in areas with a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Broadnose Sevengill Shark is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	Low	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Bramble Shark

CAAB Code 37 022001

Echinorhinus brucus (Bonnaterre, 1788)

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Cosmopolitan (but patchy)

Habitat: Continental slope

Depth: 200–900 m

Maximum size: 310 cm TL



Assessment Justification: The Bramble Shark is a rarely-encountered and poorly-known shark with a wide southern Australian range. Outside of Australian waters, it has a wide but patchy global tropical and temperate distribution. This viviparous species is suspected to have limited biological productivity (litter size, 15–26 pups). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) and its range overlaps with various sectors of the fishery. Its sluggish nature may make it susceptible to capture in trawl gear and declines have been detected in some regions outside Australia, demonstrating a vulnerability to population reduction where it overlaps with fisheries. Parts of the upper continental slope where it occurs are heavily fished while other parts (e.g., western Great Australian Bight) receive little fishing effort. It has some refuge in deeper water given the closure to trawling of most SESSF waters deeper than 700 m, although it primarily occurs shallower than that depth. Since it is unknown if this fishery is causing a population reduction, there is currently inadequate information available to assess the Bramble Shark beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Limit bycatch
- Maintain deepwater refuge
- Identify & protect critical habitat

Prickly Shark

CAAB Code 37 022002

Echinorhinus cookei Pietschmann, 1928

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Pacific

Habitat: Continental shelf & slope

Depth: 4–1,100 m

Maximum size: 450 cm TL



Assessment Justification: The Prickly Shark is a rare and poorly-known shark recorded from widely-separated locations off southeast and northeast Australia. It is likely to be more wide-ranging than currently identified as it is known from limited records. Outside of Australian waters, it has a wide but patchy tropical and temperate Pacific distribution. Despite having a large litter size, this viviparous species may have limited biological productivity due to other life history parameters which are currently unknown (litter size, up to 114 pups). It undertakes vertical migration from near the surface at night to deeper waters by day. Individuals remain sedentary during the day and show high site fidelity. Its range overlaps with the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) in the southeast and with the Coral Sea Fishery in the northeast; it may be an infrequent bycatch of these fisheries. Fishing effort is high in the southeast and very low in the northeast parts of its range. It has some refuge in deeper water given the closure to trawling of most SESSF waters deeper than 700 m and possibly in the Coral Sea Marine Park. Since it is unknown if fishing (particularly the SESSF) is causing a population reduction, there is currently inadequate information available to assess the Prickly Shark beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Limit bycatch
- Maintain deepwater refuge
- Identify & protect critical habitat

Southern Mandarin Dogfish

CAAB Code 37 020049

Cirrhigaleus australis White, Last & Stevens, 2007

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australasia

Habitat: Continental slope

Depth: 360–640 m

Maximum size: 123 cm TL



Assessment Justification: The Southern Mandarin Dogfish is a rare and poorly-known shark with a relatively restricted eastern Australian range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it occurs off New Zealand. This viviparous species is suspected to have limited biological productivity (litter size, 10 pups). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery. Of concern is that its limited depth range and narrow band of habitat on the continental slope falls entirely within the fishery's trawl footprint. Although reported to be naturally rare, the historical impact of the fishery may have been significant given declines in other dogfish species. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented a significant decline (90%) in the catch rate of various dogfishes. While an increase in Piked Spurdog was also reported, this has not been mirrored in the Southern Mandarin Dogfish as monitoring from 1994 to 2006 recorded it at an exceptionally low catch rate. It may have refuge off northern New South Wales where there is little trawling effort, and potentially on deep rocky reefs. However, since it is unknown if fishing is causing a population reduction, there is currently inadequate information available to assess the Southern Mandarin Dogfish beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Limit bycatch
- Identify & protect critical habitat

Whitespotted Spurdog

CAAB Code 37 020008

Squalus acanthias Linnaeus, 1758

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Cosmopolitan (antitropical; except North Pacific)

Habitat: Continental shelf & slope

Depth: 0–1,446 m

Maximum size: 100 cm TL (Australia)



Assessment Justification: The Whitespotted Spurdog is a common shark with a wide southern Australian range. Outside of Australian waters, it has a wide but patchy global boreal and temperate distribution. This viviparous species has limited biological productivity (litter size, up to 20 pups). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery, where most of the catch has historically been retained. Despite having a wide depth range, locally it primarily occurs in bays and estuaries at depths of <30 m, which provides some refuge from major fishing gears which do not operate close inshore. This habitat does expose it to recreational fishing, for example it is taken in substantial amounts by recreational gillnet in Tasmania. Where the species has been targeted in other regions, it has collapsed in the absence of management. However, it remains abundant in southern Australia, is not suspected to be close to reaching the population reduction threshold and the Whitespotted Spurdog is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	–	–
Connectivity	–	–

Current Management

- CMS Appendix II
- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Maintain deepwater refuge

Eastern Highfin Spurdog

CAAB Code 37 020038

Squalus albifrons Last, White & Stevens, 2007

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 131–450 m

Maximum size: 86 cm TL



Assessment Justification: The Eastern Highfin Spurdog is a poorly-known endemic shark with a wide eastern Australian range. Little biological data are available on this viviparous species, but it is likely to have limited productivity similar to the Piked Spurdog (Amat, 15.5–18 years; Amax, 25–28 years, depending on location; GL, 22 years; biennial reproductive cycle; litter size, 1–5 pups), although the Eastern Highfin Spurdog reaches a larger maximum size. This species has been occasionally reported as bycatch in New South Wales trawl fisheries, although most of the population occurs north of fishing grounds. Off southern Queensland, it is a possible bycatch of line and trawl fisheries but overlap with these fisheries is suspected to be limited. Its range also overlaps with the Commonwealth-managed Coral Sea Fishery, but this fishery has few active vessels and limited fishing effort with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery). Furthermore, there may now be significant protection provided by the Coral Sea Marine Park. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Eastern Highfin Spurdog is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Western Highfin Spurdog

CAAB Code 37 020018

Squalus altipinnis Last, White & Stevens, 2007

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; occurs in an area of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental shelf & slope

Depth: 130–300 m

Maximum size: 72 cm TL



Assessment Justification: The Western Highfin Spurdog is a poorly-known shark with a restricted northwest Australian range (extent of occurrence ~20,000 km²). Outside of Australia, it has a patchy Southeast Asian distribution. Little biological data are available on this viviparous species, but it is likely to have limited productivity similar to the Piked Spurdog (Amat, 15.5–18 years; Amax, 25–28 years, depending on location; GL, 22 years; biennial reproductive cycle; litter size, 1–5 pups). It is a possible bycatch of the Commonwealth-managed North West Slope Trawl Fishery (which has limited effort with only a small number of active vessels) but occurs too deep for the Western Australian Pilbara Fish Trawl Fishery (which operates primarily at depths of 50–110 m). Considerable areas of Western Australia's North Coast Bioregion are closed to trawling through spatial management arrangements, which may provide a refuge. Population trend is unknown, although it is suspected to be stable based on levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Western Highfin Spurdog is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch



Greeneye Spurdog

CAAB Code 37 020048

Squalus chloroculus Last, White & Motomura, 2007

IUCN Red List Category & Criteria

Endangered A2bd*

*See Supporting Information on following page

Reasons for Listing

Inferred population reduction of >50% over the last 3 generations (63 years) based on trend data & catch levels

Distribution: Australian endemic

Habitat: Continental slope

Depth: 216–1,360 m

Maximum size: 99 cm TL



Assessment Justification: The Greeneye Spurdog was a historically common endemic shark with a wide southeast Australian range. This species has limited biological productivity (Amat, 16 years; Amax, 26 years; GL, 21 years; triennial reproductive cycle; litter size, 4–15 pups). Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented a decline of ~97% for 'greeneye dogsharks' (which included the Greeneye Spurdog), the equivalent of a >99.9% population reduction over three generations (63 years). Monitoring between 1996 and 2006 showed declines in the western part of its range (the equivalent of a >99% reduction over three generations) and an absence of the species in the eastern part of its range (confirmed by surveys in 2009). Changes in targeting may partially explain declines in catch-per-unit-effort in the west, and the species has some refuge in deeper water given the closure to trawling of most Southern and Eastern Scalefish and Shark Fishery waters deeper than 700 m (although the Greeneye Spurdog is most common at depths of 300–500 m). Overall, balancing reported declines with some refuge in deeper waters, it is inferred that the population has undergone a reduction of >50% over the last three generations (63 years) and the Greeneye Spurdog is assessed as Endangered.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Medium
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- Commercial fishery retention ban (AUS)
- Commercial fishery mixed-species daily catch limit (NSW)
- General commercial fishery controls

Conservation Actions

- Recover population
- Mitigate catch
- Reduce post-release mortality
- Maintain deepwater refuge
- Identify & protect critical habitat

Supporting Information for Greeneye Spurdog

IUCN Red List Category & Criteria: Endangered A2bd

EPBC Act Status: Not listed

Recommendation: Consider listing

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Inferred population reduction of >50% over the last 3 generations (63 years) based on trend data & catch levels
B	Not applicable: EOO>20,000 km ² ; AOO >2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is likely > 10,000 mature individuals
D	Not applicable: although <5 locations, population size is likely > 1,000 mature individuals; AOO >20 km ²
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	1,338,000 km ² unknown	high low
Area of occupancy trend	>2,000 km ² unknown	low low
No. of mature individuals trend	likely > 10,000 decreasing	low high
No. subpopulations	unknown	low
No. locations	2	medium
Generation length*	21 years	high
Global population share	100%	high

*Generation length calculated from age data for this species (Rochowski 2014).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: declines the equivalent of >99.9% population reduction over three generations off eastern Australia (with an absence of the species in more recent surveys) and >99% in the western part of the range (Graham *et al.* 2001, McLean *et al.* 2015, Walker & Gason 2007, Walker & Rochowski 2019); this represents the bulk of the species' upper slope range, but declines are not expected in its mid slope range where there is some refuge in deepwater (Patterson *et al.* 2019); therefore, when considered across the species' national extent, an overall population reduction of >50% is inferred over the last three generations and the causes of this reduction have not ceased; there is a need to obtain more recent data on catch rates for comparison with previous work.

Information sources: Graham *et al.* (2001); McLean *et al.* (2015); Patterson *et al.* (2019); Rochowski (2014); Rochowski *et al.* (2015); Walker & Gason (2007); Walker & Rochowski (2019).

Fatspine Spurdog

CAAB Code 37 020039

Squalus crassispinus Last, Edmunds & Yearsley, 2007

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australasia

Habitat: Continental slope

Depth: 180–300 m

Maximum size: 67 cm TL



Assessment Justification: The Fatspine Spurdog is a poorly-known shark with a relatively restricted northwest Australian range (although with an extent of occurrence >20,000 km²). Outside of Australia, it occurs in Papua New Guinea. Little biological data are available on this viviparous species, but it is likely to have limited productivity similar to the Piked Spurdog (Amat, 15.5–18 years; Amax, 25–28 years, depending on location; GL, 22 years; biennial reproductive cycle; litter size, 1–5 pups). It is a possible bycatch of the Commonwealth-managed North West Slope Trawl Fishery (which has limited effort with only a small number of active vessels) but occurs too deep for the Western Australian Pilbara Fish Trawl Fishery (which operates primarily at depths of 50–110 m). Considerable areas of Western Australia's North Coast Bioregion are closed to trawling through spatial management arrangements, which may provide a refuge. Population trend is unknown, although it is suspected to be stable based on levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Fatspine Spurdog is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Edmunds' Spurdog

CAAB Code 37 020046

Squalus edmundsi White, Last & Stevens, 2007

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort; deepwater refuge

Distribution: Australia & Indonesia

Habitat: Continental slope

Depth: 200–850 m

Maximum size: 88 cm TL



Assessment Justification: Edmunds' Spurdog is a poorly-known shark with a wide Western Australian range. Outside of Australia, it occurs in eastern Indonesia. Little biological data are available on this viviparous species, but it is likely to have limited productivity (litter size, 5–6 pups; other parameters possibly similar to the Piked Spurdog although Edmunds' Spurdog reaches a larger maximum size: Amat, 15.5–18 years; Amax, 25–28 years, depending on location; GL, 22 years; biennial reproductive cycle). It is a possible bycatch of the Commonwealth-managed North West Slope Trawl Fishery and Western Deepwater Trawl Fishery, but both fisheries have low fishing effort with only a small number of active vessels. Furthermore, its depth range provides it with refuge at depths beyond current fishing activities. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and Edmunds' Spurdog is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Eastern Longnose Spurdog

CAAB Code 37 020041

Squalus grahami White, Last & Stevens, 2007

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (66 years) based on trend data & catch levels

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 148–504 m

Maximum size: 73 cm TL



Assessment Justification: The Eastern Longnose Spurdog is a common endemic shark with a wide eastern Australian range. Little biological data are available on this viviparous species, but it is likely to have limited productivity (litter size, 1–5 pups; other parameters possibly similar to the Piked Spurdog: Amat, 15.5–18 years; Amax, 25–28 years, depending on location; GL, 22 years; biennial reproductive cycle). Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented a decline of ~97% for 'greeneye dogsharks' (which included the Eastern Longnose Spurdog), the equivalent of a >99.9% population reduction over three generations (66 years). The heavily fished region is estimated to be ~20% of the species' range, and fishing pressure remains high there. Outside of this area, it is a possible bycatch of state-managed fisheries, but fishing pressure over much of the remainder of the species' range is low or absent, particularly off northeast Queensland. The population reduction recorded in the southeast is therefore not considered representative of the whole range of the species. Overall, it is inferred that the population has undergone a reduction approaching 30% over the last three generations (66 years) and the Eastern Longnose Spurdog is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Monitor population
- Limit bycatch
- Reduce post-release mortality
- Identify & protect critical habitat

Piked Spurdog

CAAB Code 37 020006

Squalus megalops (Macleay, 1881)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 0–732 m

Maximum size: 64 cm TL



Assessment Justification: The Piked Spurdog is a common endemic shark with a wide southern Australian range. This viviparous species has limited biological productivity (Amat, 15.5–18 years; Amax, 25–28 years, depending on location; GL, 22 years; biennial reproductive cycle; litter size, 1–5 pups). It is the most abundant shark on the outer continental shelf and upper slope of southern Australia. It is a bycatch or byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery, where most of the catch has historically been discarded (due to low value and small size). It is also a component of various state-managed fisheries. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an increase in the catch rate of 18%. Monitoring between 2000 and 2006 showed continuing increasing trends in trawl catches in the southeast. There have been no detectable changes in catch rates in commercial shark gillnets in Bass Strait since the 1970s and no apparent declines in Western Australia. Due to these increasing or stable catch rates as well as large areas of the species' range that are unfished or lightly fished, the Piked Spurdog is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve species complex	Medium
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Philippine Spurdog

CAAB Code 37 020047

Squalus montalbani Whitley, 1931

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (81 years) based on trend data & catch levels

Distribution: Indo-West Pacific

Habitat: Continental shelf & slope

Depth: 154–1,370 m

Maximum size: 106 cm TL



Assessment Justification: The Philippine Spurdog is a common shark with a wide but separated eastern and Western Australian range. Outside of Australian waters, it has a patchy tropical Eastern Indian-Western Pacific distribution. This species has limited biological productivity (Amat, 26 years; Amax, 28 years, although this is suspected to be an underestimate; GL, 27 years; possible triennial reproductive cycle; litter size, 4–16 pups). Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented a decline of ~97% for 'greeneye dogsharks' (which included the Philippine Spurdog), the equivalent of a >99.9% population reduction over three generations (81 years). The heavily fished region is estimated to be <20% of the species' range. Outside of this area, it is a possible bycatch of other Commonwealth and state-managed fisheries, but fishing pressure over much of the remainder of the species' range is low or absent, particularly off northeast Queensland and in deepwater off Western Australia. The population reduction recorded in the southeast is therefore not considered representative of the whole range of the species. Overall, it is inferred that the population has undergone a reduction approaching 30% over the last three generations (81 years) and the Philippine Spurdog is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	High

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Monitor population
- Limit bycatch
- Reduce post-release mortality
- Maintain deepwater refuge
- Identify & protect critical habitat

Western Longnose Spurdog

CAAB Code 37 020040

Squalus nasutus Last, Marshall & White, 2007

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort; deepwater refuge

Distribution: Indo-West Pacific

Habitat: Continental slope

Depth: 300–850 m

Maximum size: 77 cm TL



Assessment Justification: The Western Longnose Spurdog is a poorly-known shark with a wide Western Australian range. Outside of Australia, it has a patchy tropical Eastern Indian-Western Pacific distribution. Little biological data are available on this viviparous species, but it is likely to have limited productivity similar to the Piked Spurdog (Amat, 15.5–18 years; Amax, 25–28 years, depending on location; GL, 22 years; biennial reproductive cycle; litter size, 1–5 pups). It is a possible bycatch of the Commonwealth-managed North West Slope Trawl Fishery and Western Deepwater Trawl Fishery, but both fisheries have low fishing effort with only a small number of active vessels. Furthermore, its depth range provides it with refuge at depths beyond current fishing activities. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Western Longnose Spurdog is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Bartail Spurdog

CAAB Code 37 020037

Squalus notocaudatus Last, White & Stevens, 2007

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental slope

Depth: 220–450 m

Maximum size: 62 cm TL



Assessment Justification: The Bartail Spurdog is a poorly-known endemic shark with a relatively restricted northeast Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this viviparous species, but it is likely to have limited productivity similar to the Piked Spurdog (Amat, 15.5–18 years; Amax, 25–28 years, depending on location; GL, 22 years; biennial reproductive cycle; litter size, 1–5 pups). Its range overlaps with the Commonwealth-managed Coral Sea Fishery, but this fishery has few active vessels and limited fishing effort with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery). The Queensland-managed East Coast Trawl Fishery may occasionally take this species as it operates down to 300 m depth, although only at the western edge of the species' range. Furthermore, there may now be significant protection provided by the Coral Sea Marine Park. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Bartail Spurdog is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Gulper Shark

CAAB Code 37 020023

Centrophorus granulosus (Bloch & Schneider, 1801)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Cosmopolitan (but patchy)

Habitat: Continental shelf & slope

Depth: 50–1,440 m

Maximum size: 173 cm TL



Assessment Justification: The Gulper Shark is a rarely-encountered shark with a wide but separated eastern and Western Australian range. Outside of Australian waters, it has a wide but patchy tropical and temperate Indo-West Pacific and Atlantic distribution. This viviparous species is among the least biologically productive chondrichthyan fishes (Amat, 16.5 years; Amax, 39 years; GL, 28 years; biennial reproductive cycle; litter size, 1 pup). Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented a decline of 99.7% for gulper sharks (*Centrophorus* species), the equivalent of a >99.9% population reduction over three generations (84 years). The Gulper Shark however occurs north of this area and while its range overlaps with the Commonwealth-managed western deepwater trawl fisheries in the west, and the Coral Sea Fishery in the northeast, these fisheries have few active vessels and limited fishing effort. Furthermore, in the northeast there may now be significant protection provided by the Coral Sea Marine Park. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Gulper Shark is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Harrison’s Dogfish

CAAB Code 37 020010

Centrophorus harrissoni McCulloch, 1915

IUCN Red List Category & Criteria

Endangered A2bd

Reasons for Listing

Inferred population reduction of >50% over the last 3 generations (105 years) based on trend data & catch levels

Distribution: Australasia

Habitat: Continental slope

Depth: 220–1,050 m

Maximum size: 114 cm TL



Assessment Justification: Harrison’s Dogfish was a historically common shark with a wide eastern Australian range. Outside of Australian waters, it occurs off northern New Zealand. This viviparous species is among the least biologically productive chondrichthyan fishes (Amat, >23 years; estimated GL, 35 years; biennial or possible triennial reproductive cycle; litter size, 1–2 pups). Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented a decline of 99.7% for gulper sharks (*Centrophorus* species), the equivalent of a >99.9% population reduction over three generations (105 years). The heavily fished area of southeast Australia represents about half of the geographical range of Harrison’s Dogfish with lower levels of fishing in the northern part of its range and on some seamounts. It has refuge from some fishing gear given the closure to trawling of most Southern and Eastern Scalefish and Shark Fishery waters deeper than 700 m (although Harrison’s Dogfish occurs primarily at 350–800 m), and the closure of all waters deeper than 183 m to shark-hook and gillnet methods. Overall, balancing reported declines with areas of reduced threat and management measures, it is inferred that the population has undergone a reduction of >50% over the last three generations (105 years) and Harrison’s Dogfish is assessed as Endangered.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	High
Connectivity	–	–

Current Management

- Conservation Dependent (EPBC Act)
- Management Strategy
- Species-specific spatial closures
- Commercial fishery retention ban (AUS, NSW)
- General commercial fishery controls

Conservation Actions

- Recover population
- Mitigate catch
- Reduce post-release mortality
- Maintain deepwater refuge
- Identify & protect critical habitat

Endeavour Dogfish

CAAB Code 37 020001

Centrophorus moluccensis Bleeker, 1860

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Indo-West Pacific

Habitat: Continental shelf & slope

Depth: 125–823 m

Maximum size: 100 cm TL



Assessment Justification: The Endeavour Dogfish is a common shark with a wide but separated eastern and Western Australian range. Outside of Australian waters, it has a wide but patchy tropical and temperate Indo-West Pacific distribution. This viviparous species is among the least biologically productive chondrichthyan fishes (Amat, >20 years; estimated GL, 30 years; biennial or possible triennial reproductive cycle; litter size, 1–2 pups). Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented a decline of 99.7% for gulper sharks (*Centrophorus* species), the equivalent of a >99.9% population reduction over three generations (90 years). The heavily fished area of southeast Australia represents less than a quarter of the species' eastern range. Elsewhere, much of its range receives very limited fishing effort, including in the northeast and in the west. In these areas, its range overlaps with the Commonwealth-managed Coral Sea Fishery and western deepwater trawl fisheries, but these fisheries have few active vessels and limited fishing effort. While severe declines have occurred on the southeast upper slope where there has been a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Endeavour Dogfish is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	High
Connectivity	Assess connectivity	Medium

Current Management

- Commercial fishery retention ban (AUS)
- Commercial fishery mixed-species daily catch limit (NSW)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Leafscale Gulper Shark

CAAB Code 37 020009

Centrophorus squamosus (Bonnaterre, 1788)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Indo-West Pacific & Eastern Atlantic

Habitat: Continental slope

Depth: 230–2,400 m

Maximum size: 164 cm TL



Assessment Justification: The Leafscale Gulper Shark is a common shark with a relatively restricted southeast Australian range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it has a wide but patchy tropical and temperate Indo-West Pacific and Eastern Atlantic distribution. This viviparous species is among the least biologically productive chondrichthyan fishes (Amat, 35 years; Amax, 70 years; GL, 52.5 years; probable biennial or triennial reproductive cycle; litter size, 7 pups). Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented a decline of 99.7% for gulper sharks (*Centrophorus* species), the equivalent of a >99.9% population reduction over three generations (158 years). The Leafscale Gulper Shark however is only a minor component of catches as it primarily occurs deeper than the depths of fishing. As such, this species has extensive refuge in deeper water given its occurrence to >2,000 m and the closure to trawling of most Southern and Eastern Scalefish and Shark Fishery waters deeper than 700 m. While severe declines have occurred on the southeast upper slope where there has been a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Leafscale Gulper Shark is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Western Gulper Shark

CAAB Code 37 020050

Centrophorus westraliensis White, Ebert & Compagno, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 616–750 m

Maximum size: 91 cm TL



Assessment Justification: The Western Gulper Shark is a rarely-encountered and poorly-known endemic shark with a relatively restricted southwest Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this viviparous species, but gulper sharks are among the least biologically productive chondrichthyan fishes (biennial or triennial reproductive cycle; litter size, mostly 1–2 pups). It is a possible bycatch of the Commonwealth-managed Western Deepwater Trawl Fishery, however this fishery has limited effort with only a small number of active vessels. The Western Gulper Shark has a heightened susceptibility to population depletion due to its limited geographic and depth ranges and inferred very low intrinsic rate of population increase. If fishing pressure was to change within its range, catches of this species would need to be carefully monitored; where targeted or taken as bycatch, gulper shark stocks have rapidly collapsed. However, population trend is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Western Gulper Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve nomenclature	Medium
Distribution	Clarify range	Low
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Southern Dogfish

CAAB Code 37 020011

Centrophorus zeehaani White, Ebert & Compagno, 2008

IUCN Red List Category & Criteria

Endangered A2bd

Reasons for Listing

Inferred population reduction of >50% over the last 3 generations (105 years) based on trend data & catch levels

Distribution: Australian endemic

Habitat: Continental slope

Depth: 210–700 m

Maximum size: 103 cm TL



Assessment Justification: The Southern Dogfish was a historically common shark with a wide southern Australian range. Outside of Australian waters, it has a wide but patchy tropical and temperate Indo-West Pacific and Atlantic distribution. This viviparous species is among the least biologically productive chondrichthyan fishes (Amax, 46 years; estimated GL, 35 years; probable biennial or triennial reproductive cycle; litter size, 1 pup). Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented a decline of 99.7% for gulper sharks (*Centrophorus* species), the equivalent of a >99.9% population reduction over three generations (105 years). Much of the eastern half of the species' range is subject to fishing effort in the Southern and Eastern Scalefish and Shark Fishery and it has no refuge in deeper waters given its narrow occurrence on the upper slope. The western half of its range receives much lower levels of fishing effort, with very little effort in the Western Deepwater Trawl Fishery. Overall, balancing reported declines with areas of reduced threat and management measures, it is inferred that the population has undergone a reduction of >50% over the last three generations (105 years) and the Southern Dogfish is assessed as Endangered.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve nomenclature	High
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Low

Current Management

- Conservation Dependent (EPBC Act)
- Management Strategy
- Species-specific spatial closures
- Commercial fishery retention ban (AUS, NSW)
- General commercial fishery controls

Conservation Actions

- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Brier Shark

CAAB Code 37 020003

Deania calcea (Lowe, 1839)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (87 years) based on trend data & catch levels

Distribution: Cosmopolitan (but patchy)

Habitat: Continental shelf & slope

Depth: 70–1,470 m

Maximum size: 122 cm TL



Assessment Justification: The Brier Shark is a common shark with a wide southern Australian range. Outside of Australian waters, it has a wide but patchy global temperate distribution. This viviparous species has limited biological productivity (Amat, 21.5 years; Amax, 37 years; GL, 29 years; likely biennial or triennial reproductive cycle; litter size, 1–17 pups). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where most of the catch has historically been retained. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented a decline of 87% for the congeneric Longsnout Dogfish; the Brier Shark is inferred to have declined on a similar scale (the equivalent of a >99% population reduction over three generations; 87 years). Monitoring of Brier Shark in the SESSF between 1996 and 2006 shows continuing declines. However, there are significant areas of its range (e.g., western Great Australian Bight; southwest slope) with limited or no fishing effort, as well as extensive refuge in deepwater given the closure to trawling of most SESSF waters deeper than 700 m. Overall, it is inferred that the population has undergone a reduction approaching 30% over the last three generations (87 years) and the Brier Shark is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Monitor population
- Manage catch at sustainable levels
- Reduce post-release mortality
- Maintain deepwater refuge
- Identify & protect critical habitat

Longsnout Dogfish

CAAB Code 37 020004

Deania quadrispinosa (McCulloch, 1915)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (87 years) based on trend data & catch levels

Distribution: Southern Hemisphere

Habitat: Continental slope

Depth: 150–1,360 m

Maximum size: 119 cm TL



Assessment Justification: The Longsnout Dogfish is a poorly-known shark with a wide southern and northwest Australian range. Outside of Australian waters, it has a wide but patchy subtropical and temperate Southern Hemisphere distribution. This viviparous species has limited biological productivity (litter size, 8–17 pups; other parameters possibly similar to the Brier Shark: Amat, 21.5 years; Amax, 37 years; GL, 29 years). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where about half of the catch has historically been retained. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented a decline of 87% for the Longsnout Dogfish (the equivalent of a >99% population reduction over three generations; 87 years). Monitoring of the closely-related Brier Shark between 1996 and 2006 shows continuing declines. However, there are significant areas of the Longsnout Dogfish’s range (e.g., western Great Australian Bight; Western Australian continental slope) with limited or no fishing effort, as well as extensive refuge in deepwater given the closure to trawling of most SESSF waters deeper than 700 m. Overall, it is inferred that the population has undergone a reduction approaching 30% over the last three generations (87 years) and the Longsnout Dogfish is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	High
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Manage catch at sustainable levels
- Reduce post-release mortality
- Maintain deepwater refuge
- Identify & protect critical habitat

Bareskin Dogfish

CAAB Code 37 020024

Centroscyllium kamoharai Abe, 1966

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Indo-West Pacific

Habitat: Continental slope

Depth: 730–1,285 m

Maximum size: 63 cm TL



Assessment Justification: The Bareskin Dogfish is a rarely-encountered and poorly-known shark with a wide but separated southeast and Western Australian range. Outside of Australian waters, it has a wide but patchy tropical and warm-temperate Western Pacific distribution. This viviparous species is suspected to have limited biological productivity (litter size, 3–22 pups). Records are generally infrequent, suggesting that it is not common or is largely outside the range of fisheries. Indeed, its deep occurrence places it outside of current commercial fishing activities given the closure to trawling of most waters deeper than 700 m in the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery, particularly as it mostly occurs at depths >900 m. Off the west coast, the Western Deepwater Trawl Fishery has low fishing effort with few active vessels and does not fish to the depths that this species occurs in. There is nothing to infer or suspect population reduction at this time and the Bareskin Dogfish is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Blurred Smooth Lanternshark

CAAB Code 37 020027

Etmopterus bigelowi Shirai & Tachikawa, 1993

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

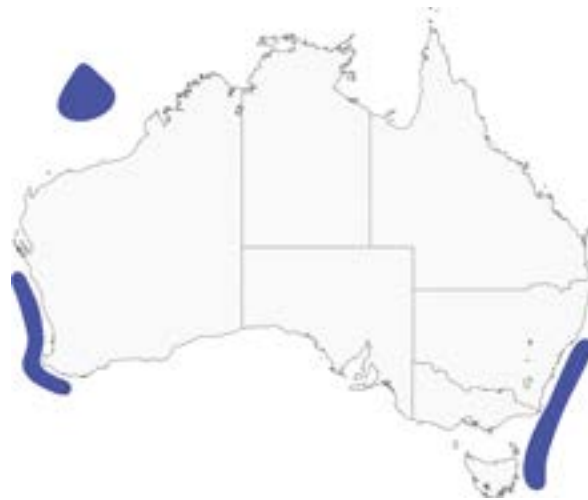
Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Cosmopolitan (but patchy)

Habitat: Pelagic

Depth: 163–1,440 m

Maximum size: 72 cm TL



Assessment Justification: The Blurred Smooth Lanternshark is a poorly-known shark with a wide but patchy eastern and Western Australian range. Outside of Australian waters, it has a wide but very patchy global tropical and temperate distribution. This viviparous species is suspected to have limited biological productivity (possibly similar to the Southern Lanternshark: Amat, 30 years; Amax, 57 years; GL, 43.5 years; biennial reproductive cycle; litter size, 6–16 pups). This species has limited catchability in most fishing gear due to its small size, morphology, and midwater habitat. It is a byproduct or bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery, primarily on automatic longline (with only small amounts caught by otter trawl). A portion of the catch has historically been retained while the majority is discarded, but mortality is expected to be high. It is not likely to interact with fisheries in the western part of its range, and it has considerable refuge in deep waters beyond current fishing activities. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Blurred Smooth Lanternshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Maintain deepwater refuge

Short-tail Lanternshark

CAAB Code 37 020032

Etmopterus brachyurus Smith & Radcliffe, 1912

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental slope

Depth: 400–610 m

Maximum size: 50 cm TL



Assessment Justification: The Short-tail Lanternshark is a poorly-known shark recorded from two widely-separated locations off northeast and Western Australia. Outside of Australian waters, it has a patchy tropical and warm-temperate Western Pacific distribution. This viviparous species is suspected to have limited biological productivity (litter size, 5–13 pups; other parameters possibly similar to the Smooth Lanternshark: Amat, 8–11 years; Amax, 17 years; GL, 12.5–14 years). This species has limited catchability in most fishing gear due to its small size and morphology, but unlike some other lanternsharks which are pelagic, this species is demersal which would make it susceptible to trawling. Its range overlaps with the Commonwealth-managed Western Deepwater Trawl Fishery in the west, and the Coral Sea Fishery (CSF) in the northeast, but both fisheries have few active vessels and limited fishing effort (no trawl effort since the 2006/07 fishing season in the CSF with trawling no longer permitted in this fishery). Furthermore, in the northeast there may now be significant protection provided by the Coral Sea Marine Park. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Short-tail Lanternshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve species complex	Low
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Pink Lanternshark

CAAB Code 37 020029

Etmopterus dianthus Last, Burgess & Séret, 2002

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; occurs in an area of limited fishing effort; deepwater refuge

Distribution: Australasia

Habitat: Continental slope

Depth: 708–880 m

Maximum size: 41 cm TL



Assessment Justification: The Pink Lanternshark is a poorly-known shark with a restricted central Queensland Plateau range off northeast Australia (extent of occurrence ~20,000 km²). Outside of Australian waters, it occurs off New Caledonia. It is currently known from only a limited depth range and a narrow band of habitat, but it is likely to occur more widely than presently recorded. This viviparous species is suspected to have limited biological productivity (possibly similar to the Smooth Lanternshark although the Pink Lanternshark is smaller: Amat, 8–11 years; Amax, 17 years; GL, 12.5–14 years; litter size, 1–6 pups). This species has limited catchability in most fishing gear due to its small size and morphology, although its benthic occurrence makes it susceptible to trawling. Its range overlaps with the Commonwealth-managed Coral Sea Fishery, but this has few active vessels and limited fishing effort with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery). Furthermore, there may now be significant protection provided by the Coral Sea Marine Park. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Pink Lanternshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Lined Lanternshark

CAAB Code 37 020031

Etmopterus dislineatus Last, Burgess & Séret, 2002

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 590–800 m

Maximum size: 45 cm TL



Assessment Justification: The Lined Lanternshark is a poorly-known endemic shark with a relatively restricted northeast Australian range (although with an extent of occurrence >20,000 km²). It is currently known from only a limited depth range and a narrow band of habitat, but it may occur more widely than presently recorded. This viviparous species is suspected to have limited biological productivity (possibly similar to the Smooth Lanternshark: Amat, 8–11 years; Amax, 17 years; GL, 12.5–14 years; litter size, 1–6 pups). This species has limited catchability in most fishing gear due to its small size and morphology, but unlike some other lanternsharks which are pelagic, this species has been recorded near the bottom which would make it susceptible to trawling. Its range overlaps with the Commonwealth-managed Coral Sea Fishery, but this has few active vessels and limited fishing effort with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery). Furthermore, there may now be significant protection provided by the Coral Sea Marine Park. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Lined Lanternshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Blackmouth Lanternshark

CAAB Code 37 020030

Etmopterus evansi Last, Burgess & Séret, 2002

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australasia

Habitat: Continental slope

Depth: 430–689 m

Maximum size: 34 cm TL



Assessment Justification: The Blackmouth Lanternshark is a poorly-known shark with a relatively restricted northwest Australian range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it occurs in eastern Indonesia. It is currently known from only a narrow band of habitat, but it may occur more widely than presently recorded. This viviparous species is suspected to have limited biological productivity (possibly similar to the Smooth Lanternshark although the Blackmouth Lanternshark is smaller: Amat, 8–11 years; Amax, 17 years; GL, 12.5–14 years; litter size, 1–6 pups). This species has limited catchability in most fishing gear due to its small size and morphology, but unlike some other lanternsharks which are pelagic, this species has been recorded near the bottom which would make it susceptible to trawling. Its range overlaps with the Commonwealth-managed North West Slope Trawl Fishery, but this has few active vessels and limited fishing effort. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Blackmouth Lanternshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Pygmy Lanternshark

CAAB Code 37 020028

Etmopterus fusus Last, Burgess & Séret, 2002

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australasia

Habitat: Continental slope

Depth: 430–550 m

Maximum size: 30 cm TL



Assessment Justification: The Pygmy Lanternshark is a poorly-known shark with a relatively restricted northwest Australian range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it occurs in Papua New Guinea. It is currently known from only a narrow band of habitat, but it may occur more widely than presently recorded. This viviparous species is suspected to have limited biological productivity (possibly similar to the Smooth Lanternshark although the Pygmy Lanternshark is smaller: Amat, 8–11 years; Amax, 17 years; GL, 12.5–14 years; litter size, 1–6 pups). This species has limited catchability in most fishing gear due to its small size and morphology, but unlike some other lanternsharks which are pelagic, this species has been recorded near the bottom which would make it susceptible to trawling. Its range overlaps with the Commonwealth-managed North West Slope Trawl Fishery, but this has few active vessels and limited fishing effort. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Pygmy Lanternshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Southern Lanternshark

CAAB Code 37 020021

Etmopterus granulosus (Günther, 1880)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Southern Hemisphere

Habitat: Continental slope

Depth: 250–1,500 m

Maximum size: 86 cm TL



Assessment Justification: The Southern Lanternshark is a common shark with a relatively restricted southeast Australian range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it has a wide but patchy Southern Hemisphere distribution. This viviparous species has limited biological productivity (Amat, 30 years; Amax, 57 years; GL, 43.5 years; biennial reproductive cycle; litter size, 6–16 pups). It is a byproduct or bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where part of the catch has historically been retained, and part is discarded (although post-release mortality is unknown). It was also a bycatch of deepwater trawls targeting Orange Roughy off Tasmania, but most of the historical fishing grounds are now closed. Bycatch levels in Orange Roughy fisheries have been reported as less than in many other trawl fisheries since aggregations are primarily targeted. This species has considerable refuge in deeper waters given the closure to trawling of most SESSF waters deeper than 700 m (particularly since the species is most commonly recorded >600 m). While it is possible that some declines have occurred on the upper slope where there has been a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Southern Lanternshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Maintain deepwater refuge

Blackbelly Lanternshark

CAAB Code 37 020005

Etmopterus lucifer Jordan & Snyder, 1902

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Indo-West Pacific

Habitat: Pelagic; continental slope

Depth: 158–1,357 m

Maximum size: 47 cm TL



Assessment Justification: The Blackbelly Lanternshark is a common but poorly-known shark with a wide southern and eastern Australian range. Outside of Australian waters, it has a wide but patchy tropical and warm-temperate Western Pacific distribution. This viviparous species has limited biological productivity (Amat, 13 years; Amax, 18 years; GL, 15.5 years; litter size, 7 pups). This species has limited catchability in most fishing gear due to its small size, morphology, and partial pelagic habitat. However, it is bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where most of the catch is discarded (although post-release mortality is unknown). In the northeast part of its range there is little fishing effort and it is not likely to interact significantly with state-managed fisheries given its depth range. While regularly caught in the southeast and Great Australian Bight, it has refuge in deeper water given the closure to trawling of most SESSF waters deeper than 700 m. While it is possible that some declines have occurred in areas with a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Blackbelly Lanternshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction	Low
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Maintain deepwater refuge

Moller’s Lanternshark

CAAB Code 37 020033

Etmopterus molleri (Whitley, 1939)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Continental slope

Depth: 238–700 m

Maximum size: 46 cm TL



Assessment Justification: Moller’s Lanternshark is a rarely-encountered and poorly-known shark with a relatively restricted eastern Australian range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it occurs around New Zealand. This viviparous species is suspected to have limited biological productivity (possibly similar to the Smooth Lanternshark: Amat, 8–11 years; Amax, 17 years; GL, 12.5–14 years; litter size, 1–6 pups). This species has limited catchability in most fishing gear due to its small size and morphology, but unlike some other lanternsharks which are pelagic, this species has been recorded near the bottom which would make it susceptible to trawling. The southern extent of its range overlaps with the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery and it is a potential bycatch in that fishery. The upper continental slope of northern New South Wales receives little trawling effort, and as such it may have some refuge there. Population trend is unknown, although it is suspected to be stable based on its limited catchability and levels of fishing effort in the northern part of its range. There is nothing to infer or suspect population reduction at this time and Moller’s Lanternshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve species complex	Medium
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Smooth Lanternshark

CAAB Code 37 020015

Etmopterus pusillus (Lowe, 1839)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Cosmopolitan (but patchy)

Habitat: Pelagic; continental slope

Depth: 275–1,120 m

Maximum size: 50 cm TL



Assessment Justification: The Smooth Lanternshark is a common but poorly-known shark with a wide but separated southeast and Western Australian range. Outside of Australian waters, it has a wide but patchy global tropical and temperate distribution. This viviparous species has limited biological productivity (Amat, 8–11 years; Amax, 17 years; GL, 12.5–14 years; litter size, 1–6 pups). This species has limited catchability in most fishing gear due to its small size, morphology, and partial pelagic habitat. However, it is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where the majority has historically been retained. In the western part of its range it is a possible bycatch of the Commonwealth-managed deeper water trawl fisheries off Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery) but these have limited effort with only a small number of active vessels. It is not likely to interact significantly with state-managed fisheries given its depth range and it has refuge in deeper water given the closure to trawling of most SESSF waters deeper than 700 m. While it is possible that some declines have occurred in areas with a long history of fishing (i.e., the southeast), it is not suspected to be close to reaching the population reduction threshold and the Smooth Lanternshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	–	–
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Maintain deepwater refuge

Bristled Lanternshark

CAAB Code 37 020022

Etmopterus unicolor (Engelhardt, 1912)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Indo-West Pacific

Habitat: Pelagic; continental slope

Depth: 750–1,500 m

Maximum size: 79 cm TL



Assessment Justification: The Bristled Lanternshark is a common shark with a wide southern Australian range. Outside of Australian waters, it has a patchy temperate Western Pacific distribution. This viviparous species is suspected to have limited biological productivity (litter size, 2–21 pups; other parameters possibly similar to the Southern Lanternshark: Amat, 30 years; Amax, 57 years; GL, 43.5 years; biennial reproductive cycle). It was a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) in deepwater trawls targeting Orange Roughy off Tasmania, but most of the historical fishing grounds are now closed. Bycatch levels in Orange Roughy fisheries have been reported as less than in many other trawl fisheries since aggregations are primarily targeted. Given the closure to trawling of most SESSF waters deeper than 700 m, it occurs at depths beyond current fishing operations, and there are no apparent threats to this species. There is nothing to infer or suspect population reduction at this time and the Bristled Lanternshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	–	–
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Portuguese Dogfish

CAAB Code 37 020025

Centroscymnus coelolepis Bocage & Capello, 1864

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Cosmopolitan (but patchy)

Habitat: Continental slope; abyssal plain

Depth: 128–3,700 m

Maximum size: 122 cm TL



Assessment Justification: The Portuguese Dogfish is a common shark with a wide southern Australian range. Outside of Australian waters, it has a wide but patchy global tropical and temperate distribution. This viviparous species is suspected to have limited biological productivity (litter size, 1–29 pups; other parameters possibly similar to the Golden Dogfish: Amat, 20 years; Amax, 54 years; GL, 41 years). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where it is discarded (although post-release mortality is unknown). However, this species has significant refuge in deeper water given the closure to trawling of most SESSF waters deeper than 700 m, as well as its wide depth range which reaches the abyssal plain and thus outside of fishing activities. Declines (>90%) of various dogfishes have been documented on the southeast upper slope, but these are not suspected to be representative of the population status of the Portuguese Dogfish which is more commonly encountered at depths of >1,000 m. It is not suspected to be close to reaching the population reduction threshold and the Portuguese Dogfish is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Maintain deepwater refuge

Owston's Dogfish

CAAB Code 37 020019

Centroscyrnus owstonii Garman, 1906

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (90 years) based on trend data & catch levels

Distribution: Cosmopolitan (but patchy)

Habitat: Continental slope

Depth: 150–1,459 m

Maximum size: 120 cm TL



Assessment Justification: Owston's Dogfish is a common shark with a wide southern Australian range. Outside of Australian waters, it has a wide but patchy global temperate distribution. This viviparous species has limited biological productivity (estimated GL, 30 years; litter size, 5–34 pups). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where most of the catch has historically been retained. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented significant declines (>90%) in the catch rate of various dogfishes; Owston's Dogfish is inferred to have declined on a similar scale. More recently, standardised catch-per-unit-effort in the SESSF between 1996 and 2006 showed a decline of 90% for this species. These declines are not considered representative of the entire range as there are significant areas (e.g., western Great Australian Bight; Western Australian continental slope) with limited or no fishing effort. It also has extensive refuge in deepwater given the closure to trawling of most SESSF waters deeper than 700 m (particularly as it is most common >600 m). Overall, it is inferred that the population has undergone a reduction approaching 30% over the last three generations (90 years) and Owston's Dogfish is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Monitor population
- Manage catch at sustainable levels
- Maintain deepwater refuge
- Identify & protect critical habitat

Golden Dogfish

CAAB Code 37 020012

Centroselachus crepidater (Bocage & Capello, 1864)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Cosmopolitan (but patchy)

Habitat: Continental slope

Depth: 270–2,080 m

Maximum size: 105 cm TL



Assessment Justification: The Golden Dogfish is a common shark with a wide southern Australian range. Outside of Australian waters, it has a wide but patchy global tropical and temperate distribution. This viviparous species has limited biological productivity (Amat, 20 years; Amax, 54 years; GL, 41 years; litter size, 3–9 pups). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where most of the catch has historically been retained. Trend data are not available for this species, but fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented significant declines (>90%) in the catch rate of various dogfishes. It is therefore likely that declines also occurred in the Golden Dogfish (given its limited biological productivity and high catches). However, it has extensive refuge in deepwater given the closure to trawling of most SESSF waters deeper than 700 m (particularly as it is most common at 780–1,100 m). Furthermore, outside of the southeast and parts of the eastern Great Australian Bight, much of its habitat and range is not fished. While it has probably declined in areas with a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Golden Dogfish is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	–	–
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Maintain deepwater refuge

Whitetail Dogfish

CAAB Code 37 020035

Scymnodalatias albicauda Taniuchi & Garrick, 1986

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Primarily Southern Ocean

Habitat: Pelagic

Depth: 0–512 m

Maximum size: 111 cm TL



Assessment Justification: The Whitetail Dogfish is a rare and poorly-known shark recorded off Tasmania and northeast Australia. Its Australian range is most certainly wider than presently documented as it is known from few records. Outside of Australian waters, it has a wide but patchy Southern Ocean distribution. Little biological data are available on this viviparous species although it is highly fecund (litter size, 59 pups). It is epipelagic and mesopelagic in oceanic waters and undertakes vertical migrations from near the surface at night to deeper waters by day. However, it has also been recorded as demersal, and therefore it is susceptible to capture in a variety of fishing gear (specimens have been collected by trawl and longline). Interactions with Australian fisheries appear to be limited, although infrequent incidental capture is likely to occur at least off southeast Australia. Since range is not fully defined, and it is unknown if fishing activities are causing a population reduction (although this is unlikely given the apparent rarity of catches), there is currently inadequate information available to assess the Whitetail Dogfish beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Identify & protect critical habitat

Sherwood's Dogfish

CAAB Code 37 020052

Scymnodalatias sherwoodi (Archey, 1921)

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australasia

Habitat: Pelagic

Depth: 400–500 m

Maximum size: 85 cm TL



Assessment Justification: Sherwood's Dogfish is a rare and poorly-known shark recorded off Tasmania and southwest Australia. Its Australian range is most certainly wider in southern waters than presently documented as it is known from few records. Outside of Australian waters, it occurs in New Zealand. Little biological data are available on this viviparous species. It is probably epipelagic and mesopelagic in oceanic waters but has also been recorded as demersal, and therefore it is susceptible to capture in a variety of fishing gear (specimens have been collected by trawl). Interactions with Australian fisheries appear to be limited, although infrequent incidental capture is likely to occur at least off southeast Australia. Since range is not fully defined, and it is unknown if fishing activities are causing a population reduction (although this is unlikely given the apparent rarity of catches), there is currently inadequate information available to assess Sherwood's Dogfish beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Identify & protect critical habitat

Largespine Velvet Dogfish

CAAB Code 37 020013

Scymnodon macracanthus (Regan, 1906)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (102 years) based on trend data & catch levels

Distribution: Indo-Pacific

Habitat: Continental slope

Depth: 219–1,550 m

Maximum size: 170 cm TL



Assessment Justification: The Largespine Velvet Dogfish is a rare shark recorded off southeast and southwest Australia. Outside of Australian waters, it has a wide but patchy Indo-Pacific distribution. This viviparous species has limited biological productivity (Amat, 29 years; Amax, 39 years; GL, 34 years; litter size, up to 36 pups). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where most of the catch has historically been retained. Trend data are not available for this species, but fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented significant declines (>90%) in the catch rate of various dogfishes. It is therefore inferred that declines have occurred in the Largespine Velvet Dogfish in the southeast which represents the bulk of the species' Australian range. However, it has extensive refuge in deepwater given the closure to trawling of most SESSF waters deeper than 700 m (particularly as it is most common >600 m). Based on overlap with well-established trawl and line fisheries and its low productivity, together with refuge in deep waters, it is inferred that the population has undergone a reduction approaching 30% over the last three generations (102 years) and the Largespine Velvet Dogfish is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	High
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Monitor population
- Manage catch at sustainable levels
- Maintain deepwater refuge
- Identify & protect critical habitat

Southern Sleeper Shark

CAAB Code 37 020036

Somniosus antarcticus Whitley, 1939

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Southern Ocean

Habitat: Continental slope; seamounts

Depth: 300–1,440 m

Maximum size: 600 cm TL



Assessment Justification: The Southern Sleeper Shark is a rarely-encountered and poorly-known shark with a wide but patchy southeast Australian, Macquarie Island, and Kerguelen Plateau range. Outside of Australian waters, it has a wide but patchy Southern Ocean distribution. This viviparous species is suspected to have limited biological productivity (litter size, 10 pups). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where it is discarded (although post-release mortality is unknown). This species has considerable refuge in deeper waters given the closure to trawling of most SESSF waters deeper than 700 m and given the closure of Orange Roughy fishing grounds off Tasmania. It is also a bycatch of Commonwealth-managed Sub-Antarctic longline and trawl fisheries (Heard Island and McDonald Islands; Macquarie Island), but catch levels are generally low, and are not considered to be at levels likely to cause a negative impact on the population. It is not suspected to be close to reaching the population reduction threshold and the Southern Sleeper Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve nomenclature	High
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Velvet Dogfish

CAAB Code 37 020042

Zameus squamulosus (Günther, 1877)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Cosmopolitan (but patchy)

Habitat: Pelagic; continental slope

Depth: 0–2,000 m

Maximum size: 84 cm TL



Assessment Justification: The Velvet Dogfish is a rarely-encountered and poorly-known shark with a wide but separated southeast and Western Australian range. Outside of Australian waters, it has a wide but patchy global tropical and temperate distribution. This viviparous species is suspected to have limited biological productivity (litter size, 3–10 pups). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where it is discarded (although post-release mortality is unknown). In the western part of its range it is a possible bycatch of the Commonwealth-managed deeper water trawl fisheries off Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery) but these have limited effort with only a small number of active vessels. This species has significant refuge in deeper water given the closure to trawling of most SESSF waters deeper than 700 m, as well as its wide depth range which reaches well beyond fishing activities. Furthermore, its partial occurrence in the pelagic zone likely reduces its catchability. Declines (>90%) of various dogfishes have been documented on the southeast upper slope, but these are not suspected to be representative of the population status of the Velvet Dogfish. It is not suspected to be close to reaching the population reduction threshold and the Velvet Dogfish is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Prickly Dogfish

CAAB Code 37 021001

Oxynotus bruniensis (Ogilby, 1893)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (60 years) based on trend data & catch levels

Distribution: Australasia

Habitat: Continental shelf & slope

Depth: 45–1,067 m

Maximum size: 75 cm TL



Assessment Justification: The Prickly Dogfish is a common shark with a wide southern Australian range. Outside of Australian waters, it occurs around New Zealand. This viviparous species has limited biological productivity (estimated GL, 20 years; litter size, 8 pups). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where the bulk of catch is discarded (capture mortality is suspected to be high). Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented significant declines (>90%) in the catch rate of various dogfishes; the Prickly Dogfish is inferred to have declined on a similar scale. This species has a core depth range of 300–650 m which places it heavily in the trawl footprint of the southeast. However, there are areas of its range with lower levels of fishing pressure (i.e., western Great Australian Bight; northern New South Wales) and it would have some refuge in deepwater given the closure to trawling of most SESSF waters deeper than 700 m (although this is outside of its core depth range). Overall, it is inferred that the population has undergone a reduction approaching 30% over the last three generations (60 years) and the Prickly Dogfish is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Monitor population
- Limit bycatch
- Reduce post-release mortality
- Maintain deepwater refuge
- Identify & protect critical habitat

Black Shark

CAAB Code 37 020002

Dalatias licha (Bonnaterre, 1788)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (87 years) based on trend data & catch levels

Distribution: Cosmopolitan (but patchy)

Habitat: Continental shelf & slope

Depth: 37–1,800 m

Maximum size: 182 cm TL



Assessment Justification: The Black Shark is a common shark with a wide southern Australian range. Outside of Australian waters, it has a wide but patchy global tropical and temperate distribution. This viviparous species has limited biological productivity (estimated GL, 29 years; litter size, 3–16 pups). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where about half of the catch has historically been retained. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented significant declines (>90%) in the catch rate of various dogfishes; the Black Shark is inferred to have declined on a similar scale. More recently, standardised catch-per-unit-effort for the species in the SESSF between 1994 and 2006 showed a decline of 84%. These declines are not considered representative of the entire range as there are significant areas (e.g., western Great Australian Bight; Western Australian continental slope) with limited or no fishing effort. It also has extensive refuge in deepwater given the closure to trawling of most SESSF waters deeper than 700 m. Overall, it is inferred that the population has undergone a reduction approaching 30% over the last three generations (87 years) and the Black Shark is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	Medium
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Monitor population
- Manage catch at sustainable levels
- Reduce post-release mortality
- Maintain deepwater refuge
- Identify & protect critical habitat

Pygmy Shark

CAAB Code 37 020034

Euprotomicrus bispinatus (Quoy & Gaimard, 1824)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; limited catchability

Distribution: Cosmopolitan

Habitat: Pelagic

Depth: 0–1,500 m

Maximum size: 27 cm TL



Assessment Justification: The Pygmy Shark is a rarely-encountered and poorly-known shark with a wide Western Australian range. It is possibly more widespread around Australia than currently known. Outside of Australian waters, it has a circumglobal tropical and temperate distribution. Little biological data are available on this viviparous species (litter size, 8 pups). It is epipelagic, mesopelagic, and bathypelagic in oceanic waters and undertakes vertical migrations from near the surface at night to deeper waters by day. This is one of the smallest living shark species and has limited catchability in most fishing gear due to its small size, morphology, and pelagic habitat. Interactions with Australian fisheries are limited, although incidental capture would occur sporadically. Population trend is unknown, although it is suspected to be stable based on its limited catchability and widespread occurrence in oceanic waters. There is nothing to infer or suspect population reduction at this time and the Pygmy Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	–	–
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population

Smalltooth Cookiecutter Shark

CAAB Code 37 020014

Isistius brasiliensis (Quoy & Gaimard, 1824)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; limited catchability

Distribution: Cosmopolitan

Habitat: Pelagic

Depth: 0–3,500 m

Maximum size: 50 cm TL



Assessment Justification: The Smalltooth Cookiecutter Shark is a common but poorly-known shark with a wide Australian oceanic range. Outside of Australian waters, it has a circumglobal tropical and temperate distribution. Little biological data are available on this viviparous species (litter size, 9 pups). It is epipelagic, mesopelagic, and bathypelagic in oceanic waters and undertakes vertical migrations from near the surface at night to deeper waters by day. This species has limited catchability in most fishing gear due to its small size, morphology, parasitic feeding behaviour, and pelagic habitat. It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery, and probably in some state and territory fisheries. Some catches are of individuals attached to target or other bycatch species as it feeds on their flesh. Population trend is unknown, although it is suspected to be stable based on its limited catchability and widespread occurrence in oceanic waters. There is nothing to infer or suspect population reduction at this time and the Smalltooth Cookiecutter Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	–	–
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population

Largetooth Cookiecutter Shark

CAAB Code 37 020043

Isistius plutodus Garrick & Springer, 1964

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; limited catchability

Distribution: Western Pacific & Atlantic

Habitat: Pelagic

Depth: 60–200 m

Maximum size: 42 cm TL



Assessment Justification: The Largetooth Cookiecutter Shark is a rarely-encountered and poorly-known shark recorded from isolated locations off eastern Australia. It is possibly more widespread around Australia than currently known. Outside of Australian waters, it has a wide but patchy Western Pacific and Atlantic distribution. Little biological data are available on this viviparous species (the related Smalltooth Cookiecutter Shark has a litter size of 9 pups). The Largetooth Cookiecutter Shark is epipelagic with most records close to land. It is not known if it undertakes vertical migrations from near the surface at night to deeper waters by day (like the Smalltooth Cookiecutter Shark). This species has limited catchability in most fishing gear due to its small size, morphology, parasitic feeding behaviour, and epipelagic habitat. Interactions with Australian fisheries are limited, although incidental capture would occur sporadically. Population trend is unknown, although it is suspected to be stable based on its limited catchability. There is nothing to infer or suspect population reduction at this time and the Largetooth Cookiecutter Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population

Smalleye Pygmy Shark

CAAB Code 37 020017

Squaliolus aliae Teng, 1959

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; limited catchability

Distribution: Indo-West Pacific

Habitat: Pelagic

Depth: 150–2,000 m

Maximum size: 22 cm TL



Assessment Justification: The Smalleye Pygmy Shark is a rarely-encountered and poorly-known shark recorded from isolated locations off eastern and Western Australia. It is possibly more widespread around Australia than currently known. Outside of Australian waters, it has a wide but patchy tropical and warm-temperate Western Pacific distribution. Little biological data are available on this viviparous species (litter size possibly <10 pups like other small kitefin shark species). It is epipelagic, mesopelagic, and bathypelagic over continental slopes and is thought to undertake vertical migrations from near the surface at night to deeper waters by day. This is the smallest living shark species and has limited catchability in most fishing gear due to its small size, morphology, and pelagic habitat. Interactions with Australian fisheries are limited, although incidental capture would occur sporadically. Population trend is unknown, although it is suspected to be stable based on its limited catchability. There is nothing to infer or suspect population reduction at this time and the Smalleye Pygmy Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population

Common Sawshark

CAAB Code 37 023002

Pristiophorus cirratus (Latham, 1794)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 40–630 m

Maximum size: 149 cm TL



Assessment Justification: The Common Sawshark is a common endemic shark with a wide southern Australian range. This viviparous species has limited biological productivity (Amax, 15 years; biennial reproductive cycle; litter size, 6–22 pups). It is most common in the southeast continental shelf (particularly Bass Strait). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) where most of the catch has historically been retained. Off Western Australia, the species is taken as byproduct in the Temperate Demersal Gillnet and Demersal Longline Fishery. Fishery-independent surveys in the SESSF Shark Gillnet Sector in Bass Strait since the mid-1970s indicate that catch rates initially declined severely, but subsequently stabilised, and then increased. Fishing effort and catch has since reduced with the implementation of management and current exploitation rates are considered sustainable. While declines have occurred in areas with a long history of exploitation (e.g., Bass Strait and elsewhere in the southeast), these have been prior to the last three generations (estimated as 30 years). The population trend over the last three generations (1990–2020) has been increasing and the Common Sawshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	High
Connectivity	–	–

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Identify & protect critical habitat

Tropical Sawshark

CAAB Code 37 023004

Pristiophorus delicatus Yearsley, Last & White, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental slope

Depth: 176–405 m

Maximum size: 85 cm TL



Assessment Justification: The Tropical Sawshark is a poorly-known endemic shark with a relatively restricted northeast Australian range (although with an extent of occurrence >20,000 km²). Its range may not be fully defined as it is known from only a limited number of records. Little biological data are available on this viviparous species (possible biennial reproductive cycle with litter sizes of up to ~20 pups like other sawsharks). The species is a bycatch of the eastern king prawn deepwater sector of the Queensland East Coast Trawl Fishery. This sector has relatively low fishing effort and trawlers do not generally operate beyond 200 m depth which is at the upper limit of the depth range of the Tropical Sawshark. There is also some overlap with the Queensland Deepwater Fin Fish Fishery that uses multiple-hook line fishing gear and the Commonwealth-managed Coral Sea Fishery (CSF), but these fisheries are small-scale with no trawl effort in the CSF since the 2006/07 fishing season (trawling is no longer permitted in this fishery). Significant areas of the species' range are now within the Coral Sea Marine Park. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Tropical Sawshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Southern Sawshark

CAAB Code 37 023001

Pristiophorus nudipinnis Günther, 1870

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–110 m

Maximum size: 124 cm TL



Assessment Justification: The Southern Sawshark is a common endemic shark with a wide southern Australian range. This viviparous species has limited biological productivity despite a short lifespan (Amax, 9 years; biennial reproductive cycle; litter size, 7–14 pups). This species is most common in the southeast (particularly Bass Strait) where it is abundant on the continental shelf. It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) where most of the catch has historically been retained. Fishery-independent surveys in the SESSF Shark Gillnet Sector in Bass Strait since the mid-1970s indicate that catch rates initially declined severely, but subsequently stabilised, and then recovered by the late 2000s. Fishing effort and catch has since reduced with the implementation of management and current exploitation rates are considered sustainable. While historical declines occurred in areas with a long history of exploitation (e.g., Bass Strait and probably elsewhere in the southeast, although catches are negligible off South Australia), these were prior to the last three generations (estimated as 21 years). The population trend over the last three generations (1999–2020) has been increasing and the Southern Sawshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	High
Connectivity	–	–

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Eastern Angelshark

CAAB Code 37 024004

Squatina albipunctata Last & White, 2008

IUCN Red List Category & Criteria

Vulnerable A2bd*

*See Supporting Information on following page

Reasons for Listing

Inferred population reduction of >30% over the last 3 generations (69 years) based on trend data & catch levels

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 35–415 m

Maximum size: 130 cm TL



Assessment Justification: The Eastern Angelshark is a poorly-known endemic shark with a wide eastern Australian range. Little biological data are available on this viviparous species (estimated GL, 23 years; possible biennial reproductive cycle; litter size, possibly up to 20 pups). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of the Eastern Angelshark of 96%, the equivalent of a >99.9% population reduction over three generations (69 years). The heavily fished region is estimated to be ~30% of the species' range. It is also caught in New South Wales and Queensland trawl fisheries, although little information is available on catch levels. Fishing pressure in some parts of its range is low, particularly off northeast Queensland and the population reduction recorded in the southeast is not considered representative of the whole range of the species. Overall, it is inferred that the population has undergone a reduction of >30% over the last three generations (69 years) and the Eastern Angelshark is assessed as Vulnerable.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Protect species
- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for Eastern Angelshark

IUCN Red List Category & Criteria: Vulnerable A2bd

EPBC Act Status: Not listed

Recommendation: Consider listing

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Inferred population reduction of >30% over the last 3 generations (69 years) based on trend data & catch levels
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is likely > 10,000 mature individuals
D	Not applicable: population size is likely > 1,000 mature individuals; AOO > 20 km ² ; > 5 locations
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	1,218,800 km ² unknown	high low
Area of occupancy trend	> 2,000 km ² unknown	low low
No. of mature individuals trend	likely > 10,000 decreasing	low high
No. subpopulations	unknown	low
No. locations	6	medium
Generation length*	23 years	low
Global population share	100%	high

*Generation length inferred from the Pacific Angelshark *Squatina californica* (Cailliet *et al.* 1992).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: declines the equivalent of >99.9% population reduction over three generations in the southern part of the species' range (~30% of the range) (Graham *et al.* 2001, Pogonoski *et al.* 2016); there is no deepwater refuge in the south but given relatively light fishing effort across much of the remainder of its range (Patterson *et al.* 2019) (with some exceptions, e.g., southern Queensland), a level of decline of <30% is suspected outside southeast Australia; therefore, when considered across the species' national extent, an overall population reduction of >30% is inferred over the last three generations and the causes of this reduction have not ceased; there is a need to obtain more recent data on catch rates for comparison with previous work.

Information sources: Cailliet *et al.* (1992); Graham *et al.* (2001); Patterson *et al.* (2019); Pogonoski *et al.* (2016); Walker & Gason (2007).

Australian Angelshark

CAAB Code 37 024001

Squatina australis Regan, 1906

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–130 m

Maximum size: 152 cm TL



Assessment Justification: The Australian Angelshark is a common endemic shark with a wide southern Australian range. Little biological data are available on this viviparous species (possible biennial reproductive cycle; litter size, up to 20 pups). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery in the southeast, where standardised catch-per-unit-effort between 1994 and 2006 showed no overall trend. Most of the catch has historically been retained. Small quantities are also taken in state fisheries. Significant parts of its distribution (e.g., western Great Australian Bight; southwest Western Australia) are subject to much lower levels of fishing effort, which would provide the species with some refuge from major fishing gear. While it is possible that some declines have occurred in areas with a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Australian Angelshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	High	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Western Angelshark

CAAB Code 37 024005

Squatina pseudocellata Last & White, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 150–310 m

Maximum size: 114 cm TL



Assessment Justification: The Western Angelshark is a poorly-known endemic shark with a relatively restricted northwest Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this viviparous species, but it is likely to have limited productivity similar to other Australian angelsharks (possible biennial reproductive cycle; litter size, <20 pups). It is a possible bycatch of the Commonwealth-managed North West Slope Trawl Fishery (which has limited effort with only a small number of active vessels) but occurs too deep for the Western Australian Pilbara Fish Trawl Fishery (which operates primarily at depths of 50–110 m). Considerable areas of Western Australia's North Coast Bioregion are closed to trawling through spatial management arrangements, which may provide a refuge. Population trend is unknown, although it is suspected to be stable based on levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Western Angelshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Ornate Angelshark

CAAB Code 37 024002

Squatina tergocellata McCulloch, 1914

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 130–400 m

Maximum size: 140 cm TL



Assessment Justification: The Ornate Angelshark is a common endemic shark with a wide southern Australian range. This viviparous species has limited biological productivity (biennial reproductive cycle; litter size, 2–9 pups). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery, primarily in the central Great Australian Bight, where standardised catch-per-unit-effort between 2000 and 2006 showed no overall trend (although acknowledging the short length of this time-series). Most of the catch has historically been retained. Only negligible quantities are taken in state fisheries, probably due to the species' depth range. Significant parts of its distribution (e.g., western Great Australian Bight; southwest Western Australia) are subject to much lower levels of fishing effort, which would provide the species with some refuge from major fishing gear. While it is possible that some declines have occurred in areas with a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Ornate Angelshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Byproduct
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Crested Hornshark

CAAB Code 37 007003

Heterodontus galeatus (Günther, 1870)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–93 m

Maximum size: 130 cm TL



Assessment Justification: The Crested Hornshark is a poorly-known endemic shark with a relatively restricted eastern Australian range (although with an extent of occurrence >20,000 km²). It is considered uncommon, especially relative to the Port Jackson Shark, a species it tends to replace in northern New South Wales and southern Queensland. Little biological data are available on this oviparous species (Amat in captivity, 11 years; annual fecundity, 10–16 eggs). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery, as well as various New South Wales and Queensland state-managed fisheries. It has no market value and is always discarded. Post-release survivorship is expected to be very high due to the robust nature of the species (studies have shown it to be high in the morphologically-similar and closely-related Port Jackson Shark). Its occurrence on rocky reefs provides it with some refuge from major fishing gears. Population trend is unknown, although it is suspected to be stable based on the levels of interactions with fisheries within its range. There is nothing to infer or suspect population reduction at this time and the Crested Hornshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Port Jackson Shark

CAAB Code 37 007001

Heterodontus portusjacksoni (Meyer, 1793)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–275 m

Maximum size: 165 cm TL



Assessment Justification: The Port Jackson Shark is a common endemic shark with a wide southern Australian range. There is a single vagrant record from New Zealand, but this is not considered part of its normal range. This oviparous species has limited biological productivity (Amat, 7–17 years; Amax, 35 years; GL, 21–26 years; annual reproductive cycle; annual fecundity, 10–16 eggs). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), as well as various state-managed fisheries (e.g., in the Western Australian Temperate Demersal Gillnet and Demersal Longline Fishery). It has no market value and is always discarded. Post-release survivorship is very high due to the robust nature of the species. There is some recreational catch and collection for the aquarium trade, but at low numbers. There was an historical decline from the 1970s to 2001 in Bass Strait due to persecution when caught as bycatch, however this has ceased, and the population is stable; standardised catch-per-unit-effort data from the SESSF between 1994 and 2006 showed no trend off eastern Australia. Its occurrence on rocky reefs also provides it with some refuge from major fishing gears. It is not suspected to be close to reaching the population reduction threshold and the Port Jackson Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Mod.	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	High	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Zebra Hornshark

CAAB Code 37 007002

Heterodontus zebra (Gray, 1831)

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Indo-West Pacific

Habitat: Continental shelf

Depth: 0–200 m

Maximum size: 122 cm TL



Assessment Justification: The Zebra Hornshark is a rare and poorly-known shark with a relatively restricted northwest Australian range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it has a wide but patchy tropical and warm-temperate Eastern Indian and Western Pacific distribution. Its Australian range may not be fully defined as it is known locally from few records. Little biological data are available on this oviparous species. Australian records are from the outer continental shelf at depths of 150–200 m, whereas elsewhere it mostly occurs shallower than 50 m; its local depth range may therefore not be fully defined. It is a possible bycatch of trawl fisheries, however its currently known depth range is too shallow for the Commonwealth-managed North West Slope Trawl Fishery (which has limited effort with only a small number of active vessels) and too deep for the Western Australian Pilbara Fish Trawl Fishery (which operates primarily at depths of 50–110 m). Considerable areas of Western Australia's North Coast Bioregion are closed to trawling through spatial management arrangements, which may provide a refuge. However, since its local occurrence is not fully defined, and it is unknown if fishing activities are causing a population reduction (although this appears unlikely), there is currently inadequate information available to assess the Zebra Hornshark beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve nomenclature	High
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Limit bycatch
- Identify & protect critical habitat

Collared Carpetshark

CAAB Code 37 013002

Parascyllium collare Ramsay & Ogilby, 1888

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf; reefs

Depth: 20–175 m

Maximum size: 87 cm TL



Assessment Justification: The Collared Carpetshark is a common but poorly-known endemic shark with a relatively restricted eastern Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species, but it is thought to be relatively productive. It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery, where the bulk of catch is discarded (although post-release survivorship is unknown). It is also a bycatch of state trawl fisheries; it is caught in only very low numbers in the northern part of its range off Queensland. Its occurrence on hard bottoms (amongst a variety of habitats) provides some refuge from major fishing gear and it is suspected to occur in significant areas of little to no trawl fishing pressure. This family of carpetsharks are not particularly susceptible to capture in fishing gear other than trawls. While it is possible that some declines have occurred in areas with a long history of fishing (i.e., the southern portion of its range), it is not suspected to be close to reaching the population reduction threshold and the Collared Carpetshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Elongate Carpetshark

CAAB Code 37 013019

Parascyllium elongatum Last & Stevens, 2008

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 50 m

Maximum size: 42 cm TL



Assessment Justification: The Elongate Carpetshark is a poorly-known endemic shark recorded from a single specimen collected from the stomach of a School Shark off southwest Australia (extent of occurrence unknown). Little biological data are available on this species. An evaluation of the potential effects of threatening processes is difficult given that it is only known from a single specimen. A variety of demersal fisheries operate off southwest Australia including the Western Australian Temperate Demersal Gillnet and Demersal Longline Fishery although this family of carpetsharks are not particularly susceptible to capture in fishing gear used. Since the species' range is not fully defined, and it is unknown if these fishing activities are causing a population reduction (although this is unlikely), there is currently inadequate information available to assess the Elongate Carpetshark beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Limit bycatch
- Identify & protect critical habitat

Rusty Carpetshark

CAAB Code 37 013005

Parascyllium ferrugineum McCulloch, 1911

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf; reefs

Depth: 5–150 m

Maximum size: 80 cm TL



Assessment Justification: The Rusty Carpetshark is a common endemic shark with a wide southern Australian range. Little biological data are available on this oviparous species, but it is thought to be relatively productive. It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery in the southeast and the Great Australian Bight, where the catch is discarded (although post-release survivorship is unknown). It is also a possible bycatch of South Australian prawn trawl fisheries. Its occurrence on hard bottoms (amongst a variety of habitats) provides some refuge from major fishing gear and there are significant areas of its distribution (e.g., western Great Australian Bight; Bass Strait; shallow inshore waters) with limited or no trawl fishing effort. This family of carpetsharks are not particularly susceptible to capture in fishing gear other than trawls. While it is possible that some declines have occurred in areas with a long history of fishing (i.e., the eastern portion of its range), it is not suspected to be close to reaching the population reduction threshold and the Rusty Carpetshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Ginger Carpetshark

CAAB Code 37 013018

Parascyllium sparsimaculatum Goto & Last, 2002

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australian endemic

Habitat: Continental slope

Depth: 205–245 m

Maximum size: 79 cm TL



Assessment Justification: The Ginger Carpetshark is a rarely-encountered and poorly-known endemic shark with a restricted southwest Australian range (extent of occurrence <20,000 km²). It is only known from a limited number of specimens and its full geographic and depth range have not been defined. Little biological data are available on this species. It is a possible bycatch of the Commonwealth-managed Western Deepwater Trawl Fishery however this fishery has limited effort with only a small number of active vessels. This family of carpetsharks are not particularly susceptible to capture in fishing gear other than trawls. Since the species' range is not fully defined, and it is unknown if fishing activities are causing a population reduction (although this is unlikely), there is currently inadequate information available to assess the Ginger Carpetshark beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Limit bycatch
- Identify & protect critical habitat

Varied Carpetshark

CAAB Code 37 013004

Parascyllium variolatum (Duméril, 1853)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–180 m

Maximum size: 90 cm TL



Assessment Justification: The Varied Carpetshark is a poorly-known endemic shark with a wide southern Australian range. Little biological data are available on this oviparous species (three captive females laid 57 eggs over a period of 167 days). It is a possible bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF). While other carpetshark species of this family are components of shark bycatch in trawl sectors of the fishery, the Varied Carpetshark has not been reported in catch and bycatch monitoring. This may reflect habitat preferences as it occupies rocky reefs and kelp beds (among other habitats). Any bycatch in the SESSF or in state trawl fisheries would be discarded (although post-release survivorship is unknown). There are significant areas of its distribution (e.g., western Great Australian Bight; Bass Strait; shallow inshore waters) with limited or no trawl fishing effort. This family of carpetsharks are not particularly susceptible to capture in fishing gear other than trawls. Despite a lack of information, there is nothing to infer or suspect population reduction at this time and the Varied Carpetshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch



Colclough's Shark

CAAB Code 37 013013

Brachaelurus colcloughi Ogilby, 1908

IUCN Red List Category & Criteria

Vulnerable C2a(ii)*

*See Supporting Information on following page

Reasons for Listing

Suspected population size <10,000 mature individuals; an inferred continuing decline; 100% of mature individuals suspected to be in one subpopulation

Distribution: Australian endemic

Habitat: Continental shelf; reefs

Depth: 4–217 m

Maximum size: 75 cm TL



Assessment Justification: Colclough's Shark is a rare endemic shark with a relatively restricted eastern Australian range (although with an extent of occurrence >20,000 km²). This viviparous species has limited biological productivity (possible biennial or even triennial reproductive cycle; litter size, 6–7 pups). Its range is under considerable pressure from commercial and recreational fishing, and development-associated habitat modification and loss in the highly urbanised southern part of its range. It is a bycatch of the Queensland East Coast Trawl Fishery and the East Coast Inshore Fin Fish Fishery. There is some refuge in protected areas of Moreton Bay Marine Park and due to its habit of sheltering on rocky reefs during the day, although its movement away from reefs at night exposes it to prawn trawling. It is assumed that all individuals belong to the one continuous subpopulation given its restricted range. Currently it is known from <80 records, despite its distribution being well surveyed and researched. Given its apparent rarity and relatively restricted range, the population size is suspected to be <10,000 mature individuals, with an inferred continuing decline based on levels of fishing effort and habitat modification across its range, together with limited biological productivity. Therefore, Colclough's Shark is assessed as Vulnerable.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: habitat degradation		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Protect species
- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for Colclough's Shark

IUCN Red List Category & Criteria: Vulnerable C2a(ii)

EPBC Act Status: Not listed

Recommendation: Prioritise data collection

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Not applicable: no data or evidence to support population reduction approaching the thresholds
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Suspected population size < 10,000 mature individuals; an inferred continuing decline; 100% of mature individuals suspected to be in one subpopulation
D	Not applicable: population size is likely > 1,000 mature individuals; AOO > 20 km ² ; > 5 locations
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	211,100 km ² unknown	high low
Area of occupancy trend	> 2,000 km ² unknown	low low
No. of mature individuals trend	< 10,000 decreasing	low low
No. subpopulations	1	low
No. locations	6	medium
Generation length*	15.5 years	low
Global population share	100%	high

*Generation length inferred from the Blind Shark *Brachaelurus waddi* (Norén 2013).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: a small population size is suspected based on rarity across a well surveyed and heavily fished range (Kyne *et al.* 2011, 2015); on-going threats (primarily bycatch and habitat degradation) along with intrinsic biological susceptibility infer a continuing decline (Kyne *et al.* 2015); given relatively restricted continuous range, it is assumed that 100% of mature individuals occur in one subpopulation but this needs testing; further data are required to strengthen the evidence-base underlying this assessment.

Information sources: Kyne *et al.* (2011, 2015); Norén (2013).

Blind Shark

CAAB Code 37 013007

Brachaelurus waddi (Bloch & Schneider, 1801)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf; reefs

Depth: 0–140 m

Maximum size: 120 cm TL



Assessment Justification: The Blind Shark is a common endemic shark with a relatively restricted eastern Australian range (although with an extent of occurrence >20,000 km²). This viviparous species has limited biological productivity (Amax, 19 years; biennial or possibly triennial reproductive cycle; litter size, 3–9 pups). It is a secretive nocturnal species inhabiting rocky shorelines and reefs and adjacent seagrass beds. This habitat limits interactions with many commercial fisheries, although it is a bycatch of commercial trap fishing in New South Wales. The species has no market value and is discarded. It is a robust species, able to remain out of water for extended periods of time, and therefore post-release survivorship is expected to be high. There is some recreational catch and collection for the aquarium trade, but these are at low levels. Population trend is unknown, although it is suspected to be stable based on habitat, resilience, and limited occurrence in fisheries. There is nothing to infer or suspect population reduction at this time and the Blind Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Mod.	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Tasselled Wobbegong

CAAB Code 37 013011

Eucrossorhinus dasypogon (Bleeker, 1867)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australasia

Habitat: Continental shelf; reefs

Depth: 0–50 m

Maximum size: 125 cm TL



Assessment Justification: The Tasselled Wobbegong is a common, but poorly-known shark with a wide northern Australian range. Outside of Australian waters, it occurs around New Guinea. Little biological data are available on this viviparous species. It is a bycatch of commercial trawl, net, and line fisheries, although its habitat preferences for shallow coral reefs mean it does not regularly interact with most fishing gears and bycatch levels are very low. Wobbegongs are robust species and therefore post-release survivorship is expected to be high if they were caught and discarded. It is common in the Great Barrier Reef Marine Park where it receives refuge in protected areas. Population trend is unknown, although it is suspected to be stable based on habitat, resilience, and limited occurrence in fisheries. There is nothing to infer or suspect population reduction at this time and the Tasselled Wobbegong is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Floral Banded Wobbegong

CAAB Code 37 013021

Orectolobus floridus Last & Chidlow, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf; reefs

Depth: 42–85 m

Maximum size: 75 cm TL



Assessment Justification: The Floral Banded Wobbegong is a poorly-known endemic shark with a relatively restricted southwest Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this viviparous species. It is a bycatch of the Western Australian Temperate Demersal Gillnet and Demersal Longline Fishery. Small wobbegongs (<150 cm) are selectively discarded alive, thus, the Floral Banded Wobbegong is likely to be mostly discarded. The mean annual wobbegong catch (all species) showed no sign of decline between 1999 and 2014. This species is also a possible discarded bycatch of rock lobster pots. Wobbegongs are robust species and therefore post-release survivorship is expected to be high. It has not been recorded in trawl bycatch, suggesting that it is likely to occur on rocky reefs which would provide it with some refuge. Furthermore, there are significant parts of its range which are unfished or only lightly fished. Population trend is unknown, although it is suspected to be stable based on the levels of interactions with fisheries within its range. There is nothing to infer or suspect population reduction at this time and the Floral Banded Wobbegong is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Gulf Wobbegong

CAAB Code 37 013020

Orectolobus halei Whitley, 1940

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf; reefs

Depth: 0–100 m

Maximum size: 206 cm TL



Assessment Justification: The Gulf Wobbegong is a common endemic shark with a wide southern Australian range. This viviparous species has limited biological productivity (triennial reproductive cycle; litter size, 12–47 pups). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery where the majority has historically been retained. It is a component of the Western Australian Temperate Demersal Gillnet and Demersal Longline Fishery; the mean annual wobbegong catch (all species) showed no sign of decline between 1999 and 2014. In New South Wales, wobbegongs are mostly caught in the Ocean Trap and Line Fishery; wobbegong catch (all species and combined fishing gears) declined between 1990–91 and 2008–09, after which time it stabilised but at low levels. However, fishing effort also declined, resulting in catch rate being relatively constant. The Gulf Wobbegong is a bycatch of a variety of other state fisheries but is generally discarded in the non-shark fisheries. Wobbegongs are robust species and therefore post-release survivorship is expected to be high. Current catch trends suggest that the population is stable. There is nothing to infer or suspect population reduction at this time and the Gulf Wobbegong is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Mod.	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	High
Connectivity	–	–

Current Management

- Commercial fishery mixed-species daily catch limit (NSW)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Western Wobbegong

CAAB Code 37 013016

Orectolobus hutchinsi Last & Chidlow, 2006

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf; reefs

Depth: 5–105 m

Maximum size: 149 cm TL



Assessment Justification: The Western Wobbegong is a common endemic shark with a wide Western Australian range. This viviparous species has limited biological productivity (possible biennial or triennial reproductive cycle; litter size, 18–29 pups). It is a bycatch of the Western Australian Temperate Demersal Gillnet and Demersal Longline Fishery. Small wobbegongs (<150 cm) are selectively discarded alive, thus, the Western Wobbegong is likely to be mostly discarded. The mean annual wobbegong catch (all species) showed no sign of decline between 1999 and 2014. This species is also a bycatch of rock lobster pots and local trawl fisheries. Where caught in these fisheries, it is discarded; wobbegongs are robust species and therefore post-release survivorship is expected to be high. It also occurs on rocky reefs which would provide it with some refuge and there are significant parts of its range which are unfished or only lightly fished. Population trend is unknown, although it is suspected to be stable based on the level of interactions with fisheries within its range. There is nothing to infer or suspect population reduction at this time and the Western Wobbegong is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Spotted Wobbegong

CAAB Code 37 013003

Orectolobus maculatus (Bonnaterre, 1788)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf; reefs

Depth: 0–218 m

Maximum size: 170 cm TL



Assessment Justification: The Spotted Wobbegong is a common endemic shark with a wide southern Australian range. This viviparous species has limited biological productivity (triennial reproductive cycle; litter size, 8–37 pups). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery where the majority has historically been retained. It is a component of the Western Australian Temperate Demersal Gillnet and Demersal Longline Fishery; the mean annual wobbegong catch (all species) showed no sign of decline between 1999 and 2014. In New South Wales, wobbegongs are mostly caught in the Ocean Trap and Line Fishery; wobbegong catch (all species and combined fishing gears) declined between 1990–91 and 2008–09, after which time it stabilised but at low levels. However, fishing effort also declined, resulting in catch rate being relatively constant. The Spotted Wobbegong is a bycatch of a variety of other state fisheries but is generally discarded in the non-shark fisheries. Wobbegongs are robust species and therefore post-release survivorship is expected to be high. Current catch trends suggest that the population is stable. There is nothing to infer or suspect population reduction at this time and the Spotted Wobbegong is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	Mod.	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	High
Life history	Assess age	Low
Connectivity	–	–

Current Management

- Commercial fishery mixed-species daily catch limit (NSW)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Ornate Wobbegong

CAAB Code 37 013001

Orectolobus ornatus (de Vis, 1883)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australasia

Habitat: Continental shelf; reefs

Depth: 0–100 m

Maximum size: 110 cm TL



Assessment Justification: The Ornate Wobbegong is a common shark with a wide eastern Australian range. Outside of Australian waters, it occurs in Papua New Guinea. This viviparous species has limited biological productivity (triennial reproductive cycle; litter size, 4–18 pups). In New South Wales, wobbegongs are mostly caught in the Ocean Trap and Line Fishery; wobbegong catch (all species and combined fishing gears) declined between 1990–91 and 2008–09, after which time it stabilised but at low levels. However, fishing effort also declined, resulting in catch rate being relatively constant. In Queensland, it is a bycatch of the East Coast Trawl Fishery where it is discarded. It is also a bycatch of trap fisheries for fish and crustaceans. Wobbegongs are robust species and therefore post-release survivorship is expected to be high. Current catch trends suggest that the population is stable. There is nothing to infer or suspect population reduction at this time and the Ornate Wobbegong is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Mod.	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	High
Life history	Assess age	Low
Connectivity	–	–

Current Management

- Commercial fishery mixed-species daily catch limit (NSW)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Dwarf Spotted Wobbegong

CAAB Code 37 013022

Orectolobus parvimaculatus Last & Chidlow, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 10–135 m

Maximum size: 94 cm TL



Assessment Justification: The Dwarf Spotted Wobbegong is a poorly-known endemic shark with a relatively restricted southwest Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this viviparous species. It is a bycatch of the Western Australian Temperate Demersal Gillnet and Demersal Longline Fishery. Small wobbegongs (<150 cm) are selectively discarded alive, thus, the Dwarf Spotted Wobbegong is likely to be mostly discarded. The mean annual wobbegong catch (all species) showed no sign of decline between 1999 and 2014. This species is also a bycatch of local trawl fisheries and possibly rock lobster pots. Where caught in these fisheries, it is discarded; wobbegongs are robust species and therefore post-release survivorship is expected to be high. It is also likely to occur on rocky reefs which would provide it with some refuge and there are significant parts of its range which are unfished or only lightly fished. Population trend is unknown, although it is suspected to be stable based on the level of interactions with fisheries within its range. There is nothing to infer or suspect population reduction at this time and the Dwarf Spotted Wobbegong is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Network Wobbegong

CAAB Code 37 013023

Orectolobus reticulatus Last, Pogonoski & White, 2008

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–20 m

Maximum size: 52 cm TL



Assessment Justification: The Network Wobbegong is a rare and poorly-known endemic shark with a relatively restricted northern Australian range (although with an extent of occurrence >20,000 km²). It is known from only a limited number of records and its range and habitat have not been fully defined; these records suggest that preferred habitat is rocky and coral reefs. Little biological data are available on this viviparous species. It may be a bycatch of the Commonwealth-managed Northern Prawn Fishery in Joseph Bonaparte Gulf. However, records thus far have come from very shallow water and these depths are largely outside of the trawl grounds. Levels of interactions with state and territory inshore fisheries are unknown but are suspected to be low. It may have refuge in some lightly fished or unfished remote parts of its range, and in its suspected reef habitat. However, since range is not fully defined, and it is unknown if fishing activities are causing a population reduction, there is currently inadequate information available to assess the Network Wobbegong beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Mitigate catch
- Identify & protect critical habitat

Northern Wobbegong

CAAB Code 37 013017

Orectolobus wardi Whitley, 1939

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australasia

Habitat: Continental shelf; reefs

Depth: 0–3 m

Maximum size: 63 cm TL



Assessment Justification: The Northern Wobbegong is a common but poorly-known shark with a wide northern Australian range. Outside of Australian waters, it occurs marginally in eastern Indonesia and Papua New Guinea. Little biological data are available on this viviparous species. It is a possible bycatch of inshore commercial fisheries, although its habitat preferences for rocky and coral reefs, and its very shallow occurrence mean it is unlikely to interact with most fisheries. It is a bycatch of the Western Australian Pilbara Fish Trawl Fishery and is discarded. Wobbegongs are robust species and therefore post-release survivorship is expected to be high when discarded. Considerable areas of Western Australia's North Coast Bioregion and the Northern Territory are closed to trawling through spatial management arrangements, which may provide a refuge. The overall population trend is suspected to be stable based on a low level of interactions with fisheries. There is nothing to infer or suspect population reduction at this time and the Northern Wobbegong is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve species complex	High
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Cobbler Wobbegong

CAAB Code 37 013012

Sutorectus tentaculatus (Peters, 1865)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf; reefs

Depth: 0–35 m

Maximum size: 92 cm TL



Assessment Justification: The Cobbler Wobbegong is a common endemic shark with a wide southern Australian range. Little biological data are available on this viviparous species (litter size, 12 pups). It is a bycatch of the Western Australian Temperate Demersal Gillnet and Demersal Longline Fishery. Small wobbegongs (<150 cm) are selectively discarded alive, thus, the Cobbler Wobbegong is likely to be mostly discarded. The mean annual wobbegong catch (all species) showed no sign of decline between 1999 and 2014. This species is also a bycatch of rock lobster pots in Western Australia, of South Australian prawn fisheries, and likely some other state fisheries. It is discarded in these fisheries, and wobbegongs are robust species and therefore post-release survivorship is expected to be high. It also occurs on rocky reefs which would provide it with some refuge and there are significant parts of its range which are unfished or only lightly fished. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Cobbler Wobbegong is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Brownbanded Bambooshark

CAAB Code 37 013008

Chiloscyllium punctatum Müller & Henle, 1838

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental shelf; reefs

Depth: 0–85 m

Maximum size: 132 cm TL



Assessment Justification: The Brownbanded Bambooshark is a common shark with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Eastern Indian and Western Pacific distribution. This oviparous species has high biological productivity (Amax, 16 years in captivity; six captive females laid 692 eggs in one year). It inhabits rocky and coral reefs (among other habitats) which provides refuge from major fishing gear. It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF). Estimates of fishing mortality rates for the species in the NPF are below those that would lead to significant population declines. It is also a bycatch in a variety of state and territory trawl and net fisheries but is generally discarded. There are significant areas of this species' range that are only lightly fished or unfished, including areas of Western Australia's North Coast Bioregion and the Northern Territory that are closed to trawling. It is a robust species and therefore post-release survivorship is expected to be high. Population trend is unknown, although it is suspected to be stable. There is nothing to infer or suspect population reduction at this time and the Brownbanded Bambooshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve species complex	High
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Papuan Epaulette Shark

CAAB Code 37 013024

Hemiscyllium hallstromi Whitley, 1967

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; occurs in an area of limited fishing effort

Distribution: Australasia

Habitat: Continental shelf; reefs

Depth: 0–15 m

Maximum size: 77 cm TL



Assessment Justification: The Papuan Epaulette Shark is a poorly-known shark with a restricted Torres Strait range (extent of occurrence <math><20,000\text{ km}^2</math>). Outside of Australian waters, it occurs in southern Papua New Guinea. Little biological data are available on this oviparous species. It is a possible bycatch of Torres Strait fisheries, although its habitat preferences for shallow coral reefs mean it is unlikely to interact with most fishing gears. Species of this family are robust species and therefore post-release survivorship is expected to be high if they were caught and discarded. There may be some collection for the aquarium trade, but levels of take are unknown. Population trend is unknown, although it is suspected to be stable based on a lack of threats in its range and habitat. There is nothing to infer or suspect population reduction at this time and the Papuan Epaulette Shark is assessed as Least Concern. This species is globally threatened; however, the limited extent of its Australian range is unlikely to represent a considerable global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population

Epaulette Shark

CAAB Code 37 013014

Hemiscyllium ocellatum (Bonnaterre, 1788)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australasia

Habitat: Continental shelf; reefs

Depth: 0–50 m

Maximum size: 107 cm TL



Assessment Justification: The Epaulette Shark is a common shark with a wide northeast Australian range. Outside of Australian waters, it occurs marginally into southern Papua New Guinea. This oviparous species has moderate biological productivity (in captivity: breeds continuously, 2 egg cases may be laid every 14 days, annual fecundity therefore up to ~50; in the wild: females carrying egg cases observed only between August and December, annual fecundity therefore up to ~20). It is a possible bycatch of the Queensland commercial fisheries, although its habitat preferences for shallow coral reefs mean it is unlikely to interact with most fishing gears and bycatch levels are very low. Species of this family are robust and therefore post-release survivorship is expected to be high if they were caught and discarded. There is some collection for the aquarium trade, but this is at a low level relative to what is expected to be a large population size. Much of the species' range and habitat occurs within the Great Barrier Reef Marine Park. Population trend is unknown, although it is suspected to be stable. There is nothing to infer or suspect population reduction at this time and the Epaulette Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Target
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Speckled Carpetshark

CAAB Code 37 013015

Hemiscyllium trispeculare Richardson, 1843

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australia & Indonesia

Habitat: Continental shelf; reefs

Depth: 0–50 m

Maximum size: 79 cm TL



Assessment Justification: The Speckled Carpetshark is a common, but poorly-known shark with a wide northern Australian range. Outside of Australian waters, it occurs marginally into eastern Indonesia. Little biological data are available on this oviparous species. It is a possible bycatch of inshore commercial fisheries, although its habitat preferences for shallow coral reefs mean it is unlikely to interact with most fishing gears. Species of this family are robust and therefore post-release survivorship is expected to be high if they were caught and discarded. There may be some collection for the aquarium trade, but levels of take are unknown. Population trend is unknown, although it is suspected to be stable based on a lack of threats in its range and habitat. There is nothing to infer or suspect population reduction at this time and the Speckled Carpetshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Tawny Shark

CAAB Code 37 013010

Nebrius ferrugineus (Lesson, 1831)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-Pacific

Habitat: Continental shelf; reefs

Depth: 0–70 m

Maximum size: 320 cm TL



Assessment Justification: The Tawny Shark is a common shark with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West and Central Pacific distribution. Little biological data are available on this viviparous species (litter size, up to 32 pups). It was a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF), however Turtle Exclusion Devices, which are mandatory, have been shown to reduce the capture of this species by 100%. Estimates of fishing mortality for the species in the NPF are well below those that would lead to significant population decline. It is also a minor bycatch of state and territory fisheries but is generally released alive. Tawny Sharks disappeared from heavily fished reefs in the MOU 1974 Box (where access by Indonesian fishers using traditional artisanal fishing techniques is permitted). However, this represents a very small part of their Australian range. Overall population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Tawny Shark is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Mod.	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Zebra Shark

CAAB Code 37 013006

Stegostoma tigrinum Forster, 1781

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental shelf; reefs

Depth: 0–62 m

Maximum size: 235 cm TL



Assessment Justification: The Zebra Shark is a common shark with a wide northern and eastern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. This oviparous species has low biological productivity (in captivity: Amat, 6–8 years; Amax, 28 years; GL, 17–18 years; 40–80 eggs laid per year with 25% hatching success). It was a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF), however Turtle Exclusion Devices, which are mandatory, have been shown to reduce the capture of this species by 100%. Estimates of fishing mortality for the species in the NPF are well below those that would lead to significant population declines. It is also a bycatch of some state and territory fisheries but is generally released alive with high post-release survivorship. Australian Zebra Sharks are part of the Eastern Indonesia-Oceania subpopulation. The species is heavily exploited in Indonesia and this may be affecting the population status locally in northern Australia. However, it is not suspected to be close to reaching the population reduction threshold overall, particularly given a secure eastern Australian range, and the Zebra Shark is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Whale Shark

Rhincodon typus Smith, 1828

IUCN Red List Category & Criteria

Endangered A2bd

Reasons for Listing

Inferred population reduction of >50% over the last 3 generations (75 years) based on trend data & catch levels

Distribution: Cosmopolitan

Habitat: Pelagic

Depth: 0–1,000 m

Maximum size: 1,500 cm TL



Assessment Justification: The Whale Shark is a common planktivorous shark with a wide Australian range. Outside of Australian waters, it has a circumglobal tropical and warm-temperate distribution. Ningaloo Reef in Western Australia is a locally important aggregation site. This viviparous species has the largest litter size recorded in a shark (the one examined female had 304 pups). Reliable age data are not available, but generation length is estimated as 25 years. This is a highly-mobile species with genetic results indicating distinct Indo-Pacific and Atlantic subpopulations. The species does not regularly interact with Australian fisheries although it is susceptible to ship strike given its surface-swimming behaviour. The Indo-Pacific subpopulation is inferred to have undergone a reduction of 63% over the last three generations (75 years). This is based on decline estimates, and past, and in some cases, ongoing levels of exploitation. The Australian assessment of the Whale Shark reflects the Indo-West Pacific category of Endangered due to connectivity with the broader subpopulation. International co-operation and conservation instruments will be vital to allow the recovery of the species in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor sightings	High
Life history	–	–
Connectivity	–	–

Current Management

- Vulnerable & Migratory (EPBC Act)
- Recovery Plan
- CITES Appendix II (export restriction)
- CMS Appendices I & II
- State protections (TAS, WA)
- General commercial fishery controls

Conservation Actions

- Engage internationally to recover population
- Mitigate catch
- Identify & protect critical habitat

Goblin Shark

CAAB Code 37 009002

Mitsukurina owstoni Jordan, 1898

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Cosmopolitan (but patchy)

Habitat: Pelagic; continental slope

Depth: 0–1,300 m

Maximum size: 550 cm TL



Assessment Justification: The Goblin Shark is a rare and poorly-known shark with a wide southeast Australian range. Outside of Australian waters, it has a wide but patchy global tropical and temperate distribution. Its Australian range is likely wider than presently documented. Little biological data are available on this viviparous species (embryos are probably oophagous and litter size small like other lamnoid sharks). It is a bycatch of the Southern and Eastern Scalefish and Shark Fishery (SESSF). However, it has refuge in deepwater given the closure to trawling of most SESSF waters deeper than 700 m and may also avoid interactions with demersal fishing gear due to its partial mesopelagic habitat. Globally, most catches are juveniles, suggesting that the bulk of the adult population occurs outside the depth range of, or is otherwise unavailable to most fisheries. Population trend is unknown, although it is suspected to be stable based on its refuge in deepwater and limited occurrence in fisheries. There is nothing to infer or suspect population reduction at this time and the Goblin Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge



Grey Nurse Shark

CAAB Code 37 008001

Carcharias taurus Rafinesque, 1810

IUCN Red List Category & Criteria

Vulnerable A2bcd*

*See Supporting Information on following page

Reasons for Listing

Inferred population reduction of >30% over the last 3 generations (75 years) based on trend data, catch levels, & a decline in area of occupancy

Distribution: Cosmopolitan (but patchy)

Habitat: Continental shelf

Depth: 0–191 m

Maximum size: 320 cm TL



Assessment Justification: The Grey Nurse Shark is a locally-common shark with a wide Australian range. Outside of Australian waters, it has a wide but patchy tropical and temperate Indo-West Pacific and Atlantic distribution. There are two distinct Australian subpopulations: east coast and west coast. This viviparous species has limited biological productivity (Amat, 9–10 years; Amax, 40 years; GL, 25 years; biennial reproductive cycle; litter size, 2 pups). In the east, targeting by spear fishers in the 1960s and 1970s and incidental capture in fisheries and shark control programs led to dramatic declines and disappearance from some aggregation sites. Data from New South Wales and Queensland shark control programs showed significant population reductions (>97% over the last three generations; 75 years; the east coast subpopulation therefore meets Critically Endangered). Western Australian demersal gillnet fishery catch data indicated that the west coast subpopulation was stable pre-1997 when data were available. Effort reduction and closed areas infer that the subpopulation would be in a similar or better state now. Overall, given significant declines in the east (with a decline in the area of occupancy) but an apparent stable trend in the west and a lack of significant threats across its wide northern Australian range (albeit where records are sparse), it is inferred that the population has undergone a reduction of >30% over the last three generations (75 years) and the Grey Nurse Shark is assessed as Vulnerable (see page 23 for additional information).

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	Mod.	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess age	High
Connectivity	Assess connectivity	High

Current Management

- Critically Endangered (east coast); Vulnerable (west coast) (EPBC Act)
- Recovery Plan
- State protections (NSW, QLD, TAS, VIC, WA)
- Species-specific spatial closures
- General commercial fishery controls

Conservation Actions

- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for Grey Nurse Shark

IUCN Red List Category & Criteria: Vulnerable A2bcd

EPBC Act Status: Critically Endangered (east)/Vulnerable (west)

Recommendation: Maintain & improve management

Recovery Plan: DoE (2014b). Recovery plan for the Grey Nurse Shark (*Carcharias taurus*). Department of the Environment (DoE), Canberra (due for review).

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Inferred population reduction of >30% over the last 3 generations (75 years) based on trend data, catch levels, & a decline in area of occupancy
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Not applicable: while eastern Australian population size estimates of <2,500 mature individuals (point estimates of 686 or 2,167 depending on biological parameters) suggest a national population size of <10,000 mature individuals, there is an increasing trend and therefore, no continuing decline
D	Not applicable: population size >1,000 mature individuals; AOO > 20 km ² ; >5 locations
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	11,065,800 km ² unknown	high low
Area of occupancy trend	>2,000 km ² decreasing	high low
No. of mature individuals trend	likely <10,000 increasing	low high
No. subpopulations	2	high
No. locations	>10	high
Generation length*	25 years	low
Global population share	10%	high

*Generation length calculated from age data for this species (Goldman *et al.* 2006).

Reason for change from EPBC Act listing

genuine change
 new knowledge
 taxonomic change
 previous mistake
 no change

Explanation: recent application of close-kin mark-recapture (Bradford *et al.* 2018) suggests a national population size estimate under the threshold for Vulnerable C; however, there is an increasing trend (hence, species is not eligible under Criterion C; see page 23); while a national assessment is provided here, there are two recognised subpopulations in Australian waters (Ahonen *et al.* 2009, Stow *et al.* 2006); the east coast subpopulation remains Critically Endangered under Criterion A with the equivalent of a >97% population reduction over the last three generations (Reid *et al.* 2011); available stable population trend data from the west coast subpopulation are now dated (pre-1997) but there is no reason to suspect that population status would have deteriorated since then given effort reduction and large closed areas (Chidlow *et al.* 2006); interactions with fisheries outside the east coast appear limited including its wide northern range (although records there are scattered e.g., Momigliano & Jaiteh 2015); therefore, when considered across the species' national extent, an overall population reduction of >30% is inferred over the last three generations and the causes of this reduction have not ceased.

Information sources: Ahonen *et al.* (2009); Bradford *et al.* (2018); Chidlow *et al.* (2006); Goldman *et al.* (2006); Jakobs & Braccini (2019); Lynch *et al.* (2013); Momigliano & Jaiteh (2015); Reid *et al.* (2011); Stow *et al.* (2006).

Smalltooth Sandtiger Shark

CAAB Code 37 008003

Odontaspis ferox (Risso, 1810)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (75 years) based on trend data & catch levels

Distribution: Cosmopolitan (but patchy)

Habitat: Pelagic; continental slope

Depth: 10–883 m

Maximum size: 450 cm TL



Assessment Justification: The Smalltooth Sandtiger Shark is a rare and poorly-known shark with a wide but patchy eastern and Western Australian range. Outside of Australian waters, it has a wide but very patchy global tropical and warm-temperate distribution. Little biological data are available on this viviparous species (estimated GL, 25 years; embryos are probably oophagous). It is a byproduct or bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) where the bulk of the catch has historically been retained. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented 14 sharks during 246 tows in 1976/77, but only a single juvenile in 165 tows in 1996/97. Furthermore, of 36 specimens caught by NSW Fisheries Research Vessel *Kapala*, 33 were caught during 1975–1981 (from 500 slope trawls), but only three from ~300 trawls during 1982–1997. This suggests that the population has seriously declined in the southeast. However, there is no reason to expect a decline off Western Australia where levels of fishing effort are very low on the slope. It also has some refuge in deepwater given the closure to trawling of most SESSF waters deeper than 700 m. Overall, it is inferred that the population has undergone a reduction approaching 30% over the last three generations (75 years) and the Smalltooth Sandtiger Shark assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- State protection (NSW)
- General commercial fishery controls

Conservation Actions

- Monitor population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Crocodile Shark

CAAB Code 37 009003

Pseudocarcharias kamoharai (Matsubara, 1936)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Cosmopolitan

Habitat: Pelagic

Depth: 0–590 m

Maximum size: 122 cm TL



Assessment Justification: The Crocodile Shark is a common shark with a wide Australian range. Outside of Australian waters, it has a circumglobal tropical and subtropical oceanic distribution. This viviparous species has limited biological productivity although it does have a relatively early age-at-maturity (Amat, 5 years; Amax, 13 years; GL, 9 years; litter size, 4 pups). It is thought to display vertical migrations, occurring in deeper waters during the day, and moving towards the surface at night. It is a bycatch of the Commonwealth-managed Western Tuna and Billfish Fishery off Western Australia and to a lesser extent, the Eastern Tuna and Billfish Fishery. Hook mortality of Crocodile Sharks can be low and globally, catch rates in pelagic longline fisheries have been increasing over time. It is uncertain if this is a result of the shifting nature of fisheries or possibly mesopredator release due to the removal of larger pelagic predators. This requires further examination but may suggest that the population is increasing. The Crocodile Shark has a wide range with significant areas of Australian waters not subject to pelagic longline fisheries. It is not suspected to be close to reaching the population reduction threshold and the Crocodile Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess age	Medium
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Megamouth Shark

CAAB Code 37 009001

Megachasma pelagios Taylor, Compagno & Struhsaker, 1983

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Cosmopolitan (but patchy)

Habitat: Pelagic

Depth: 5–1,500 m

Maximum size: 550 cm TL



Assessment Justification: The Megamouth Shark is a rare planktivorous shark locally known from a single specimen found beached in southwest Australia in 1988 (extent of occurrence unknown). Outside of Australian waters, it has a wide but very patchy global tropical and warm-temperate distribution. Worldwide it is known from ~120 documented records and its Australian range is likely to be wider than presently documented. Little biological data are available on this viviparous species (embryos are probably oophagous). It occupies a variety of habitats with records coming from coastal waters, over continental shelves, and offshore in the pelagic zone. It appears to be a vertical migrator, presumably following the vertical migrations of euphausiid prey (krill) during diel cycles. Globally it is a rare bycatch of various high-seas and coastal fisheries, but the lack of reports locally suggests that it rarely interacts with Australian fisheries. With considerably more specimens known from Taiwan, Japan, and the Philippines than elsewhere, it is possible that the species is only a vagrant to Australian waters. However, since its local occurrence is not fully defined, and it is unknown if fishing activities are causing a population reduction (although this appears unlikely), there is currently inadequate information available to assess the Megamouth Shark beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- State protection (TAS)
- General commercial fishery controls

Conservation Actions

- Understand population
- Engage internationally to recover population
- Maintain deepwater refuge
- Identify & protect critical habitat

Pelagic Thresher

Alopias pelagicus Nakamura, 1935

IUCN Red List Category & Criteria

Endangered A2bd

Reasons for Listing

Estimated population reduction of >50% over the last 3 generations (56 years) based on trend data & catch levels

Distribution: Indo-Pacific

Habitat: Pelagic

Depth: 0–152 m

Maximum size: 390 cm TL



Assessment Justification: The Pelagic Thresher is a common shark with a wide northern Australian range. Outside of Australian waters, it has a wide tropical and subtropical Indo-Pacific distribution. This viviparous species has limited biological productivity (Amat, 9–13 years; Amax, 24–28 years; GL, 18.5 years; likely annual reproductive cycle; litter size, 2 pups). It is a highly-mobile species but with genetic structuring between the Eastern and Western Pacific (connectivity between the Indian and Pacific Oceans is unknown). It is a bycatch of Australian longline fisheries, but catches are low. Mortality rates are high on commercial fishing gear. While population trend data are not available for Australian waters, global analysis estimated a population reduction of ~75% over the last three generations (56 years). This analysis included data from both the Pacific and Indian Oceans. The Australian assessment of the Pelagic Thresher reflects the global category of Endangered under the assumption of connectivity with the regional subpopulation(s). International co-operation and conservation instruments will be vital to allow the recovery of the species in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Target
Fishing - Indigenous	None	–
Fishing - shark control	Low	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	High

Current Management

- CITES Appendix II (export restriction)
- CMS Appendix II (EPBC listing exemption)
- General commercial fishery controls

Conservation Actions

- Protect species
- Engage internationally to recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Bigeye Thresher

CAAB Code 37 012002

Alopias superciliosus (Lowe, 1841)

IUCN Red List Category & Criteria

Vulnerable A2bd

Reasons for Listing

Estimated population reduction of >30% over the last 3 generations (56 years) based on trend data & catch levels

Distribution: Cosmopolitan

Habitat: Pelagic

Depth: 0–700 m

Maximum size: 484 cm TL



Assessment Justification: The Bigeye Thresher is a rare shark with a wide Australian range. Outside of Australian waters, it has a wide global tropical and temperate distribution. This viviparous species has limited biological productivity (Amat, 9 years; Amax, 28 years; GL, 18.5 years; likely annual reproductive cycle; litter size, 2–4 pups). It is a highly-mobile species and although there is some genetic structuring between the Northwest Atlantic and the Pacific Oceans, it can be considered one global population. It is a vertical migrator, occurring in surface waters at night and diving deep during the day. It is a bycatch of Australian longline fisheries, but catches are low. Mortality rates are high on commercial fishing gear. While population trend data are not available for Australian waters, global analysis estimated a population reduction of >30% over the last three generations (56 years). This analysis included data from the North Atlantic, Pacific, and Indian Oceans. The Australian assessment of the Bigeye Thresher reflects the global category of Vulnerable under the assumption of connectivity with the regional subpopulation(s). International co-operation and conservation instruments will be vital to allow the recovery of the species in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Target
Fishing - Indigenous	None	–
Fishing - shark control	Low	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	High

Current Management

- CITES Appendix II (export restriction)
- CMS Appendix II (EPBC listing exemption)
- General commercial fishery controls

Conservation Actions

- Protect species
- Engage internationally to recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Common Thresher

Alopias vulpinus (Bonnaterre, 1788)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (77 years) based on trend data & catch levels

Distribution: Cosmopolitan

Habitat: Pelagic

Depth: 0–650 m

Maximum size: 575 cm TL



Assessment Justification: The Common Thresher is a common shark with a wide Australian range. Outside of Australian waters, it has a circumglobal tropical and temperate distribution. This viviparous species has limited biological productivity (Amat, 13 years; Amax, 38 years; GL, 25.5 years; annual or biennial reproductive cycle; litter size, 2–6 pups). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery, where most of the catch was historically retained. It is also caught in Commonwealth and state longline and gillnet fisheries (with high mortality rates). Global trend analysis estimated a population reduction of >30% over the last three generations (77 years). This analysis included declining trends in the North Atlantic and Mediterranean Sea, but an increasing trend in the Eastern Pacific (where there is specific management; this trend may not be representative of the wider Pacific). Under the assumption of connectivity with the regional subpopulation(s), declines are inferred in Australia, but not to the extent seen in the Atlantic. It is inferred that the Australian population has undergone a reduction approaching 30% over the last three generations (77 years) and the Common Thresher is assessed as Near Threatened. International co-operation and conservation instruments will be vital to ensure the species does not become threatened in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	Mod.	Target
Fishing - Indigenous	None	–
Fishing - shark control	Low	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	High

Current Management

- CITES Appendix II (export restriction)
- CMS Appendix II (EPBC listing exemption)
- General commercial fishery controls

Conservation Actions

- Monitor population
- Manage catch at sustainable levels
- Reduce post-release mortality
- Identify & protect critical habitat

Basking Shark

CAAB Code 37 011001

Cetorhinus maximus (Gunnerus, 1765)

IUCN Red List Category & Criteria

Endangered A2bd

Reasons for Listing

Suspected population reduction of >50% over the last 3 generations (102 years) based on trend data & catch levels

Distribution: Primarily Pacific & Atlantic

Habitat: Pelagic

Depth: 0–1,200 m

Maximum size: 1,000 cm TL



Assessment Justification: The Basking Shark is a rare planktivorous shark with a wide southern Australian range. Outside of Australian waters, it has a wide antitropical distribution primarily in the Pacific and Atlantic. This viviparous species has limited biological productivity (Amat, 18 years; Amax, 50 years; GL, 34 years; estimated 3–5 year reproductive cycle; litter size, 6 pups). Genetic results indicate one global population. There are very few local records or sightings suggesting that it rarely interacts with Australian fisheries or may primarily be a vagrant or occasional visitor. It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery and is susceptible to ship strike given its surface-swimming behaviour. The global population is suspected to have undergone a reduction of >50% over the last three generations (102 years). This is partially based on steep decline estimates in waters adjacent to Australia (i.e., New Zealand). In various regions, there are some signs of stabilisation and possible slow recovery with the ending of target fishing and high levels of protection. The Australian assessment of the Basking Shark reflects the global category of Endangered. International co-operation and conservation instruments will be vital to allow the recovery of the species in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor sightings	High
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- Migratory (EPBC Act)
- CITES Appendix II
- CMS Appendices I & II
- State protection (TAS)
- General commercial fishery controls

Conservation Actions

- Engage internationally to recover population
- Maintain deepwater refuge
- Identify & protect critical habitat



White Shark

CAAB Code 37 010003

Carcharodon carcharias (Linnaeus, 1758)

IUCN Red List Category & Criteria

Vulnerable A1bd*

*See Supporting Information on following page

Reasons for Listing

Inferred population reduction of >50% over the last 3 generations (81 years) based on trend data & catch levels

Distribution: Cosmopolitan

Habitat: Pelagic; continental shelf

Depth: 0–1,280 m

Maximum size: 600 cm TL



Assessment Justification: The White Shark is a rare shark with a wide Australian range. Outside of Australian waters, it has a circumglobal primarily temperate distribution. This viviparous species has limited biological productivity (Amat, 7–33 years; Amax, 18–73 years; GL, 27 years; suspected 2–3 year reproductive cycle; litter size, 2–17 pups). There are two subpopulations: Eastern Australasia (east coast and New Zealand) and Southern-Western Australia. Although protected, it is a target of shark control programs in some states and is a bycatch of southern gillnet fisheries (post-release survivorship requires examination). Application of close-kin mark-recapture estimated population sizes of 750 (range: 470–1,030) mature individuals for Eastern Australasia, and 1,460 (760–2,250) for Southern-Western Australia. Combined, the point estimate for the the Australasian population size (2,210) is below the Endangered criterion C threshold (<2,500 mature individuals). However, there is evidence of no continuing decline. Historical population reductions have been documented on the east coast from the 1950s onwards. Some analyses suggesting declines of >90% are considered overestimates. The causes of the population reduction are clearly reversible, understood, and have ceased (threats are ongoing but mortality is not likely to be at levels causing additional population reduction). It is inferred that the population has undergone a reduction of >50% over the last three generations (81 years) and the White Shark is assessed as Vulnerable.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	Mod.	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction	Medium
Connectivity	Assess connectivity	High

Current Management

- Vulnerable & Migratory (EPBC Act)
- Recovery Plan
- CITES Appendix II
- CMS Appendices I & II
- State protections (NSW, QLD, SA, TAS, VIC, WA)
- General commercial fishery controls

Conservation Actions

- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for White Shark

IUCN Red List Category & Criteria: Vulnerable A1bd

EPBC Act Status: Vulnerable & Migratory

Recommendation: Maintain & improve management

Recovery Plan: DSEWPaC (2013). Recovery Plan for the White Shark (*Carcharodon carcharias*). Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), Canberra (due for review).

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Inferred population reduction of >50% over the last 3 generations (81 years) based on trend data & catch levels where the causes of the reduction are clearly reversible and understood and have ceased
B	Not applicable: EOO>20,000 km ² ; AOO >2,000 km ²
C	Not applicable: while estimated population size is <2,500 mature individuals, there is evidence of no continuing decline; two subpopulations with population size estimates of 750 (range: 470–1,030) mature individuals for Eastern Australasia, and 1,460 (760–2,250) for Southern-Western Australia; therefore, number of mature individuals in each subpopulation is not likely ≤1,000 mature individuals
D	Not applicable: population size >1,000 mature individuals; AOO >20 km ² ; >5 locations
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	15,155,600 km ² unknown	high low
Area of occupancy trend	>2,000 km ² unknown	low low
No. of mature individuals trend	2,210 increasing	high low
No. subpopulations	2	high
No. locations	>10	high
Generation length*	27 years	high
Global population share	10%	low

*Generation length calculated from age data for this species (there is considerable variability in generation length estimates depending on region and ageing methods used; see Rigby *et al.* 2019a).

Reason for change from EPBC Act listing

genuine change
 new knowledge
 taxonomic change
 previous mistake
 no change

Explanation: no change from current listing; IUCN criteria are provided here; recent application of close-kin mark-recapture (Bruce *et al.* 2018, Hillary *et al.* 2018) provides national population size estimate under the threshold for Endangered C; however, several lines of evidence point to either a stable or increasing trend with little support for a continuing decline (hence, species is not eligible under Criterion C); available population trend data for the Eastern Australasia subpopulation indicated severe declines from the start of data collection (1950–1960s) followed by slight increases since the mid-1990s (New South Wales data at least) (Reid *et al.* 2011); some analyses of Queensland data indicating population reduction of >90% over three generations (Roff *et al.* 2018) are not considered robust and are considered an overestimate; less data are available on trend for the Southern-Western Australia subpopulation (Braccini *et al.* 2017, Taylor *et al.* 2018); when considered across the species' national extent, an overall population reduction in the band of 50–70% is inferred over the last three generations and the causes of the severe historical reductions have ceased (that is, current levels of mortality are not likely causing additional population reduction) making the species eligible under Criterion A1.

Information sources: Braccini *et al.* (2017); Bruce *et al.* (2018); Davenport *et al.* (2021); Hillary *et al.* (2018); Lee *et al.* (2018); Reid *et al.* (2011); Rigby *et al.* (2019a); Roff *et al.* (2018); Taylor *et al.* (2018).

Shortfin Mako

CAAB Code 37 010001

Isurus oxyrinchus Rafinesque, 1810

IUCN Red List Category & Criteria

Vulnerable A2bd

Reasons for Listing

Inferred population reduction of >30% over the last 3 generations (72 years) based on trend data & catch levels

Distribution: Cosmopolitan

Habitat: Pelagic

Depth: 0–650 m

Maximum size: 394 cm TL



Assessment Justification: The Shortfin Mako is a common shark with a wide Australian range. Outside of Australian waters, it has a circumglobal tropical and temperate distribution. This viviparous species has limited biological productivity (Amat, 20 years; Amax, 28 years; GL, 24 years; triennial reproductive cycle; litter size, 4–25 pups). It is a highly-mobile species which can be considered one connected global population. It is a bycatch of the Commonwealth-managed Eastern Tuna and Billfish Fishery, and to a lesser extent, in other Commonwealth line fisheries (with high mortality rates). Global trend analysis estimated a population reduction of ~50% over the last three generations (72 years). This analysis included a population reduction of 48% over the last three generations in the Indian Ocean, but also an increasing trend in New Zealand. While there is some uncertainty over the species' Australian population status, this assessment reflects a balance between the Indian Ocean and New Zealand trends, with an inferred population reduction of ~30% over the last three generations (72 years) and the Shortfin Mako is assessed as Vulnerable. International co-operation and conservation instruments will be vital to allow the recovery of the species in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Mod.	Target
Fishing - Indigenous	None	–
Fishing - shark control	Low	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	–	–

Current Management

- Migratory (EPBC Act) (rec. fish. permitted)
- CMS Appendix II
- Commercial fishery mixed-species quota (NSW)
- General commercial fishery controls

Conservation Actions

- Engage internationally to recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Longfin Mako

CAAB Code 37 010002

Isurus paucus Guitart Manday, 1966

IUCN Red List Category & Criteria

Vulnerable A2bd

Reasons for Listing

Inferred population reduction of >30% over the last 3 generations (72 years) based on trend data & catch levels

Distribution: Cosmopolitan

Habitat: Pelagic

Depth: 0–1,752 m

Maximum size: 427 cm TL



Assessment Justification: The Longfin Mako is a rare and poorly-known shark with a wide Australian range. Outside of Australian waters, it has a wide but patchy global tropical and warm-temperate distribution. Little biological data are available on this viviparous species (estimated GL, 24 years; litter size, possibly 2–8 pups). It is a bycatch of the Commonwealth-managed Eastern Tuna and Billfish Fishery and the Southern and Eastern Scalefish and Shark Fishery. Population trend data are not available for Australia, indeed time-series are lacking from all areas except for the Atlantic United States (which shows a severe population reduction). Given a lack of data from the Pacific or Indian Oceans, the population status of the Shortfin Mako is used to infer the status of the Longfin Mako. Global analysis estimated a population reduction of ~50% over the last three generations (72 years) for the Shortfin Mako. This analysis included data from the Indian Ocean indicating a population reduction of 48% over the last three generations, but also data from New Zealand indicating an increasing trend. Balancing these trends resulted in an inferred population reduction of ~30% over the last three generations (72 years) giving an assessment of Vulnerable. International co-operation and conservation instruments will be vital to allow the recovery of the species in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Target
Fishing - Indigenous	None	–
Fishing - shark control	Low	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	High
Life history	Assess age	High
Connectivity	Assess connectivity	Medium

Current Management

- Migratory (EPBC Act) (rec. fish. permitted)
- CMS Appendix II
- Commercial fishery mixed-species quota (NSW)
- General commercial fishery controls

Conservation Actions

- Engage internationally to recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Porbeagle

CAAB Code 37 010004

Lamna nasus (Bonnaterre, 1788)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Cosmopolitan (antitropical)

Habitat: Pelagic; continental shelf

Depth: 0–370 m

Maximum size: 355 cm TL



Assessment Justification: The Porbeagle is a common shark with a wide southern Australian range. Outside of Australian waters, it has a wide antitropical distribution with two widely-separated Southern Hemisphere and North Atlantic subpopulations. This viviparous species has limited biological productivity (Amat, 16.5 years; Amax, 60 years; GL, 38.3 years; annual or biennial reproductive cycle; litter size, 1–5 pups). It is a highly-mobile species with no genetic structure in the Southern Hemisphere subpopulation. It is a bycatch of the Commonwealth-managed Eastern Tuna and Billfish Fishery, and to a lesser extent, in other Commonwealth line fisheries (with generally low catch levels in these fisheries). Catch rate indicators showed generally stable or increasing catches across most of the Southern Hemisphere and trend analysis of modelled relative abundance for 1962–2015 revealed only modest annual rates of reduction (the equivalent of <20% population reduction over the last three generations; 115 years). The Porbeagle is assessed as Least Concern, reflecting the extinction risk status of the Southern Hemisphere subpopulation. The species is globally threatened (due to its North Atlantic status); therefore, the Southern Hemisphere including Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Mod.	Target
Fishing - Indigenous	None	–
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- Migratory (EPBC Act) (rec. fish. permitted)
- CITES Appendix II (export restriction)
- CMS Appendix II
- Commercial fishery mixed-species quota (NSW)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

White-bodied Catshark

CAAB Code 37 015040

Apristurus albisoma Nakaya & Séret, 1999

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Australasia

Habitat: Insular slope; seamounts

Depth: 935–1,564 m

Maximum size: 60 cm TL



Assessment Justification: The White-bodied Catshark is a rarely-encountered and poorly-known shark with a relatively restricted Norfolk Ridge and Lord Howe Rise range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it occurs in New Caledonia. Little biological data are available on this oviparous species or *Apristurus* catsharks in general (biological productivity unknown). This species was possibly a bycatch of the East Coast Deepwater Trawl Sector of the Southern and Eastern Scalefish and Shark Fishery on the Lord Howe Rise, however, this fishery has had low effort since the 1990s with no effort since 2013/14. An exploratory deepwater trawl and line fishery around Norfolk Island between 2000 and 2003 did not develop into a viable fishery, and subsequently there is no deepwater fishing effort in that area. There are also significant trawl exclusion zones in place. Furthermore, the species' deep occurrence has provided it with refuge. There is nothing to infer or suspect population reduction at this time and the White-bodied Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Roughskin Catshark

CAAB Code 37 015017

Apristurus ampliceps Sasahara, Sato & Nakaya, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Australasia

Habitat: Continental slope

Depth: 840–1,500 m

Maximum size: 87 cm TL



Assessment Justification: The Roughskin Catshark is a rarely-encountered and poorly-known shark with a wide but separated southeast and southwest Australian range. Outside of Australian waters, it occurs off New Zealand. Little biological data are available on this oviparous species or *Apristurus* catsharks in general (biological productivity unknown). It may have been a bycatch of the Commonwealth-managed South Tasman Rise Trawl Fishery (STRTF) and the Southern and Eastern Scalefish and Shark Fishery (SESSF). However, the STRTF has been closed since 2007 to protect stocks of the target species, Orange Roughy, and most SESSF waters deeper than 700 m are closed to trawling. In the southwest, it is a possible bycatch of the Western Deepwater Trawl Fishery although this fishery has limited effort with only a small number of active vessels. Overall, the species generally, if not exclusively, occurs at depths beyond current fishing activities. There is nothing to infer or suspect population reduction at this time and the Roughskin Catshark is assessed as Least Concern. If the STRTF reopens, any bycatch of this species should be monitored.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve species complex	High
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Pinocchio Catshark

CAAB Code 37 015020

Apristurus australis Sato, Nakaya & Yorozu, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 485–1,035 m

Maximum size: 62 cm TL



Assessment Justification: The Pinocchio Catshark is a poorly-known endemic shark with a wide but separated eastern and Western Australian range. Little biological data are available on this oviparous species or *Apristurus* catsharks in general (biological productivity unknown). In the southeast, it is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) and was possibly a bycatch of the South Tasman Rise Trawl Fishery, however that fishery closed in 2007. Elsewhere across its range fishing effort is low or absent. It is a possible bycatch of the Western Deepwater Trawl Fishery in the west and the Coral Sea Fishery (CSF) in the northeast; however, these fisheries have limited effort with only a small number of active vessels (and no trawl effort since 2006/07 in the CSF; trawling is no longer permitted in this fishery). Furthermore, the species has considerable refuge in deeper waters given the closure to trawling of most SESSF waters deeper than 700 m. While it is possible that some declines have occurred on the southeast upper slope where there has been a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Pinocchio Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Bighead Catshark

CAAB Code 37 015019

Apristurus bucephalus White, Last & Pogonoski, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 920–1,140 m

Maximum size: 68 cm TL



Assessment Justification: The Bighead Catshark is a rarely-encountered and poorly-known endemic shark with a restricted southwest Australian range (extent of occurrence <math><20,000\text{ km}^2</math>). However, it is only known from two specimens and the distribution is expected to be wider than presently recorded. Little biological data are available on this oviparous species or *Apristurus* catsharks in general (biological productivity unknown). It is a possible bycatch of the Commonwealth-managed Western Deepwater Trawl Fishery; however, that fishery has limited effort with only a small number of active vessels. Furthermore, its deep occurrence would provide it with refuge beyond fished depths. Population trend is unknown, although it is suspected to be stable based on levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Bighead Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Smoothbelly Catshark

CAAB Code 37 015021

Apristurus longicephalus Nakaya, 1975

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in areas of limited fishing effort; deepwater refuge

Distribution: Indo-West Pacific

Habitat: Continental slope

Depth: 500–1,140 m

Maximum size: 59 cm TL



Assessment Justification: The Smoothbelly Catshark is a rarely-encountered and poorly-known shark recorded from two widely-separated locations off northwest and northeast Australia. It is known from only a few specimens and the distribution is expected to be wider than presently recorded. Outside of Australian waters, it has a wide but patchy tropical and warm-temperate Indo-West Pacific distribution. Little biological data are available on this oviparous species or *Apristurus* catsharks in general (biological productivity unknown). In the northwest, it is a possible bycatch of the Commonwealth-managed deeper water trawl fisheries (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery), and in the northeast, the Coral Sea Fishery (CSF). However, these fisheries all have limited effort with only a small number of active vessels (and no trawl effort since 2006/07 in the CSF; trawling is no longer permitted in this fishery). Furthermore, its deep occurrence would provide it with refuge beyond fished depths, and there is now significant protection provided by the Coral Sea Marine Park. There is nothing to infer or suspect population reduction at this time and the Smoothbelly Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Fleshynose Catshark

CAAB Code 37 015016

Apristurus melanoasper Iglésias, Nakaya & Stehmann, 2004

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Australasia & North Atlantic

Habitat: Continental slope

Depth: 512–1,520 m

Maximum size: 79 cm TL



Assessment Justification: The Fleshynose Catshark is a poorly-known shark with a wide southern Australian range. Outside of Australian waters, it occurs around New Zealand, New Caledonia, and the North Atlantic (however, the Southern and Northern Hemisphere forms may represent separate species). Little biological data are available on this oviparous species or *Apristurus* catsharks in general (biological productivity unknown). In the southeast, it was a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) and was possibly a bycatch of the South Tasman Rise Trawl Fishery, however that fishery closed in 2007. The species has considerable refuge in deeper waters given the closure to trawling of most SESSF waters deeper than 700 m (particularly as it occurs locally at depths >900 m). Overall, this species generally, if not exclusively, occurs at depths beyond current fishing activities. There is nothing to infer or suspect population reduction at this time and the Fleshynose Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve species complex	High
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Bulldog Catshark

CAAB Code 37 015018

Apristurus pinguis Deng, Xiong & Zhan, 1983

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Indo-West Pacific

Habitat: Continental slope

Depth: 996–2,057 m

Maximum size: 65 cm TL



Assessment Justification: The Bulldog Catshark is a rarely-encountered and poorly-known shark with a wide southeast Australian range. Outside of Australian waters, it has a wide but patchy warm-temperate Eastern Indian-Western Pacific distribution. Little biological data are available on this oviparous species or *Apristurus* catsharks in general (biological productivity unknown). It was possibly a bycatch of the Commonwealth-managed South Tasman Rise Trawl Fishery, however that fishery closed in 2007. The species has considerable refuge in deeper waters given the closure to trawling of most Southern and Eastern Scalefish and Shark Fishery waters deeper than 700 m. The Bulldog Catshark generally, if not exclusively, occurs at depths beyond current fishing activities. Population trend is unknown, although it is suspected to be stable based on a lack of threats within its range. There is nothing to infer or suspect population reduction at this time and the Bulldog Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Bigfin Catshark

CAAB Code 37 015015

Apristurus platyrhynchus (Tanaka, 1909)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Indo-West Pacific

Habitat: Continental slope

Depth: 400–1,080 m

Maximum size: 71 cm TL



Assessment Justification: The Bigfin Catshark is a rarely-encountered and poorly-known shark which occurs in widely-separated areas off eastern and Western Australia and on the Norfolk Ridge. Outside of Australian waters, it has a patchy tropical and warm-temperate Western Pacific distribution (however, Australian forms may represent separate species). Little biological data are available on this oviparous species or *Apristurus* catsharks in general (biological productivity unknown). In the west, it is a possible bycatch of the Commonwealth-managed Western Deepwater Trawl Fishery and in the northeast, the Coral Sea Fishery (CSF). However, these fisheries have limited effort with only a small number of active vessels (and no trawl effort since 2006/07 in the CSF; trawling is no longer permitted in this fishery). Furthermore, its deep occurrence would provide it with refuge beyond fished depths, and there is now significant protection provided by the Coral Sea Marine Park. There is nothing to infer or suspect population reduction at this time and the Bigfin Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Freckled Catshark

CAAB Code 37 015014

Apristurus sinensis Chu & Hu, 1981

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Indo-West Pacific

Habitat: Continental slope

Depth: 537–1,290 m

Maximum size: 75 cm TL



Assessment Justification: The Freckled Catshark is a rarely-encountered and poorly-known shark which occurs in widely-separated areas off southeast and Western Australia and off Ashmore Reef. Outside of Australian waters, it occurs in the South China Sea (however, it possibly represents a species complex). Little biological data are available on this oviparous species or *Apristurus* catsharks in general (biological productivity unknown). It may have been a bycatch of the Commonwealth-managed South Tasman Rise Trawl Fishery (STRTF) and the Southern and Eastern Scalefish and Shark Fishery (SESSF). However, the STRTF has been closed since 2007 to protect stocks of the target species, Orange Roughy, and most SESSF waters deeper than 700 m are closed to trawling. In the west, it is a possible bycatch of the Western Deepwater Trawl Fishery although this fishery has limited effort with only a small number of active vessels. Overall, this species generally, if not exclusively, occurs at depths beyond current fishing activities (as locally it has been recorded at depths of 940–1,290 m). There is nothing to infer or suspect population reduction at this time and the Freckled Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve species complex	High
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Grey Spotted Catshark

CAAB Code 37 015027

Asymbolus analis (Ogilby, 1885)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence > 20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 25–200 m

Maximum size: 61 cm TL



Assessment Justification: The Grey Spotted Catshark is a common endemic shark with a relatively wide eastern Australian range. Little biological data are available on this oviparous species or *Asymbolus* catsharks in general (this species appears to be reproductively active year-round, indicating that it may have relatively high biological productivity). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) where it is discarded (discard mortality is suspected to be high). Monitoring in the SESSF between 2000 and 2006 showed variable catch rates but no overall trend (while this was reported as Grey Spotted Catshark, given the geographical range of monitoring, it likely consisted of multiple *Asymbolus* species). It is a bycatch of state-managed trawl fisheries, including the Queensland East Coast Trawl Fishery. It has some refuge in shallow shelf waters outside of major fisheries. Overall population trend is unknown, although it is suspected to be stable based on short-term SESSF trends, productivity, and areas of refuge. While it is possible that some declines have occurred in areas with a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Grey Spotted Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Blotched Catshark

CAAB Code 37 015023

Asymbolus funebris Compagno, Stevens & Last, 1999

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 145 m

Maximum size: 44 cm TL



Assessment Justification: The Blotched Catshark is a rarely-encountered and poorly-known endemic shark recorded from a single specimen collected off southwest Australia (extent of occurrence unknown). Little biological data are available on this oviparous species or *Asymbolus* catsharks in general (other species of the genus appear to be reproductively active year-round, indicating they may have relatively high biological productivity). An evaluation of the potential effects of threatening processes is difficult given that it is only known from a single specimen. Given its small size, it is unlikely to be caught by gillnet and line, although catsharks are susceptible to capture by trawl. Since the species' geographic and depth range are not fully defined, and it is unknown if these fishing activities are causing a population reduction, there is currently inadequate information available to assess the Blotched Catshark beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Monitor population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Western Spotted Catshark

CAAB Code 37 015026

Asymbolus occiduus Last, Gomon & Gledhill, 1999

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 98–400 m

Maximum size: 60 cm TL



Assessment Justification: The Western Spotted Catshark is a common but poorly-known endemic shark with a wide southwest Australian range. Little biological data are available on this oviparous species or *Asymbolus* catsharks in general (other species of the genus appear to be reproductively active year-round, indicating they may have relatively high biological productivity). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery in the Great Australian Bight. However, fishing effort is largely concentrated at the eastern edge of the species' range, and the western Great Australian Bight receives much lower levels of fishing effort. Off the west coast it is a possible bycatch of the Western Deepwater Trawl Fishery although this fishery has limited effort, only a small number of active vessels, and recent fishing effort has occurred much further north than the range of the species. Given its small size, it is unlikely to be caught by gillnet and line. Population trend is unknown, although it is suspected to be stable based on levels of fishing effort across its range. It is not suspected to be close to reaching the population reduction threshold and the Western Spotted Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Pale Spotted Catshark

CAAB Code 37 015025

Asymbolus pallidus Last, Gomon & Gledhill, 1999

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental slope

Depth: 225–400 m

Maximum size: 47 cm TL



Assessment Justification: The Pale Spotted Catshark is a common but poorly-known endemic shark with a relatively restricted northeast Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species or *Asymbolus* catsharks in general (other species of the genus appear to be reproductively active year-round, indicating they may have relatively high biological productivity). While the area of the Commonwealth-managed Coral Sea Fishery overlaps with the species' range, this is a relatively small-scale fishery with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery). Additionally, significant protection is now provided by the Coral Sea Marine Park. It is a bycatch of the Queensland-managed eastern king prawn deepwater sector of the East Coast Trawl Fishery, where it is discarded (with high on-deck mortality). There is relatively low fishing effort within the species' range and the fishery does not regularly operate beyond 300 m depth; as such, much of the species' depth range is beyond that of the fishery. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Pale Spotted Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Dwarf Catshark

CAAB Code 37 015022

Asymbolus parvus Compagno, Stevens & Last, 1999

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 160–360 m

Maximum size: 40 cm TL



Assessment Justification: The Dwarf Catshark is a poorly-known endemic shark with a relatively restricted northwest Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species or *Asymbolus* catsharks in general (other species of the genus appear to be reproductively active year-round, indicating they may have relatively high biological productivity). It is a possible bycatch of the Commonwealth-managed North West Slope Trawl Fishery (which has limited effort with only a small number of active vessels) but occurs too deep for the Western Australian Pilbara Fish Trawl Fishery (which operates primarily at depths of 50–110 m). Considerable areas of Western Australia's North Coast Bioregion are closed to trawling through spatial management arrangements, which may provide a refuge (although only at the upper part of the species' depth range). Population trend is unknown, although it is suspected to be stable based on levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Dwarf Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Orange Spotted Catshark

CAAB Code 37 015024

Asymbolus rubiginosus Last, Gomon & Gledhill, 1999

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 25–540 m

Maximum size: 55 cm TL



Assessment Justification: The Orange Spotted Catshark is a common endemic shark with a wide eastern Australian range. Little biological data are available on this oviparous species or *Asymbolus* catsharks in general (this species appears to be reproductively active year-round, indicating that it may have relatively high biological productivity). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) where it is discarded (discard mortality is suspected to be high). Monitoring in the SESSF between 2000 and 2006 showed variable catch rates but no overall trend for the Grey Spotted Catshark (however, given the geographical range of monitoring, this likely consisted of multiple *Asymbolus* species, including the Orange Spotted Catshark). It is a bycatch of state-managed trawl fisheries, including the Queensland East Coast Trawl Fishery. It has some refuge in unfished or lightly fished areas (e.g., northern New South Wales slope). Overall population trend is unknown, although it is suspected to be stable based on short-term SESSF trends, productivity, and areas of refuge. While it is possible that some declines have occurred in areas with a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Orange Spotted Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Variegated Catshark

CAAB Code 37 015010

Asymbolus submaculatus Compagno, Stevens & Last, 1999

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 30–200 m

Maximum size: 44 cm TL



Assessment Justification: The Variegated Catshark is a rarely-encountered and poorly-known endemic shark with a wide southwest Australian range. Little biological data are available on this oviparous species or *Asymbolus* catsharks in general (other species of the genus appear to be reproductively active year-round, indicating they may have relatively high biological productivity). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery in the Great Australian Bight. However, fishing effort is largely concentrated to the east of the species' range, and the western Great Australian Bight receives much lower levels of fishing effort. Given its small size, it is unlikely to be caught by gillnet and line within its range. This nocturnal species inhabits caves and ledges and this cryptic habitat would provide it with refuge from fishing activities. Population trend is unknown, although it is suspected to be stable based on levels of fishing effort across its range and its habitat preference. It is not suspected to be close to reaching the population reduction threshold and the Variegated Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Gulf Catshark

CAAB Code 37 015003

Asymbolus vincenti (Zietz, 1908)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 27–220 m

Maximum size: 61 cm TL



Assessment Justification: The Gulf Catshark is a common but poorly-known endemic shark with a wide southern Australian range. Little biological data are available on this oviparous species or *Asymbolus* catsharks in general (other species of the genus appear to be reproductively active year-round, indicating they may have relatively high biological productivity). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) where it is discarded (discard mortality is suspected to be high). Monitoring in the SESSF between 2000 and 2006 showed variable catch rates but no overall trend for the Grey Spotted Catshark (however, given the geographical range of monitoring, this likely consisted of multiple *Asymbolus* species, including the Gulf Catshark). There are significant areas of its range (e.g., western Great Australian Bight; shallow inshore waters) with limited or no fishing effort, which would provide the species with refuge. Overall population trend is unknown, although it is suspected to be stable based on short-term SESSF trends, productivity, and areas of refuge. While it is possible that some declines have occurred in areas with a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Gulf Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Dusky Catshark

CAAB Code 37 015035

Bythaelurus incanus Last & Stevens, 2008

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australian endemic

Habitat: Continental slope

Depth: 900–1,000 m

Maximum size: 45 cm TL



Assessment Justification: The Dusky Catshark is a rarely-encountered and poorly-known endemic shark recorded from a single specimen collected off northwest Australia (extent of occurrence unknown). Its range is expected to be wider than presently documented given a lack of survey effort in its deep habitat. Little biological data are available on this species, but other members of the genus are viviparous with litter sizes of two pups. An evaluation of the potential effects of threatening processes is difficult given that it is only known from a single specimen. Given its probable small size and deep occurrence, it is unlikely to be caught in most fishing activities, however interactions are currently unknown. Since the species' geographic and depth range are not fully defined, and it is unknown if fishing activities are causing a population reduction, there is currently inadequate information available to assess the Dusky Catshark beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Maintain deepwater refuge
- Identify & protect critical habitat

Sawtail Shark

CAAB Code 37 015009

Figaro boardmani (Whitley, 1928)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 130–640 m

Maximum size: 61 cm TL



Assessment Justification: The Sawtail Shark is a common endemic shark with a wide southern Australian range. Little biological data are available on this oviparous species, but it is suspected to have relatively high biological productivity. It is bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) where it is discarded. Monitoring in the SESSF between 1998 and 2006 showed a decline of ~55% in catch-per-unit-effort in the southeast. This is an area of high historical fishing effort, but declines seen there are not considered representative of the entire range of the species. For example, monitoring elsewhere in the SESSF (the southern region) showed no trend over the same time-period. It is a bycatch of state-managed trawl fisheries, including the Queensland East Coast Trawl Fishery. There are significant areas of its range (e.g., western Great Australian Bight; western continental slope) with limited or no fishing effort, which would provide the species with refuge. While some declines have occurred in areas with a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Sawtail Shark is assessed as Least Concern

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve species complex	High
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess age	Medium
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Northern Sawtail Shark

CAAB Code 37 015034

Figaro striatus Gledhill, Last & White, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental slope

Depth: 300–420 m

Maximum size: 42 cm TL



Assessment Justification: The Northern Sawtail Shark is a poorly-known endemic shark with a relatively restricted northeast Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this species, but it is suspected to have relatively high biological productivity given its small size. While the area of the Commonwealth-managed Coral Sea Fishery overlaps with the species' range, this is a relatively small-scale fishery with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery). Additionally, significant protection is now provided by the Coral Sea Marine Park. It is a possible bycatch of the Queensland-managed eastern king prawn deepwater sector of the East Coast Trawl Fishery, where it would be discarded. There is relatively low fishing effort within the species' range and the fishery does not regularly operate beyond 300 m depth; as such, the species' depth range is beyond that of the fishery. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Northern Sawtail Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Slender Sawtail Shark

CAAB Code 37 015008

Galeus gracilis Compagno & Stevens, 1993

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australian endemic

Habitat: Continental slope

Depth: 290–470 m

Maximum size: 34 cm TL



Assessment Justification: The Slender Sawtail Shark is a rare and poorly-known endemic shark with a wide but patchy northern and Western Australian range. It is known from isolated records which may represent different subpopulations or may be part of a continuous range. Little biological data are available on this species, but it is suspected to have relatively high biological productivity given its small size. In the northern part of its range, it generally occurs deeper than current fishing activities. In the west, it is a possible bycatch of Commonwealth-managed deeper water trawl fisheries off Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery). These fisheries have limited effort with only a small number of active vessels. If currently-known isolated records do represent distinct subpopulations, these may be susceptible to localised depletion in the presence of fishing, particularly given the species' apparent rarity. Since the species' geographic range is not fully defined, and it is unknown if fishing activities are causing localised population reductions, there is currently inadequate information available to assess the Slender Sawtail Shark beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Speckled Catshark

CAAB Code 37 015004

Halaelurus sellus White, Last & Stevens, 2007

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 60–165 m

Maximum size: 42 cm TL



Assessment Justification: The Speckled Catshark is a common but poorly-known endemic shark with a wide northwest Australian range. Little biological data are available on this oviparous species (it exhibits multiple oviparity with 6 egg cases carried at one time). It is a probable bycatch of the Commonwealth-managed Northern Prawn Fishery, although trawling primarily occurs shallower than the depth range of the species, and of the Western Australian Pilbara Fish Trawl Fishery, which operates primarily at depths of 50–110 m; therefore, deeper parts of its depth range are generally lightly fished or unfished. Furthermore, considerable areas of Western Australia’s North Coast Bioregion and the Northern Territory are closed to trawling through spatial management arrangements, providing a refuge. It may also be a bycatch of the Northern Territory Demersal Fishery, but overall much of its range receives limited to no fishing effort. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Speckled Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Short-tail Catshark

CAAB Code 37 015036

Parmaturus bigus Séret & Last, 2007

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australian endemic

Habitat: Continental slope

Depth: 590–606 m

Maximum size: 71 cm TL



Assessment Justification: The Short-tail Catshark is a rarely-encountered and poorly-known endemic shark recorded from a single specimen collected off northeast Australia (extent of occurrence unknown). Little biological data are available on this oviparous species. An evaluation of the potential effects of threatening processes is difficult since it is known from only a single specimen. Given its deep occurrence, it is unlikely to be caught in most fishing activities, however interactions are currently unknown. Its range overlaps with the Commonwealth-managed Coral Sea Fishery although this fishery has few active vessels, with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery). It may also receive refuge in the Coral Sea Marine Park. However, since the species' geographic and depth range are not fully defined, and it is unknown if fishing activities are causing a population reduction (although this is unlikely), there is currently inadequate information available to assess the Short-tail Catshark beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve nomenclature	High
Distribution	Clarify range	High
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Maintain deepwater refuge
- Identify & protect critical habitat

Banded Catshark

CAAB Code 37 015005

Atelomycterus fasciatus Compagno & Stevens, 1993

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 25–125 m

Maximum size: 45 cm TL



Assessment Justification: The Banded Catshark is a common but poorly-known endemic shark with a relatively restricted northwest Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species or *Atelomycterus* catsharks in general. It is a bycatch of the Western Australian Pilbara Fish Trawl Fishery where it is discarded. This fishery operates primarily at depths of 50–110 m, whereas the Banded Catshark most regularly occurs in depths of <60 m. It may also be a bycatch of other local fisheries, but overall effort in these is localised. Considerable areas of Western Australia's North Coast Bioregion are closed to trawling through spatial management arrangements, which provides a refuge. Population trend is unknown, although it is suspected to be stable based on levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Banded Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Marbled Catshark

CAAB Code 37 015028

Atelomycterus macleayi Whitley, 1939

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–60 m

Maximum size: 60 cm TL



Assessment Justification: The Marbled Catshark is a common but poorly-known endemic shark with a relatively restricted northwest Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species or *Atelomycterus* catsharks in general. It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF). While Turtle Exclusion Devices are mandatory in the fishery, they are not effective at excluding catsharks due to their small size. Estimates of fishing mortality of *Atelomycterus* catsharks in the NPF are well below those that would lead to significant population declines. It is also a possible bycatch of Western Australian and Northern Territory trawl fisheries. Considerable areas of Western Australia's North Coast Bioregion and the Northern Territory are closed to trawling through spatial management arrangements, which provides a refuge. Furthermore, the species is often found in very shallow waters which is also a refuge from trawling. Population trend is unknown, although it is suspected to be stable based on low fishing mortality estimates and refugia. There is nothing to infer or suspect population reduction at this time and the Marbled Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Eastern Banded Catshark

CAAB Code 37 015037

Atelomycterus marnkalha Jacobsen & Bennett, 2007

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Continental shelf

Depth: 10–75 m

Maximum size: 49 cm TL



Assessment Justification: The Eastern Banded Catshark is a rare and poorly-known shark with a wide northern and eastern Australian range. Outside of Australian waters, it occurs in southern New Guinea. Little biological data are available on this oviparous species or *Atelomycterus* catsharks in general. It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF) and the Queensland East Coast Trawl Fishery. While Turtle Exclusion Devices are mandatory in these fisheries, they are not effective at excluding catsharks due to their small size. Estimates of fishing mortality of *Atelomycterus* catsharks in the NPF are well below those that would lead to significant population declines. It has refuge in areas with little fishing effort, particularly in the Great Barrier Reef Marine Park. Population trend is unknown, although it is suspected to be stable based low fishing mortality estimates and refugia. There is nothing to infer or suspect population reduction at this time and the Eastern Banded Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Blackspotted Catshark

CAAB Code 37 015029

Aulohalaelurus labiosus (Waite, 1905)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf; reefs

Depth: 0–20 m

Maximum size: 67 cm TL



Assessment Justification: The Blackspotted Catshark is a common but poorly-known endemic shark with a relatively restricted southwest Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this presumably oviparous species. It is a shallow water specialist with a limited depth range. Its occurrence on shallow reef habitats, combined with its nocturnal habits provide it with refuge from most fishing activities. It does enter the marine aquarium trade, but this trade is expected to be localised, small-scale, and not having a detrimental effect on the population (although it should be monitored). Population trend is unknown, although it is suspected to be stable based on levels of fishing effort across its range and its habitat preference. It is not suspected to be close to reaching the population reduction threshold and the Blackspotted Catshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Whitefin Swellshark

CAAB Code 37 015013

Cephaloscyllium albiginum Last, Motomura & White, 2008

IUCN Red List Category & Criteria

Critically Endangered A2bd*

*See Supporting Information on following page

Reasons for Listing

Inferred population reduction of >80% over the last 3 generations (45 years) based on trend data & catch levels

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 125–555 m

Maximum size: 110 cm TL



Assessment Justification: The Whitefin Swellshark was a historically common endemic shark with a wide southeast Australian range. Little biological data are available on this oviparous species (estimated GL, 15 years; other species of the genus are reproductively active year-round, indicating they may have relatively high biological productivity). This was one of the most abundant sharks of southern Australia. It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where most of the catch has historically been discarded. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented a decline of ~32% for 'Whitefin Swell Shark' (which included both the Saddled and Whitefin Swellsharks, and the population trend can be considered representative of both species), the equivalent of a 58% population reduction over three generations (45 years). More recently, standardised catch-per-unit-effort in the SESSF between 1994 and 2006 showed a decline of 73%, the equivalent of a ~99% population reduction over three generations. Fishing pressure is ongoing, and the species does not have significant refuge outside of fished areas. It is inferred that the population has undergone a reduction of >80% over the last three generations (45 years) and the Whitefin Swellshark is assessed as Critically Endangered.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Protect species
- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for Whitefin Swellshark

IUCN Red List Category & Criteria: Critically Endangered A2bd

EPBC Act Status: Not listed

Recommendation: Consider listing

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Inferred population reduction of >80% over the last 3 generations (45 years) based on trend data & catch levels
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is likely > 10,000 mature individuals
D	Not applicable: although < 5 locations, population size is likely > 1,000 mature individuals; AOO > 20 km ²
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	1,336,900 km ² unknown	high low
Area of occupancy trend	>2,000 km ² unknown	low low
No. of mature individuals trend	likely > 10,000 decreasing	low high
No. subpopulations	unknown	low
No. locations	2	medium
Generation length*	15 years	low
Global population share	100%	high

*Generation length inferred from the Blacktip Sawtail Shark *Galeus sauteri* (Liu *et al.* 2011).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: declines the equivalent of 58% population reduction over three generations off eastern Australia and ~99% over three generations across southeast Australia (Graham *et al.* 2001, Pardo *et al.* 2019, Walker & Gason 2007); combined, this represents the bulk of the species' range and there is no deepwater refuge (Patterson *et al.* 2019); therefore, when considered across the species' national extent, an overall population reduction of >80% is inferred over the last three generations and the causes of this reduction have not ceased; there is a need to obtain more recent data on catch rates for comparison with previous work.

Information sources: Graham *et al.* (2001); Liu *et al.* (2011); Pardo *et al.* (2019); Patterson *et al.* (2019); Walker & Gason (2007).

Cook's Swellshark

CAAB Code 37 015038

Cephaloscyllium cooki Last, Séret & White, 2008

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australia & Indonesia

Habitat: Continental slope

Depth: 225–300 m

Maximum size: 30 cm TL



Assessment Justification: Cook's Swellshark is a rarely-encountered and poorly-known shark with a relatively restricted northern Australian range (although with an extent of occurrence >20,000 km²). Outside of Australia, it occurs off Tanimbar Island, Indonesia. Little biological data are available on this oviparous species (other species of the genus are reproductively active year-round, indicating they may have relatively high biological productivity). Its depth range may preclude it from interacting with many fishing activities in the north, in particular the Northern Prawn Fishery which operates in shallower waters, as well as the Northern Territory Demersal Fishery and Timor Reef Fishery. Furthermore, considerable areas of the Northern Territory are closed to trawling through spatial management arrangements, which may provide a refuge. Given the small range of the species, bycatch levels, if any, need to be assessed. Since it is unknown if fishing activities are causing a population reduction, there is currently inadequate information available to assess Cook's Swellshark beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Reticulate Swellshark

CAAB Code 37 015007

Cephaloscyllium hiscosellum White & Ebert, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental slope

Depth: 290–420 m

Maximum size: 52 cm TL



Assessment Justification: The Reticulate Swellshark is a poorly-known endemic shark with a wide Western Australian range. Little biological data are available on this oviparous species (other species of the genus are reproductively active year-round, indicating they may have relatively high biological productivity). It is a possible bycatch of the Commonwealth-managed deeper water trawl fisheries off Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery) but these have limited effort with only a small number of active vessels. It occurs too deep for the Western Australian Pilbara Fish Trawl Fishery (which operates primarily at depths of 50–110 m). Overall, much of the species' range is unfished or only lightly fished. Population trend is unknown, although it is suspected to be stable based on levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Reticulate Swellshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Draughtboard Shark

CAAB Code 37 015001

Cephaloscyllium laticeps (Duméril, 1853)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–60 m

Maximum size: 150 cm TL



Assessment Justification: The Draughtboard Shark is a common endemic shark with a wide southern Australian range. This oviparous species is reproductively active year-round, indicating that it may have relatively high biological productivity (in captivity, females lay a pair of eggs each month). This is one of the most abundant demersal shark species of southern Australia. It is a byproduct or bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where about half of the catch has historically been retained while the rest is discarded (post-release mortality can be low due to the resilient nature of the species). Standardised catch-per-unit-effort in the SESSF trawl sector was variable but showed no trend between 1996 and 2006 and there have been no declines in catch rates in fishery-independent surveys of the shark gillnet fishery since the 1970s. The Draughtboard Shark is also a bycatch or byproduct of some state-managed fisheries. The overall population trend is suspected to be stable based on trends in the SESSF and high post-release survivorship. There is nothing to infer or suspect population reduction at this time and the Draughtboard Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Byproduct
Fishing - recreational	High	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess age	Medium
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Flagtail Swellshark

CAAB Code 37 015039

Cephaloscyllium signourum Last, Séret & White, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort; deepwater refuge

Distribution: Australasia

Habitat: Continental slope

Depth: 480–700 m

Maximum size: 74 cm TL



Assessment Justification: The Flagtail Swellshark is a rarely-encountered and poorly-known shark with a relatively restricted northeast Australian range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it occurs off New Caledonia and Vanuatu. Little biological data are available on this oviparous species (other species of the genus are reproductively active year-round, indicating they may have relatively high biological productivity). Its range overlaps with the Commonwealth-managed Coral Sea Fishery although this fishery has few active vessels, with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery). There are no deepwater fishing activities in the Torres Strait where it occurs. It may also receive refuge in the Coral Sea Marine Park. Population trend is unknown, although it is suspected to be stable based on levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Flagtail Swellshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Speckled Swellshark

CAAB Code 37 015033

Cephaloscyllium speccum Last, Séret & White, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 150–455 m

Maximum size: 69 cm TL



Assessment Justification: The Speckled Swellshark is a rare and poorly-known endemic shark with a relatively restricted northwest Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species (other species of the genus are reproductively active year-round, indicating they may have relatively high biological productivity). It is a possible bycatch of the Commonwealth-managed North West Slope Trawl Fishery (which has limited effort with only a small number of active vessels) but occurs too deep for the Western Australian Pilbara Fish Trawl Fishery (which operates primarily at depths of 50–110 m). Considerable areas of Western Australia's North Coast Bioregion are closed to trawling through spatial management arrangements, which may provide a refuge (although only at the upper part of the species' depth range). Population trend is unknown, although it is suspected to be stable based on levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Speckled Swellshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Saddled Swellshark

CAAB Code 37 015031

Cephaloscyllium variegatum Last & White, 2008

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (45 years) based on trend data & catch levels

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 115–605 m

Maximum size: 74 cm TL



Assessment Justification: The Saddled Swellshark is a poorly-known endemic shark with a wide eastern Australian range. Little biological data are available on this oviparous species (estimated GL, 15 years; other species of the genus are reproductively active year-round, indicating they may have relatively high biological productivity). Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented a decline of ~32% for 'Whitefin Swell Shark' (which included both the Saddled and Whitefin Swellsharks, and the population trend can be considered representative of both species), the equivalent of a 58% population reduction over three generations (45 years). The heavily fished region is estimated to be ~20% of the species' range, and fishing pressure remains high there. Outside of this area, it is a possible bycatch of state-managed fisheries, but fishing pressure over much of the remainder of the species' range is low or absent, particularly off northeast Queensland. The population reduction recorded in the southeast is therefore not considered representative of the whole range of the species. Overall, it is inferred that the population has undergone a reduction approaching 30% over the last three generations (45 years) and the Saddled Swellshark is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Monitor population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Narrowbar Swellshark

CAAB Code 37 015032

Cephaloscyllium zebrum Last & White, 2008

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australian endemic

Habitat: Continental slope

Depth: 440 m

Maximum size: 45 cm TL



Assessment Justification: The Narrowbar Swellshark is a rarely-encountered and poorly-known endemic shark with a restricted northeast Australian range (extent of occurrence <20,000 km²). Little biological data are available on this oviparous species (other species of the genus are reproductively active year-round, indicating they may have relatively high biological productivity). It is known only from two specimens, making an evaluation of the potential effects of threatening processes difficult. Its range overlaps with the Commonwealth-managed Coral Sea Fishery although this fishery has few active vessels, with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery). It may also receive refuge in the Coral Sea Marine Park. However, since the species' geographic and depth range are not fully defined, and it is unknown if fishing activities are causing a population reduction (although this is unlikely), there is currently inadequate information available to assess the Narrowbar Swellshark beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

False Catshark

CAAB Code 37 016001

Pseudotriakis microdon Capello, 1868

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Cosmopolitan (but patchy)

Habitat: Continental slope

Depth: 100–1,890 m

Maximum size: 296 cm TL



Assessment Justification: The False Catshark is a rarely-encountered shark known from single records off southwest and northeast Australia. Outside of Australian waters, it has a wide but patchy global tropical and temperate distribution. Its local and global range is not fully defined as evidenced by recent records in previously-unrecorded locations. This viviparous shark is suspected to have very limited biological productivity due to its oophagous reproductive mode, very large size-at-birth, late size-at-maturity, and large maximum size (possible biennial or even triennial reproductive cycle; litter size, 2 pups). There is very limited information available on interactions with fisheries. The Coral Sea specimen was taken by exploratory deepwater dropline fishing targeting deepwater reef fishes; this species is a potential bycatch of any deeper water fishing activities around Australia, particularly by line but also trawl. Given the species' apparent sporadic occurrence, apparent low abundance, and its life history parameters, it has a heightened susceptibility to localised population depletion. Further information is required on local catches. However, since it is unknown if fishing is causing a population reduction, there is currently inadequate information available to assess the False Catshark beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve nomenclature	Low
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Mitigate catch
- Reduce post-release mortality
- Maintain deepwater refuge
- Identify & protect critical habitat

Whiskery Shark

CAAB Code 37 017003

Furgaleus macki (Whitley, 1943)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; effective management

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–220 m

Maximum size: 160 cm TL



Assessment Justification: The Whiskery Shark is a common endemic shark with a wide southern and Western Australian range. This viviparous species has relatively limited biological productivity (Amat, 6.5 years; Amax, 15 years; GL, 11 years; biennial reproductive cycle; litter size, 4–29 pups). Its centre of abundance is the southwest of Western Australia where it has been commercially targeted in commercial shark fisheries since the 1940s, with fishing effort and catches intensifying in the 1960s, and heavy levels of exploitation in the 1970s and early 1980s. It was estimated that the population had been reduced to 30–45% of virgin biomass by the mid-late 1990s; in 2009/2010, it was estimated to be at 52% of virgin biomass. Management changes and lower levels of fishing effort and catches have helped the population stabilize and slowly increase over the last three generations (33 years). The species is now well managed and monitored. The species does not meet the population reduction thresholds under criterion A1 (the appropriate criterion as the causes of the reduction are clearly reversible, understood, and have ceased; i.e., the fishery is sustainably managed) over the last three generations (33 years) and the Whiskery Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Target
Fishing - recreational	Mod.	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	–	–

Current Management

- Commercial fishery input controls (WA)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

School Shark

CAAB Code 37 017008

Galeorhinus galeus (Linnaeus, 1758)

IUCN Red List Category & Criteria

Endangered A2bd

Reasons for Listing

Inferred population reduction of >50% over the last 3 generations (79 years) based on trend data & catch levels

Distribution: Primarily Pacific & Atlantic

Habitat: Continental shelf & slope

Depth: 2–600 m

Maximum size: 195 cm TL



Assessment Justification: The School Shark was a historically common shark with a wide southern Australian range. Outside of Australian waters, it has a wide but patchy temperate Pacific and Atlantic distribution. This viviparous species has limited biological productivity (Amat, 10–15 years; Amax, 40 years; GL, 26.3 years; triennial reproductive cycle; litter size, 15–43 pups). It was historically an important commercial species which has been targeted since the 1920s but is now a byproduct of targeting Gummy Shark in Commonwealth and state-managed fisheries across its range. A stock assessment in 2009 indicated that biomass was at 12% of unexploited levels. There are considerable management arrangements in place, and while there are some signs of recovery, biomass is still likely to be <20% of virgin levels. The species does not meet the conditions of criterion A1 since there is ongoing fishing mortality, i.e., the causes of the reduction have not ceased. Some of the historical population reduction occurred outside of the last three generations (pre-1943) and so it is inferred that the population has undergone a reduction of >50% over the last three generations (79 years) and the School Shark is assessed as Endangered.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	High	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	High

Current Management

- Conservation Dependent (EPBC Act)
- Rebuilding Strategy
- CMS Appendix II (EPBC listing exemption)
- Commercial fishery incidental catch limit (AUS)
- Commercial fishery daily catch limit (SA, VIC)
- General commercial fishery controls

Conservation Actions

- Recover population
- Manage catch at sustainable levels
- Reduce post-release mortality
- Identify & protect critical habitat

Darksnout Houndshark

CAAB Code 37 017010

Hemitriakis abdita Compagno & Stevens, 1993

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australian endemic

Habitat: Continental slope

Depth: 225–400 m

Maximum size: 80 cm TL



Assessment Justification: The Darksnout Houndshark is a rarely-encountered and poorly-known endemic shark with a restricted northeast Australian range (extent of occurrence <math><20,000\text{ km}^2</math>). Little biological data are available on this viviparous species (houndsharks have variable biological productivity). It is known only from a limited number of specimens, making an evaluation of the potential effects of threatening processes difficult. Its range overlaps with the Commonwealth-managed Coral Sea Fishery although this fishery has few active vessels, with no trawl effort since the 2006/07 fishing season (although trawling is no longer permitted, this species would also be susceptible to line gear used in the fishery). There are a range of Queensland-managed fisheries that potentially interact with this species. This includes the Deepwater Fin Fish Fishery, a line fishery which lands 'gummy sharks' as a component of the shark catch. In recent times, this fishery has had limited effort, with most activity off southern Queensland. The species may receive refuge in the Coral Sea Marine Park. However, since the species' geographic and depth range are not fully defined, and it is unknown if fishing activities are causing a population reduction, there is currently inadequate information available to assess the Darksnout Houndshark beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Sicklefin Houndshark

CAAB Code 37 017009

Hemitriakis falcata Compagno & Stevens, 1993

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 110–200 m

Maximum size: 80 cm TL



Assessment Justification: The Sicklefin Houndshark is a rare and poorly-known endemic shark with a relatively restricted northwest Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this viviparous species (houndsharks have variable biological productivity). It is a possible bycatch of trawl fisheries, however it occurs at depths too shallow for the Commonwealth-managed deeper water trawl fisheries. These fisheries (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery) have limited effort with only a small number of active vessels. Its range overlaps with the Western Australian-managed Pilbara Fish Trawl Fishery, however, that fishery operates primarily at depths of 50–110 m which is shallower than the depth range of the species. Furthermore, considerable areas of Western Australia's North Coast Bioregion are closed to trawling through spatial management arrangements, providing a refuge. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Sicklefin Houndshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Pencil Shark

CAAB Code 37 017006

Hypogaleus hyugaensis (Miyosi, 1939)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental shelf & slope

Depth: 40–480 m

Maximum size: 150 cm TL



Assessment Justification: The Pencil Shark is an uncommon shark with a wide Australian range. Outside of Australian waters, it has a wide but patchy tropical and warm-temperate Indo-West Pacific distribution. This viviparous species may have relatively limited biological productivity based on reproductive parameters (possible biennial reproductive cycle; litter size, 3–15 pups). Its diet of squid and pelagic teleosts suggest that it is more benthopelagic than truly demersal, and therefore, may be less susceptible to capture in demersal fishing gear. It is only caught rarely in the southeast but is caught more regularly in Western Australia. In that state, it is a byproduct of the Temperate Demersal Gillnet and Demersal Longline Fishery, but catches are small; limited monitoring from 1989–1999 showed that catch rates were stable. The species' wide depth range provides it with refuge outside of the operational area of the fishery (fishing mainly occurs at <50 m depth). Population trend is unknown, although it is suspected to be stable based on low catches and refugia. It is not suspected to be close to reaching the population reduction threshold and the Pencil Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Longnose Houndshark

CAAB Code 37 017007

Iago garricki Fourmanoir & Rivaton, 1979

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental slope

Depth: 250–475 m

Maximum size: 75 cm TL



Assessment Justification: The Longnose Houndshark is a poorly-known shark with a wide northwest and Western Australian range. Outside of Australian waters, it has a wide but patchy tropical Eastern Indian and Western Pacific distribution. Little biological data are available on this viviparous species, but it is suspected to have limited biological productivity based on a small litter size (4–5 pups). It is a possible bycatch of the Commonwealth-managed Western Deepwater Trawl Fishery and North West Slope Trawl Fishery, although these fisheries have limited effort with only a small number of active vessels. It occurs deeper than the operational area of Western Australian and Northern Territory fisheries. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Longnose Houndshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Gummy Shark

CAAB Code 37 017001

Mustelus antarcticus Günther, 1870

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; effective management

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 0–400 m

Maximum size: 185 cm TL



Assessment Justification: The Gummy Shark is a common endemic shark with a wide southern and northeast Australian range. This viviparous species has relatively high biological productivity (Amat, 5 years; Amax, 16 years; GL, 10.5 years; annual or biennial reproductive cycle; litter size, 1–57 pups, increasing with maternal size). There are a number of Queensland-managed fisheries in the northeast part of its range and details are required on catch levels in these. This includes the Deepwater Fin Fish Fishery, a line fishery which lands this species as a component of the shark catch. In southern Australia, it is an important commercial species and has been targeted since the 1920s. It is currently a target species in Commonwealth and state-managed fisheries across its range. Stock assessments for Bass Strait, South Australia, and Western Australia in the 1990s and 2000s indicated that biomass was at 40–55% of initial levels over most of those two decades. Management changes and lower levels of fishing effort have seen the population slowly increase. The overall population trend over the last three generations (32 years) is estimated to be a reduction of <20%. The species does not meet the population reduction thresholds under criterion A1 (the appropriate criterion as the causes of the reduction are clearly reversible, understood, and have ceased; i.e., the fishery is sustainably managed) over the last three generations (32 years) and the Gummy Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Target
Fishing - recreational	High	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	–	–

Current Management

- Commercial fishery quota (AUS)
- Commercial fishery daily catch limit (SA, VIC)
- Commercial fishery input controls (WA)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Grey Gummy Shark

CAAB Code 37 017005

Mustelus ravidus White & Last, 2006

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 100–300 m

Maximum size: 101 cm TL



Assessment Justification: The Grey Gummy Shark is a common but poorly-known endemic shark with a wide northwest and Western Australian range. Little biological data are available on this viviparous species (litter size, 6–24 pups). It is a possible bycatch of the Commonwealth-managed Western Deepwater Trawl Fishery and North West Slope Trawl Fishery, although these fisheries have limited effort with only a small number of active vessels. It is a byproduct of the Western Australian Temperate Demersal Gillnet and Demersal Longline Fishery, but catches are small, and it is most common in deeper waters outside the main operational area of the fishery. Its range also includes a large area (~10,000 km²) where shark fishing is prohibited. It may be a bycatch of the Pilbara Fish Trawl Fishery, however, that fishery operates primarily at depths of 50–110 m which is mostly shallower than the depth range of the species. Furthermore, considerable areas of Western Australia's North Coast Bioregion and the Northern Territory are closed to trawling through spatial management arrangements, providing a refuge. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Grey Gummy Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Western Spotted Gummy Shark

CAAB Code 37 017012

Mustelus stevensi White & Last, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 120–400 m

Maximum size: 103 cm TL



Assessment Justification: The Western Spotted Gummy Shark is a common but poorly-known endemic shark with a wide northwest Australian range. Little biological data are available on this viviparous species (houndsharks have variable biological productivity). It is a possible bycatch of the Commonwealth-managed Western Deepwater Trawl Fishery and North West Slope Trawl Fishery, although these fisheries have limited effort with only a small number of active vessels. It was a bycatch of the Western Australian Temperate Demersal Gillnet and Demersal Longline Fishery, but the closure of a large area (~10,000 km²) where shark fishing is prohibited now covers the range of the species, and it is no longer likely to be caught by the fishery. It may be a bycatch of the Pilbara Fish Trawl Fishery, however, that fishery operates primarily at depths of 50–110 m which is shallower than the depth range of the species. Furthermore, considerable areas of Western Australia's North Coast Bioregion are closed to trawling through spatial management arrangements, providing a refuge. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Western Spotted Gummy Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Australian Weasel Shark

CAAB Code 37 018020

Hemigaleus australiensis White, Last & Compagno, 2005

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Continental shelf

Depth: 12–170 m

Maximum size: 110 cm TL



Assessment Justification: The Australian Weasel Shark is a common shark with a wide northern Australian range. Outside of Australian waters, it occurs in southern New Guinea. This viviparous species may be relatively biologically productive based on its small size and presumed fast growth rates (possible biannual reproductive cycle; litter size, 1–19 pups). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF); estimates of fishing mortality rates for this species in the NPF are well below those that would lead to significant population declines. This species is taken in a wide variety of state and territory-managed inshore fisheries, but generally not in large numbers, and therefore not at levels that are likely to cause population reduction. There are significant areas of its range where fishing pressure is low or absent which provide refugia. Population trend is unknown, although due to its resilience, refugia, and sustainable mortality estimates in the major fishery catching it, it is not suspected to be close to reaching the population reduction threshold and the Australian Weasel Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess age	Medium
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Fossil Shark

CAAB Code 37 018011

Hemipristis elongata (Klunzinger, 1871)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental shelf

Depth: 1–132 m

Maximum size: 240 cm TL



Assessment Justification: The Fossil Shark is an uncommon shark with a wide northern and Western Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. This viviparous species may be relatively biologically productive based on its fast growth rate and early age-at-maturity (Amat, 3 years; Amax, 15 years; GL, 9 years; possible biannual reproductive cycle; litter size, 2–11 pups). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF); estimates of fishing mortality rates for this species in the NPF are below those that would lead to significant population declines. This species is taken in a wide variety of state and territory-managed inshore fisheries, but generally not in large numbers, and therefore not at levels that are likely to cause population reduction. There are significant areas of its range where fishing pressure is low or absent which provide refugia. Population trend is unknown, although due to its resilience, refugia, and sustainable mortality estimates in a major fishery catching it, it is not suspected to be close to reaching the population reduction threshold and the Fossil Shark is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Silvertip Shark

CAAB Code 37 018027

Carcharhinus albimarginatus (Rüppell, 1837)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Indo-Pacific

Habitat: Pelagic; continental shelf; reefs

Depth: 0–800 m

Maximum size: 300 cm TL



Assessment Justification: The Silvertip Shark is a common but poorly-known reef-associated shark with a wide but separated northwest and northeast Australian range. Outside of Australian waters, it has a wide but patchy tropical Indo-Pacific distribution. This viviparous species has limited biological productivity (biennial reproductive cycle; litter size, 1–11 pups, usually 5–6). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF) and the Queensland Coral Reef Finfish Fishery, but only in very small numbers, and not at levels that are likely to cause population reduction. It is not known to interact with the inshore gillnet fishery that operates in that state. There is evidence that the species has been depleted in remote northwest reefs where traditional Indonesian fishing activities are permitted. However, there are significant areas of its range where fishing pressure is low or absent which provide refugia (including in the Great Barrier Reef Marine Park). Population trend is unknown, although due to refugia and low and suspected sustainable catch levels in most areas, it is not suspected to be close to reaching the population reduction threshold and the Silvertip Shark is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Bignose Shark

CAAB Code 37 018012

Carcharhinus altimus (Springer, 1950)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Cosmopolitan (but patchy)

Habitat: Continental shelf & slope

Depth: 0–430 m

Maximum size: 285 cm TL



Assessment Justification: The Bignose Shark is an uncommon and poorly-known shark with a wide but patchy eastern and Western Australian range. Outside of Australian waters, it has a wide but patchy global tropical and warm-temperate distribution. Little biological data are available on this viviparous species, but it is suspected to have limited productivity (litter size, 3–15 pups). It is unusual amongst the whaler sharks in being associated with deeper water and is thought to display diurnal vertical migrations. It is a bycatch or byproduct of state and territory-managed net and line fisheries, but only in small numbers, and therefore not at levels that are likely to cause population reduction. There are significant areas of its range where fishing pressure is low or absent which provide refugia. Population trend is unknown, although due to low catches and refugia, it is not suspected to be close to reaching the population reduction threshold and the Bignose Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Target
Fishing - Indigenous	None	–
Fishing - shark control	Low	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Medium
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (NSW)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Graceful Shark

CAAB Code 37 018033

Carcharhinus amblyrhynchoides (Whitley, 1934)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Pelagic; continental shelf

Depth: 0–50 m

Maximum size: 178 cm TL



Assessment Justification: The Graceful Shark is a relatively uncommon and poorly-known shark with a wide northern Australian range. Outside of Australian waters, it has a wide but patchy tropical Indo-West Pacific distribution. This viviparous species has limited biological productivity (litter size, 2–8 pups, usually 3). It is a byproduct of the Queensland Gulf of Carpentaria Inshore Finfish Fishery, the Northern Territory Offshore Net and Line Fishery, and the Kimberley Gillnet Barramundi Fishery, but only in very small numbers, and not at levels that are likely to cause population reduction. There are significant areas of its range where fishing pressure is low or absent which provide refugia (particularly in the northwest). Population trend is unknown, although due to refugia and low and suspected sustainable catch levels, it is not suspected to be close to reaching the population reduction threshold and the Graceful Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess age	Medium
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Grey Reef Shark

CAAB Code 37 018030

Carcharhinus amblyrhynchos (Bleeker, 1856)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Suspected population reduction approaching 30% over the last 3 generations (45 years) based on trend data & catch levels

Distribution: Indo-Pacific

Habitat: Pelagic; continental shelf; reefs

Depth: 0–280 m

Maximum size: 255 cm TL



Assessment Justification: The Grey Reef Shark is a common coral reef-associated shark with a wide northern Australian range. Outside of Australian waters, it has a wide but patchy tropical Indo-Pacific distribution. This viviparous species has limited biological productivity (Amat, 11 years; Amax, 19 years; GL, 15 years; biennial reproductive cycle; litter size, up to 6 pups, usually 3–4). Its limited movements and high levels of residency make it susceptible to localised population depletion. It is a byproduct of the Queensland Coral Reef Finfish Fishery where catches are low. Catch rate data in the fishery between 1989 and 2006 showed no evidence of increase or decrease of sharks (principally Grey, Whitetip, and Blacktip Reef Sharks), although more sharks were caught in protected areas. This was confirmed by underwater visual and video surveys, suggesting that there has been localised declines. There is also evidence that this species was overfished in remote northwest islands and reefs due to Indonesian fishing activities. There are large areas of its habitat which are protected (e.g., in the Great Barrier Reef Marine Park) and other areas of limited fishing effort. Balancing these contrasting situations, it is suspected that the population has undergone a reduction approaching 30% over the last three generations (45 years) and the Grey Reef Shark is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	–	–

Current Management

- Commercial fishery trip catch limit (QLD)
- Commercial fishery mixed-species quota (NT)
- General commercial fishery controls

Conservation Actions

- Monitor population
- Manage catch at sustainable levels
- Reduce post-release mortality
- Identify & protect critical habitat

Pigeye Shark

CAAB Code 37 018026

Carcharhinus amboinensis (Müller & Henle, 1839)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific; Eastern Atlantic

Habitat: Continental shelf

Depth: 0–100 m

Maximum size: 280 cm TL



Assessment Justification: The Pigeye Shark is a common shark with a wide northern Australian range. Outside of Australian waters, it has a wide but patchy tropical Indo-West Pacific and Eastern Atlantic distribution. This viviparous species has limited biological productivity (Amat, 13 years; Amax, 30 years; GL, 21.5 years; litter size, 3–13 pups, mean 9). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF) and a byproduct of Queensland and Northern Territory net and line fisheries. This includes the Queensland East Coast Inshore Finfish Fishery and the Northern Territory Offshore Net and Line Fishery where catches are low, but there is some suggestion of localised decline based on tag-recapture data. However, there are significant areas of its range where fishing pressure is low or absent which provide refugia (particularly in the northwest). Population trend is unknown, although due to refugia and low and suspected sustainable catch levels overall, it is not suspected to be close to reaching the population reduction threshold and the Pigeye Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (NT)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Bronze Whaler

CAAB Code 37 018001

Carcharhinus brachyurus (Günther, 1870)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; effective management

Distribution: Cosmopolitan (but patchy)

Habitat: Continental shelf

Depth: 0–100 m

Maximum size: 295 cm TL



Assessment Justification: The Bronze Whaler is a common shark with a wide southern Australian range. Outside of Australian waters, it has a wide but patchy global warm-temperate distribution. This viviparous species has limited biological productivity (Amat, 16 years; Amax, 31 years; GL, 23.5 years; biennial reproductive cycle; litter size, 7–26 pups). It is a target species of line and gillnet fisheries in Western Australia, South Australia, and New South Wales (generally as a secondary target species), and a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery. The New South Wales shark control program has shown a significant decline of *Carcharhinus* catch-per-unit-effort although the Bronze Whaler is only a small part of New South Wales commercial catches of whaler sharks, which are generally stable. Catches of Bronze Whaler are also generally stable in South Australia and Western Australia. Given these stable trends and strong fisheries management, particularly in Western Australia, it is not suspected to be close to reaching the population reduction threshold and the Bronze Whaler is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Target
Fishing - recreational	Mod.	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	High	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- Commercial fishery mixed-species quota (NSW)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Spinner Shark

CAAB Code 37 018023

Carcharhinus brevipinna (Valenciennes, 1839)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Cosmopolitan (but patchy)

Habitat: Pelagic; continental shelf

Depth: 0–75 m

Maximum size: 300 cm TL



Assessment Justification: The Spinner Shark is a common shark with a wide Australian range (except southern waters). Outside of Australian waters, it has a wide but patchy global tropical and warm-temperate distribution. This viviparous species has limited biological productivity (Amat, 10 years; Amax, 31 years; GL, 20.5 years; biennial reproductive cycle; litter size, 3–20 pups, usually 7–11). It is a bycatch of some Commonwealth-managed fisheries and a byproduct of Queensland and Northern Territory net and line fisheries, where catches are generally low, and not at levels that are likely to cause population reduction (although localised catches are higher in Hervey Bay). More significant catches occur in the New South Wales Ocean Trap and Line Fishery where it is targeted by demersal longline and in the Western Australian Temperate Demersal Gillnet and Demersal Longline Fishery where it is a byproduct. There are other areas where fishing pressure is low or absent which provide refugia (particularly in the northwest). Population trend is unknown; given the targeting of adults off New South Wales, some population reduction may have occurred. However, management has been implemented there, and with suspected sustainable catch levels elsewhere, it is not suspected to be close to reaching the population reduction threshold and the Spinner Shark is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Mod.	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- Commercial fishery mixed-species quota (NSW, NT)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Nervous Shark

CAAB Code 37 018034

Carcharhinus cautus (Whitley, 1945)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Continental shelf; reefs

Depth: 0–20 m

Maximum size: 150 cm TL



Assessment Justification: The Nervous Shark is a common shark with a wide northern Australian range. Outside of Australian waters, it occurs in Papua New Guinea and the Solomon Islands. This viviparous species has limited biological productivity (Amat, 6 years; Amax, 16 years; GL, 11 years; annual or biennial reproductive cycle; litter size, 1–6 pups). It is a shallow water specialist and is associated with inshore sandy, estuarine, and mangrove habitats. It is a byproduct of the Queensland East Coast Inshore Finfish Fishery and Gulf of Carpentaria Inshore Finfish Fishery, and the Northern Territory Offshore Net and Line Fishery where catches are very low, and not at levels that are likely to cause population reduction. It is caught more regularly as bycatch of the West Australian Eighty Mile Beach Gillnet Fishery and the Kimberley Gillnet Barramundi Fishery, but these fisheries are relatively localised. There are significant areas of its range where fishing pressure is low or absent which provide refugia and the species remains abundant in shallow inshore areas. Population trend is unknown, although given it is generally exposed to only low and suspected sustainable catch levels, it is not suspected to be close to reaching the population reduction threshold and the Nervous Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Australian Blackspot Shark

CAAB Code 37 018009

Carcharhinus coatesi (Whitley, 1939)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Continental shelf

Depth: 0–123 m

Maximum size: 88 cm TL



Assessment Justification: The Australian Blackspot Shark is a common shark with a wide northern Australian range. Outside of Australian waters, it occurs in Papua New Guinea. This viviparous species has high biological productivity due to early maturity (Amat, 2 years; Amax, 6.5 years; GL, 4 years; annual reproductive cycle; litter size, 1–3 pups, mean 2). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF); estimates of fishing mortality for the species in the NPF are well below those that would lead to significant population decline. It is a byproduct of state and territory-managed fisheries, including the Queensland East Coast Inshore Finfish Fishery and Gulf of Carpentaria Inshore Finfish Fishery, and the Northern Territory Offshore Net and Line Fishery where catches are low, and not at levels that are likely to cause population reduction. There are significant areas of its range where fishing pressure is low or absent which provide refugia (particularly in the northwest). Population trend is unknown, although due to refugia, sustainable catch levels in the NPF and low catch levels elsewhere, and its high biological productivity, it is not suspected to be close to reaching the population reduction threshold and the Australian Blackspot Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	–	–

Current Management

- Commercial fishery mixed-species quota (NT)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Silky Shark

CAAB Code 37 018008

Carcharhinus falciformis (Müller & Henle, 1839)

IUCN Red List Category & Criteria

Vulnerable A2bd

Reasons for Listing

Estimated population reduction of >30% over the last 3 generations (45 years) based on trend data & catch levels

Distribution: Cosmopolitan

Habitat: Pelagic; continental shelf

Depth: 0–500 m

Maximum size: 330 cm TL



Assessment Justification: The Silky Shark is a common shark with a wide Australian range (except for southern waters). Outside of Australian waters, it has a wide global tropical and warm-temperate distribution. This viviparous species has limited biological productivity (Amat, 6–15 years; Amax, 11–36 years; GL, 15 years; annual or biennial reproductive cycle; litter size, 2–18 pups, usually 5–7). It is a bycatch of Australian longline fisheries (including the Eastern Tuna and Billfish Fishery and Western Tuna and Billfish Fishery) but interaction levels are generally low with management of shark catches in place. However, while population trend data are not available for Australian waters, global analysis estimated a population reduction of 47–54% over the last three generations (45 years). This analysis included data from the Western Central Pacific. The Australian assessment of the Silky Shark reflects the global category of Vulnerable under the assumption of connectivity with the regional subpopulation(s). International co-operation and conservation instruments will be vital to allow the recovery of the species in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- Migratory (EPBC Act)
- CITES Appendix II (export restriction)
- CMS Appendix II
- Commercial fishery mixed-species quota (NSW)
- General commercial fishery controls

Conservation Actions

- Engage internationally to recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Creek Whaler

CAAB Code 37 018035

Carcharhinus fitzroyensis (Whitley, 1943)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Continental shelf

Depth: 0–40 m

Maximum size: 135 cm TL



Assessment Justification: The Creek Whaler is a common shark with a wide northern Australian range. Outside of Australian waters, it occurs in southern Papua New Guinea. This viviparous species has moderate biological productivity (Amat, 5 years; Amax, 13 years; GL, 9 years; annual reproductive cycle; litter size, 1–7 pups, mean 4). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery and a byproduct of Queensland, Northern Territory, and Western Australian managed inshore gillnet fisheries, although catches are low, and not at levels that are likely to cause population reduction. There are significant areas of its range where fishing pressure is low or absent which provide refugia (particularly in the northwest). Population trend is unknown, although due to refugia, low and suspected sustainable catch levels, and its moderate biological productivity, it is not suspected to be close to reaching the population reduction threshold and the Creek Whaler is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Galapagos Shark

CAAB Code 37 018035

Carcharhinus galapagensis (Snodgrass & Heller, 1905)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in areas of limited fishing effort

Distribution: Cosmopolitan (but patchy)

Habitat: Pelagic; insular shelf

Depth: 0–285 m

Maximum size: 300 cm TL



Assessment Justification: The Galapagos Shark is a common shark with a wide but patchy eastern and northwest Australian range. It is primarily associated with oceanic islands and in Australian waters occurs around Lord Howe Island, Norfolk Island, and Elizabeth and Middleton Reefs (continental Australian records do not represent core range). Outside of Australian waters, it has a wide but patchy global tropical distribution. This viviparous species has limited biological productivity (Amat, 6.5–9 years; possible biennial or triennial reproductive cycle; litter size, 4–16 pups). Most of the species' Australian range occurs within marine protected areas, namely the Commonwealth-managed Lord Howe Marine Park and the New South Wales managed Lord Howe Island Marine Park. There are no commercial fisheries in the species' core Australian range, and mortality from charter and recreational fishing at Lord Howe Island is suspected to be very low. Population trend is unknown, although it is suspected to be stable due to refugia and low and suspected sustainable catch levels. There is nothing to infer or suspect population reduction at this time and the Galapagos Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Target
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Bull Shark

CAAB Code 37 018021

Carcharhinus leucas (Valenciennes, 1839)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Cosmopolitan

Habitat: Continental shelf; estuaries; rivers

Depth: 0–152 m

Maximum size: 340 cm TL



Assessment Justification: The Bull Shark is a common shark with a wide Australian range (except for southern waters). Outside of Australian waters, it has a wide global tropical and warm-temperate distribution. This viviparous species has limited biological productivity (Amat, 9.5 years; Amax, 27 years; GL, 18 years; probable biennial reproductive cycle; litter size, 1–15 pups, usually 6–8). This is a euryhaline species with juveniles inhabiting freshwater environments. It is a target species of shark control programs and a byproduct or bycatch of state and territory-managed net and line fisheries where catches are low, and not at levels that are likely to cause population reduction. A long-term decline in whaler shark catches (combined species) in the Queensland Shark Control Program suggests some decline for the Bull Shark on the east coast. There are significant areas of its range where commercial fishing pressure is low or absent which provide refugia (particularly in the northwest and in northern rivers). Low levels of Indigenous harvest are not suspected to be causing population reduction and the species remains common in rivers and estuaries across its range. While a decline is suspected on the east coast, due to refugia and low and suspected sustainable catch levels elsewhere, it is not suspected to be close to reaching the population reduction threshold and the Bull Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Mod.	Target
Fishing - Indigenous	High	Target
Fishing - shark control	High	Target
Other: freshwater flow alteration		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	–	–

Current Management

- Commercial fishery mixed-species quota (NSW, NT)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Maintain river-estuary connectivity

Common Blacktip Shark

CAAB Code 37 018039

Carcharhinus limbatus (Valenciennes, 1839)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; effective management

Distribution: Cosmopolitan

Habitat: Pelagic; continental shelf

Depth: 0–30 m

Maximum size: 255 cm TL



Assessment Justification: The Common Blacktip Shark is a common shark with a wide Australian range (except for southern waters). Outside of Australian waters, it has a wide global tropical and warm-temperate distribution. This viviparous species has variable biological productivity depending on geographic region (Amat, 4–9 years; Amax, 9–17 years; GL, 8–13 years; biennial reproductive cycle; litter size, 1–10 pups, usually 4–7). Catch data for *C. tilstoni* and *C. limbatus* are combined as ‘blacktip shark’. Blacktip sharks are a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF); estimates of fishing mortality rates in the NPF are well below those that would lead to significant population declines. Blacktip sharks are targeted in state and territory-managed gillnet and line fisheries, the most significant being the Northern Territory Offshore Net and Line Fishery. A stock assessment for that fishery estimated that biomass was at 81–90% of unfished biomass with strong evidence of sustainable catch levels. Catches are also significant in several states but are considered sustainable. The population trend is suspected to be stable given sustainable catch levels, moderate biological productivity, and effective fisheries management. It is not suspected to be close to reaching the population reduction threshold and the Common Blacktip Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Target
Fishing - recreational	Mod.	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Mod.	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- Commercial fishery mixed-species quota (NSW, NT)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Oceanic Whitetip Shark

Carcharhinus longimanus (Poey, 1861)

IUCN Red List Category & Criteria

Critically Endangered A2bd

Reasons for Listing

Estimated population reduction of >80% over the last 3 generations (62 years) based on trend data & catch levels

Distribution: Cosmopolitan

Habitat: Pelagic

Depth: 0–152 m

Maximum size: 350 cm TL



Assessment Justification: The Oceanic Whitetip Shark was a historically common shark with a wide Australian range. Outside of Australian waters, it has a circumglobal tropical and warm-temperate distribution. This viviparous species has limited biological productivity (Amat, 16 years; Amax, 25 years; GL, 20.5 years; probable biennial reproductive cycle; litter size, 1–15 pups). It is a highly-mobile species but with some genetic structuring expected between the Atlantic and Indo-Pacific. It is a bycatch of Australian longline fisheries (including the Eastern Tuna and Billfish Fishery and Western Tuna and Billfish Fishery) at low levels. While population trend data are not available for Australian waters, global analysis estimated a population reduction of >98% over the last three generations (62 years). This analysis included data from the Western Central Pacific and Indian Oceans. The Australian assessment of the Oceanic Whitetip Shark reflects the global category of Critically Endangered under the assumption of connectivity with the regional subpopulation(s). International co-operation and conservation instruments will be vital to allow the recovery of the species in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Target
Fishing - Indigenous	None	–
Fishing - shark control	Low	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	High

Current Management

- CITES Appendix II (export restriction)
- CMS Appendix I
- Commercial fishery mixed-species quota (NSW)
- General commercial fishery controls

Conservation Actions

- Protect species
- Engage internationally to recover population
- Mitigate catch
- Reduce post-release mortality

Hardnose Shark

CAAB Code 37 018025

Carcharhinus macroti (Müller & Henle, 1839)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental shelf

Depth: 0–170 m

Maximum size: 110 cm TL



Assessment Justification: The Hardnose Shark is a common shark with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. This viviparous species has limited biological productivity despite being fast-growing (Amat, 4 years; Amax, 12 years; GL, 8 years; probable biennial reproductive cycle; litter size, 2 pups). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF); estimates of fishing mortality for the species in the NPF are below those that would lead to significant population decline. It is a byproduct of state and territory-managed fisheries, including the Queensland East Coast Inshore Finfish Fishery and the Northern Territory Offshore Net and Line Fishery where catches are low, and not at levels that are likely to cause population reduction. There are significant areas of its range where fishing pressure is low or absent which provide refugia (particularly in the northwest). Population trend is unknown, although due to refugia and low and sustainable catch levels, it is not suspected to be close to reaching the population reduction threshold and the Hardnose Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- Commercial fishery mixed-species quota (NT)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Blacktip Reef Shark

CAAB Code 37 018036

Carcharhinus melanopterus (Quoy & Gaimard, 1824)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-Pacific

Habitat: Continental shelf; reefs

Depth: 0–100 m

Maximum size: 180 cm TL



Assessment Justification: The Blacktip Reef Shark is a common coral reef-associated shark with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West and Central Pacific distribution. This viviparous species has limited biological productivity (Amat, 8.5 years; Amax, 15 years; GL, 12 years; annual or biennial reproductive cycle; litter size, 2–6 pups). Its limited movement patterns and high levels of residency make it susceptible to localised population depletion. It is a byproduct of the Queensland East Coast Inshore Finfish Fishery and Coral Reef Finfish Fishery where catches are low, and not at levels that are likely to cause population reduction. Catch rate data in the Coral Reef Finfish Fishery between 1989 and 2006 showed no evidence of increase or decrease of sharks (principally Grey, Whitetip, and Blacktip Reef Sharks), although more sharks were caught in protected areas, suggesting localised declines. The Blacktip Reef Shark has refuge in very shallow waters (including reef lagoons) and there are large areas of habitat which are protected (e.g., in the Great Barrier Reef Marine Park) and other areas of limited fishing effort. While there is potential for localised depletions where its habitat overlaps with fishing, it is not suspected to be close to reaching the population reduction threshold and the Blacktip Reef Shark is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Mod.	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Dusky Shark

CAAB Code 37 018003

Carcharhinus obscurus (Lesueur, 1818)

IUCN Red List Category & Criteria

Near Threatened A1bd

Reasons for Listing

Suspected population reduction approaching 50% over the last 3 generations (114 years) based on trend data & catch levels

Distribution: Cosmopolitan (but patchy)

Habitat: Pelagic; continental shelf

Depth: 0–400 m

Maximum size: 365 cm TL



Assessment Justification: The Dusky Shark is a common shark with a wide Australian range. Outside of Australian waters, it has a wide but patchy global tropical and warm-temperate distribution. This viviparous species has very limited biological productivity (Amat, 27–32 years; Amax, 40–53 years; GL, 38 years; biennial or triennial reproductive cycle; litter size, 2–18 pups). It is a commercially important target species in Western Australia where catch-per-unit-effort data between 1975 and 2015 revealed annual rates of reduction of 3.8% (>90% population reduction when scaled to three generations; 114 years). However, the long-term estimate is based on considerable projection of the data and is indicative of historic declines rather than a stable and increasing trend since 2006 when major management measures were introduced. The Western Australian decline is not representative of the entire range as apart from New South Wales where commercial whaler shark catches are now relatively low and stable, considerable areas of its range are not subject to significant threats. It is suspected to be close to meeting the population reduction thresholds under criterion A1 (the appropriate criterion as the causes of the reduction are clearly reversible, understood, and have ceased; i.e., the fishery is sustainably managed) over the last three generations (114 years) and the Dusky Shark is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Target
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Mod.	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- CMS Appendix II (EPBC listing exemption)
- Commercial fishery mixed-species quota (NSW, NT)
- Commercial fishery input controls (WA)
- General commercial fishery controls

Conservation Actions

- Monitor population
- Manage catch at sustainable levels
- Reduce post-release mortality
- Identify & protect critical habitat

Sandbar Shark

CAAB Code 37 018007

Carcharhinus plumbeus (Nardo, 1827)

IUCN Red List Category & Criteria

Near Threatened A1bd

Reasons for Listing

Suspected population reduction approaching 50% over the last 3 generations (78 years) based on trend data & catch levels

Distribution: Cosmopolitan (but patchy)

Habitat: Pelagic; continental shelf

Depth: 0–280 m

Maximum size: 240 cm TL



Assessment Justification: The Sandbar Shark is a common shark with a wide but separated eastern and Western Australian range. Outside of Australian waters, it has a wide but patchy global tropical and warm-temperate distribution. This viviparous species has limited biological productivity (Amat, 16 years; Amax, 36 years; GL, 26 years; biennial reproductive cycle; litter size, 4–10 pups). It is a commercially important target species in Western Australia where catches between 1998 and 2005 were considered to be unsustainable. At that time, total biomass was suspected to be ~40% of unexploited levels. Major management measures including large-scale spatial closures are allowing the western stock to recover. The Western Australian declines are not likely representative of the entire range as apart from New South Wales where commercial whaler shark catches are now relatively low and stable, the species has considerable areas of its range where it is not subject to significant threats. It is suspected to be close to meeting the population reduction thresholds under criterion A1 (the appropriate criterion as the causes of the reduction are clearly reversible, understood, and have ceased; i.e., the fishery is sustainably managed) over the last three generations (78 years) and the Sandbar Shark is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Target
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- Commercial fishery mixed-species quota (NSW, NT)
- Commercial fishery input controls (WA)
- Species-specific spatial closures
- General commercial fishery controls

Conservation Actions

- Monitor population
- Manage catch at sustainable levels
- Reduce post-release mortality
- Identify & protect critical habitat

Spot-tail Shark

CAAB Code 37 018013

Carcharhinus sorrah (Valenciennes, 1839)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; effective management

Distribution: Indo-West Pacific

Habitat: Continental shelf; reefs

Depth: 0–140 m

Maximum size: 160 cm TL



Assessment Justification: The Spot-tail Shark is a common shark with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. This viviparous species has high biological productivity due to early maturity (Amat, 2 years; Amax, 14 years; GL, 8 years; annual reproductive cycle; litter size, 1–8 pups, mean 3). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF); estimates of fishing mortality rates for this species in the NPF are well below those that would lead to significant population declines. It is targeted in state and territory-managed gillnet and line fisheries, the most significant being the Northern Territory Offshore Net and Line Fishery. A stock assessment for that fishery estimated that biomass was at 81–90% of unfished biomass with strong evidence of sustainable catch levels. Catches are smaller and considered sustainable in the Queensland gillnet fisheries and it is not currently commercially fished in Western Australia. The population trend is suspected to be stable given sustainable catch levels, high biological productivity, and effective fisheries management. It is not suspected to be close to reaching the population reduction threshold and the Spot-tail Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Target
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Mod.	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- Commercial fishery quota (NT)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Australian Blacktip Shark

CAAB Code 37 018014

Carcharhinus tilstoni (Whitley, 1950)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; effective management

Distribution: Australasia

Habitat: Pelagic; continental shelf

Depth: 0–150 m

Maximum size: 200 cm TL



Assessment Justification: The Australian Blacktip Shark is a common shark with a wide northern Australian range. Outside of Australian waters, it occurs in Papua New Guinea. This viviparous species has moderate biological productivity due to early maturity (Amat, 3–6 years; Amax, 12–15 years; GL, 7.5–10.5 years; annual reproductive cycle; litter size, 1–6 pups, mean 3). Catch data for *C. tilstoni* and *C. limbatus* are combined as 'blacktip shark'. Blacktip sharks are a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF); estimates of fishing mortality rates in the NPF are well below those that would lead to significant population declines. Blacktip sharks are targeted in state and territory-managed gillnet and line fisheries, the most significant being the Northern Territory Offshore Net and Line Fishery. A stock assessment for that fishery estimated that biomass was at 81–90% of unfished biomass with strong evidence of sustainable catch levels. Catches are also significant in Queensland gillnet fisheries but are considered sustainable and this species is not currently commercially fished in Western Australia. The population trend is suspected to be stable given sustainable catch levels, moderate biological productivity, and effective fisheries management. It is not suspected to be close to reaching the population reduction threshold and the Australian Blacktip Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Target
Fishing - recreational	Mod.	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Mod.	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- Commercial fishery mixed-species quota (NT)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Northern River Shark

CAAB Code 37 018042

Glyphis garricki Compagno, White & Last, 2008

IUCN Red List Category & Criteria

Vulnerable C1*

*See Supporting Information on following page

Reasons for Listing

Estimated population size <10,000 mature individuals; projected continuing decline of at least 10% in 3 generations (54 years)

Distribution: Australasia

Habitat: Continental shelf; estuaries; rivers

Depth: 0–23 m

Maximum size: 251 cm TL



Assessment Justification: The Northern River Shark is a rare and until recently, poorly-known shark with a relatively restricted northern Australian range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it occurs in southern Papua New Guinea. Little biological data are available on this viviparous species, but it is suspected to have limited biological productivity (litter size, 9 pups). A euryhaline species, juveniles to adults occur in tropical macrotidal rivers with some adult records from marine waters. Recent research has shown it to be more wide-ranging than previously thought, with new subpopulations documented in multiple northern rivers. The application of close-kin-mark-recapture has estimated a small number of mature individuals in Van Diemen Gulf (Northern Territory). Using this population size estimate, and accounting for the remaining known range, the Australian population size is estimated to be >2,500 but <10,000 mature individuals. It is a bycatch of inshore gillnet fisheries, and is subject to minor levels of Indigenous harvest, as well as illegal recreational take, with a projected continuing decline of at least 10% in three generations (estimated at 54 years) and the Northern River Shark is assessed as Vulnerable.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: habitat degradation; freshwater flow alteration		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	–	–

Current Management

- Endangered (EPBC Act)
- Recovery Plan
- State & territory protections (NT, WA)
- General commercial fishery controls

Conservation Actions

- Recover population
- Mitigate catch
- Reduce post-release mortality
- Maintain river-estuary connectivity
- Identify & protect critical habitat

Supporting Information for Northern River Shark

IUCN Red List Category & Criteria: Vulnerable C1

EPBC Act Status: Endangered

Recommendation: Consider down-listing

Recovery Plan: DoE (2015). Sawfish and river sharks multispecies recovery plan. Department of the Environment (DoE), Canberra (due for review).

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Not applicable: no data or evidence to support population reduction approaching the thresholds
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Estimated population size < 10,000 mature individuals; projected continuing decline of at least 10% in 3 generations (54 years)
D	Not applicable: population size > 1,000 mature individuals; AOO > 20 km ² ; > 5 locations
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	463,300 km ² unknown	high low
Area of occupancy trend	> 2,000 km ² unknown	low low
No. of mature individuals trend	2,500–10,000 decreasing	medium low
No. subpopulations	5	medium
No. locations	> 10	high
Generation length*	18 years	low
Global population share	80%	medium

*Generation length inferred from the Spouttooth Shark *Glyphis glyphis* (Kyne, unpubl. data).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: recent application of close-kin mark-recapture (Bravington *et al.* 2019) provides a population size estimate for the Van Diemen Gulf (VDG) subpopulation; recent research has shown range to be considerably wider than previously thought with several recognised subpopulations (Feutry *et al.* 2020); multiplying the VDG population size estimate across other subpopulations produces a national population size estimate within the band of 2,500–10,000 mature individuals; some caveats are associated with this extrapolation: VDG is likely the largest subpopulation and others (notably King Sound) may be substantially smaller, however, it is considered plausible that population size falls within this band; on-going catch levels in commercial fisheries, plus some Indigenous harvest and illegal recreational take support a projected continuing decline (Field *et al.* 2008, Kyne & Feutry 2017); trend should be tested with further application of close-kin mark-recapture.

Information sources: Bravington *et al.* (2019); Feutry *et al.* (2020); Field *et al.* (2008); Kyne & Feutry (2017).

Speartooth Shark

CAAB Code 37 018041

Glyphis glyphis (Müller & Henle, 1839)

IUCN Red List Category & Criteria

Vulnerable C1*

*See Supporting Information on following page

Reasons for Listing

Estimated population size <10,000 mature individuals; projected continuing decline of at least 10% in 3 generations (54 years)

Distribution: Australasia

Habitat: Continental shelf; estuaries; rivers

Depth: 0–23 m

Maximum size: 260 cm TL



Assessment Justification: The Speartooth Shark is a rare and until recently, poorly-known shark with a relatively restricted northern Australian range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it occurs in southern Papua New Guinea. Little biological data are available on this viviparous species, but it is suspected to have limited biological productivity (Amat, >12 years). A euryhaline species, juveniles and subadults occur in tropical macrotidal rivers, and adults presumably occur in coastal inshore waters. However, only two adults have ever been recorded in Australia (off western Cape York). Recent research has shown it to be more wide-ranging than previously thought, with new subpopulations documented in a handful of northern rivers. The application of close-kin-mark-recapture has estimated small numbers of mature individuals in the Wenlock River (Queensland), and the Van Diemen Gulf (Northern Territory). Combining these population size estimates, and accounting for the remaining known range, the Australian population size is estimated to be >2,500 but <10,000 mature individuals. It is a bycatch of inshore gillnet and pot fisheries, and is subject to minor levels of Indigenous harvest, as well as illegal recreational take, with a projected continuing decline of at least 10% in three generations (estimated at 54 years) and the Speartooth Shark is assessed as Vulnerable.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: habitat degradation; freshwater flow alteration		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	–	–

Current Management

- Critically Endangered (EPBC Act)
- Recovery Plan
- State & territory protections (NT, QLD, WA)
- General commercial fishery controls

Conservation Actions

- Recover population
- Mitigate catch
- Reduce post-release mortality
- Maintain river-estuary connectivity
- Identify & protect critical habitat

Supporting Information for Speartooth Shark

IUCN Red List Category & Criteria: Vulnerable C1

EPBC Act Status: Critically Endangered

Recommendation: Consider down-listing

Recovery Plan: DoE (2015). Sawfish and river sharks multispecies recovery plan. Department of the Environment (DoE), Canberra (due for review).

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Not applicable: no data or evidence to support population reduction approaching the thresholds
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Estimated population size < 10,000 mature individuals; projected continuing decline of at least 10% in 3 generations (54 years)
D	Not applicable: population size > 1,000 mature individuals; AOO > 20 km ² ; > 5 locations
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	335,500 km ² unknown	high low
Area of occupancy trend	> 2,000 km ² unknown	low low
No. of mature individuals trend	2,500–10,000 decreasing	medium low
No. subpopulations	5	medium
No. locations	9	medium
Generation length*	18 years	low
Global population share	80%	medium

*Generation length estimated from limited age data for this species (Kyne, unpubl. data).

Reason for change from EPBC Act listing

genuine change
 new knowledge
 taxonomic change
 previous mistake
 no change

Explanation: recent application of close-kin mark-recapture (CSIRO, unpubl. data) provides population size estimates for the Van Diemen Gulf (VDG) and Wenlock River subpopulations; recent research has shown range to be considerably wider than previously thought with several recognised subpopulations (Feutry *et al.* 2014, 2017, Kyne *et al.* 2021a); combining the VDG and Wenlock River population size estimates and accounting for the remaining subpopulations produces a national population size estimate within the band of 2,500–10,000 mature individuals; some caveats are associated with this extrapolation: VDG is the largest subpopulation and others (e.g., Daly and Ord Rivers) may be substantially smaller (Kyne *et al.* 2021a), however, it is considered plausible that population size falls within this band; on-going catch levels in commercial fisheries, plus some Indigenous harvest and illegal recreational take support a projected continuing decline (Field *et al.* 2008, Kyne & Feutry 2017); trend should be tested with further application of close-kin mark-recapture.

Information sources: Feutry *et al.* (2014, 2017); Field *et al.* (2008); Kyne & Feutry (2017); Kyne *et al.* (2021a).

Sliteye Shark

CAAB Code 37 018005

Loxodon macrorhinus Müller & Henle, 1839

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental shelf

Depth: 7–100 m

Maximum size: 99 cm TL



Assessment Justification: The Sliteye Shark is a common shark with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. This viviparous species has high biological productivity compared to other whaler sharks due to early maturity (Amat, 1.4 years; Amax age, 8.9 years; GL, 5.2 years; annual reproductive cycle; litter size, 2–4 pups). It is a bycatch or byproduct of state and territory-managed inshore fisheries, but generally not in large numbers, and therefore not at levels that are likely to cause population reduction. There are significant areas of its range where fishing pressure is low or absent which provide refugia. Population trend is unknown, although due to its resilience and refugia, it is not suspected to be close to reaching the population reduction threshold and the Sliteye Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Sharptooth Lemon Shark

CAAB Code 37 018029

Negaprion acutidens (Rüppell, 1837)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-Pacific

Habitat: Continental shelf; reefs

Depth: 0–90 m

Maximum size: 310 cm TL



Assessment Justification: The Sharptooth Lemon Shark is a common estuarine and mangrove-associated shark with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West and Central Pacific distribution. This viviparous species has limited biological productivity (biennial reproductive cycle; litter size, 1–14 pups). It was a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF), however Turtle Exclusion Devices, which are mandatory, reduce the capture of large sharks significantly. Estimates of fishing mortality for the species in the NPF are below those that would lead to significant population decline. It is also a bycatch or byproduct of state and territory fisheries but generally not in large numbers, and therefore not at levels that are likely to cause population reduction. There are significant areas of its range where fishing pressure is low or absent which provide refugia. Population trend is unknown, although due to overall levels of catches and refugia, it is not suspected to be close to reaching the population reduction threshold and the Sharptooth Lemon Shark is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Mod.	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess age	High
Connectivity	Assess connectivity	Medium

Current Management

- Commercial fishery mixed-species quota (NT)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Blue Shark

CAAB Code 37 018004

Prionace glauca (Linnaeus, 1758)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (32 years) based on trend data & catch levels

Distribution: Cosmopolitan

Habitat: Pelagic

Depth: 0–1,000 m

Maximum size: 383 cm TL



Assessment Justification: The Blue Shark is a common shark with a wide Australian range. Outside of Australian waters, it has a circumglobal tropical and temperate distribution. This viviparous species has high biological productivity compared to other oceanic species (Amat, 5.5 years; Amax, 15.5 years; GL, 10.5 years; annual to biennial reproductive cycle; litter size, 4–135 pups, usually 25–35). This is a highly-mobile species, and individuals occurring in Australia are not expected to be resident, but rather connected to the wider global population, at least regionally. It is a bycatch of Australian longline fisheries, but catches are generally low. While population trend data are not available for Australian waters, global analysis inferred a population reduction approaching 30% over the last three generations (32 years). This analysis included data from the North and South Atlantic, North and South Pacific, and Indian Oceans. The Australian assessment of the Blue Shark reflects the global category of Near Threatened under the assumption of connectivity with the regional subpopulation(s). International co-operation and conservation instruments will be vital to ensure the species does not become threatened in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Mod.	Target
Fishing - Indigenous	None	–
Fishing - shark control	Low	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	–	–

Current Management

- CMS Appendix II (EPBC listing exemption)
- Commercial fishery mixed-species quota (NSW)
- General commercial fishery controls

Conservation Actions

- Monitor population
- Manage catch at sustainable levels
- Reduce post-release mortality
- Identify & protect critical habitat

Milk Shark

CAAB Code 37 018006

Rhizoprionodon acutus (Rüppell, 1837)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific; Eastern Atlantic

Habitat: Continental shelf

Depth: 1–200 m

Maximum size: 100 cm TL



Assessment Justification: The Milk Shark is a common shark with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific and Eastern Atlantic distribution. This viviparous species has high biological productivity due to fast growth rates and early maturity (Amat, 2 years; Amax, 8 years; GL, 5 years; annual reproductive cycle; litter size, 1–8 pups). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF); estimates of fishing mortality rates for this species in the NPF are well below those that would lead to significant population declines. This species is a bycatch or byproduct of state and territory-managed gillnet and trawl fisheries, but only in moderate numbers, and not at levels that are likely to cause population reduction. There are significant areas of its range where fishing pressure is low or absent which provide refugia. Population trend is unknown, although due to its resilience, refugia, and low and sustainable catch levels, it is not suspected to be close to reaching the population reduction threshold and the Milk Shark is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	Mod.	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (NT)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Grey Sharpnose Shark

CAAB Code 37 018037

Rhizoprionodon oligoinx Springer, 1964

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Indo-West Pacific

Habitat: Continental shelf

Depth: 0–36 m

Maximum size: 70 cm TL



Assessment Justification: The Grey Sharpnose Shark is a rarely-encountered and poorly-known shark recorded locally from a single specimen from the Gulf of Carpentaria (extent of occurrence unknown). Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. This viviparous species is likely to have high biological productivity (annual reproductive cycle; litter size, 3–5 pups; probable early age-at-maturity and fast growth rates similar to other sharpnose sharks). An evaluation of the potential effects of threatening processes is difficult given that it is only known from a single specimen. The Australian Sharpnose Shark and the Milk Shark are regular catch components of northern Australian fisheries and the fact that the Grey Sharpnose Shark has not been recorded suggests that the original Australia record represents a vagrant. Since its full distribution and interactions with Australian fisheries are unknown, there is currently inadequate information available to assess the Grey Sharpnose Shark beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Australian Sharpnose Shark

CAAB Code 37 018024

Rhizoprionodon taylori (Ogilby, 1915)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Continental shelf

Depth: 0–110 m

Maximum size: 68 cm TL



Assessment Justification: The Australian Sharpnose Shark is a common shark with a wide northern Australian range. Outside of Australian waters, it occurs in southern New Guinea. This viviparous species has high biological productivity due to fast growth rates and early maturity (Amat, 1 year; Amax, 7 years; GL, 4 years; annual reproductive cycle; litter size, 1–10 pups). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF); estimates of fishing mortality rates for this species in the NPF are well below those that would lead to significant population declines. This species is a bycatch of state and territory-managed gillnet and trawl fisheries, but in relatively low numbers, and therefore not at levels that are likely to cause population reduction. There are significant areas of its range where fishing pressure is low or absent which provide refugia. Population trend is unknown, although due to its resilience, refugia, and low and sustainable catch levels, it is not suspected to be close to reaching the population reduction threshold and the Australian Sharpnose Shark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Mod.	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Whitetip Reef Shark

CAAB Code 37 018038

Triaenodon obesus (Rüppell, 1837)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Suspected population reduction approaching 30% over the last 3 generations (41 years) based on trend data & catch levels

Distribution: Indo-Pacific

Habitat: Continental shelf; reefs

Depth: 1–330 m

Maximum size: 170 cm TL



Assessment Justification: The Whitetip Reef Shark is a common coral reef-associated shark with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-Pacific distribution. This viviparous species has limited biological productivity (Amat, 8 years; Amax, 19 years; GL, 13.5 years; biennial reproductive cycle; litter size, 1–5 pups). Its limited movement patterns and high levels of residency make it susceptible to localised population depletion. It is a byproduct of the Queensland Coral Reef Finfish Fishery where catches are low. Catch rate data in the fishery between 1989 and 2006 showed no evidence of increase or decrease of sharks (principally Grey, Whitetip, and Blacktip Reef Sharks) although more sharks were caught in protected areas, suggesting that there have been localised declines. Furthermore, previous visual surveys on the Great Barrier Reef had reported large population declines between fished and protected areas. There are large areas of its habitat which are protected (e.g., in the Great Barrier Reef Marine Park) and other areas of limited fishing effort. Balancing these contrasting situations, it is suspected that the population has undergone a reduction approaching 30% over the last three generations (41 years) and the Whitetip Reef Shark is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery trip catch limit (QLD)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Tiger Shark

CAAB Code 37 018022

Galeocerdo cuvier (Péron & Lesueur, 1822)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (69 years) based on trend data & catch levels

Distribution: Cosmopolitan

Habitat: Pelagic; continental shelf; reefs

Depth: 0–150 m

Maximum size: 740 cm TL



Assessment Justification: The Tiger Shark is a common shark with a wide Australian range (except for southern waters). Outside of Australian waters, it has a wide global tropical and warm-temperate distribution. This viviparous species has limited biological productivity (Amat, 13 years; Amax, 33 years; GL, 23 years; triennial reproductive cycle; litter size, up to 82 pups, mean 26–33). It is a target species of shark control programs in Queensland, New South Wales, and sporadically in Western Australia, a target of recreational fisheries, and a byproduct of commercial shark fisheries. Declines in catch rates have been recorded in the Queensland and New South Wales Shark Control Programs, and in New South Wales game fish tournament records, some the equivalent of >80% population reduction over three generations (69 years). There is also evidence that the species was overfished in remote northwest islands and reefs due to Indonesian fishing activities. However, across its range there are considerable areas of limited fishing effort and so these declines are not considered representative of the entire Australian population. Balancing this, it is inferred that the population has undergone a reduction approaching 30% over the last three generations (69 years) and the Tiger Shark is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	Mod.	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	High	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	–	–

Current Management

- Commercial fishery mixed-species quota (NSW, NT)
- General commercial fishery controls

Conservation Actions

- Monitor population
- Manage catch at sustainable levels
- Reduce post-release mortality
- Identify & protect critical habitat

Winghead Shark

CAAB Code 37 019003

Eusphyra blochii (Cuvier, 1816)

IUCN Red List Category & Criteria

Vulnerable A2d*

*See Supporting Information on following page

Reasons for Listing

Suspected population reduction of >30% over the last 3 generations (42 years) based on catch levels

Distribution: Indo-West Pacific

Habitat: Continental shelf

Depth: 3–127 m

Maximum size: 186 cm TL



Assessment Justification: The Winghead Shark is a common shark with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. This viviparous species has limited biological productivity (Amat, 7 years; Amax, 21 years; GL, 14 years; annual reproductive cycle; litter size, 6–25 pups, mean 11). It appears to have a patchy occurrence in northern Australia. It is a bycatch or byproduct of various state and territory-managed net fisheries but generally in low numbers, the exception being the Northern Territory Offshore Net and Line Fishery where it is caught more regularly. Globally, the species is suspected to have undergone a reduction of >50% over the last three generations (42 years) and is now rarely recorded in some areas. There is genetic evidence of connectivity with southern New Guinea, and this regional connectivity is likely to have considerable bearing on the species' Australian extinction risk status. Given continued mortality in Indonesian, Papua New Guinean, and Australian fisheries, it is suspected that the population has undergone a reduction of >30% over the last three generations (42 years) and the Winghead Shark is assessed as Vulnerable. International co-operation and conservation instruments will be vital to allow the recovery of the species in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Medium
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	High

Current Management

- Commercial fishery mixed-species quota (NT)
- General commercial fishery controls

Conservation Actions

- Protect species
- Recover population
- Mitigate catch
- Reduce post-release mortality
- Maintain river-estuary connectivity

Supporting Information for Winghead Shark

IUCN Red List Category & Criteria: Vulnerable A2d

EPBC Act Status: Not listed

Recommendation: Prioritise data collection

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Suspected population reduction of >30% over the last 3 generations (42 years) based on catch levels
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is likely > 10,000 mature individuals
D	Not applicable: population size is likely > 1,000 mature individuals; AOO > 20 km ² ; > 5 locations
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	2,456,000 km ² unknown	high low
Area of occupancy trend	> 2,000 km ² unknown	low low
No. of mature individuals trend	likely > 10,000 decreasing	low medium
No. subpopulations	unknown	low
No. locations	> 10	high
Generation length*	14 years	high
Global population share	40%	low

*Generation length calculated from age data for this species (Stevens & Lyle 1989, Smart *et al.* 2013).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: population reduction is suspected based on connected regional population (Heupel *et al.* 2020) under high levels of exploitation outside of Australian waters (Smart & Simpfendorfer 2016), life history characteristics (Smart *et al.* 2013, Stevens & Lyle 1989), disappearance from parts of historic range (outside of Australia but demonstrating susceptibility to decline) (Smart & Simpfendorfer 2016), patchy occurrence, and ongoing local fishing effort and catches (e.g., Field *et al.* 2012); further data are required to strengthen the evidence-base underlying this assessment.

Information sources: Field *et al.* (2012); Heupel *et al.* (2020); Smart & Simpfendorfer (2016); Smart *et al.* (2013); Stevens & Lyle (1989).

Scalloped Hammerhead

CAAB Code 37 019001

Sphyrna lewini (Griffith & Smith, 1834)

IUCN Red List Category & Criteria

Endangered A2bd

Reasons for Listing

Inferred population reduction of >50% over the last 3 generations (72 years) based on trend data & catch levels

Distribution: Cosmopolitan

Habitat: Pelagic; continental shelf

Depth: 0–1,000 m

Maximum size: 420 cm TL



Assessment Justification: The Scalloped Hammerhead is a common shark with a wide Australian range (except for southern waters). Outside of Australian waters, it has a wide global tropical and warm-temperate distribution. This viviparous species has limited biological productivity (Amat, 13 years; Amax, 35 years; GL, 24 years; annual or biennial reproductive cycle; litter size, 12–41 pups). It is a mobile species, with recent genetic results demonstrating two possible subpopulations (Western Australia; the rest of Australia) with the non-Western Australian subpopulation connected to Papua New Guinea and Indonesia. The species is a bycatch or byproduct of a variety of Australian fisheries, especially juveniles. Analysis of catches in the Queensland Shark Control Program (1964–2004) showed the equivalent of a 99.8% population reduction over three generations (72 years). Global trend analysis estimated a population reduction of >80% over the last three generations. Given some management measures that are in place in Australia, along with areas of refuge from fishing, it is inferred that the population has undergone a reduction of >50% over the last three generations (72 years) and the Scalloped Hammerhead is assessed as Endangered. International co-operation and conservation instruments will be vital to allow the recovery of the species in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Mod.	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- Conservation Dependent (EPBC Act)
- CITES Appendix II (export limits)
- CMS Appendix II (EPBC listing exemption)
- State protection (NSW)
- Commercial fishery quota (QLD); Commercial fishery mixed-species quota (NT)

Conservation Actions

- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Great Hammerhead

CAAB Code 37 019002

Sphyrna mokarran (Rüppell, 1837)

IUCN Red List Category & Criteria

Endangered A2bd

Reasons for Listing

Inferred population reduction of >50% over the last 3 generations (71 years) based on trend data & catch levels

Distribution: Cosmopolitan

Habitat: Pelagic; continental shelf; reefs

Depth: 0–80 m

Maximum size: 600 cm TL



Assessment Justification: The Great Hammerhead is a common shark with a wide Australian range (except for southern waters). Outside of Australian waters, it has a wide global tropical and warm-temperate distribution. This viviparous species has limited biological productivity (Amat, 8 years; Amax, 39 years; GL, 23.5 years; probable biennial reproductive cycle; litter size, 6–42 pups). It is a mobile species which can be considered one connected population in the Indo-Pacific. The species is a bycatch or byproduct of a variety of Australian fisheries, but in lower numbers than the Scalloped Hammerhead. A global analysis of Great Hammerhead extinction risk status suggested a population reduction of >80% over the last three generations (71 years) for the Indo-Pacific. While data are lacking from Australia, the congeneric and co-occurring Scalloped Hammerhead has undergone severe declines, inferring declines are likely for the Great Hammerhead. Given management measures established for Scalloped Hammerheads which will work to protect the Great Hammerhead, along with areas of refuge from fishing, it is inferred that the population has undergone a reduction of >50% over the last three generations (71 years) and the Great Hammerhead is assessed as Endangered. International co-operation and conservation instruments will be vital to allow the recovery of the species in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Mod.	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- CITES Appendix II (export limits)
- CMS Appendix II (EPBC listing exemption)
- State protection (NSW)
- Commercial fishery mixed-species quota (NT)
- General commercial fishery controls

Conservation Actions

- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Smooth Hammerhead

CAAB Code 37 019004

Sphyrna zygaena (Linnaeus, 1758)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (59 years) based on trend data & catch levels

Distribution: Cosmopolitan

Habitat: Pelagic; continental shelf

Depth: 0–60 m

Maximum size: 400 cm TL



Assessment Justification: The Smooth Hammerhead is a common shark with a wide southern Australian range. Outside of Australian waters, it has a wide global tropical and temperate distribution. This viviparous species has limited biological productivity, although it is the most productive of the large hammerheads (Amat, 15 years; Amax, 24 years; GL, 19.5 years; probable biennial reproductive cycle; litter size, 20–50 pups). There is no evidence of connectivity between the Atlantic and the Indo-Pacific, but regional connectivity is poorly-known. The species is a bycatch or byproduct of a variety of state-managed fisheries particularly in New South Wales and Western Australia. Analysis of hammerhead catches (comprised mostly of Smooth Hammerhead) in the New South Wales Shark Control Program showed an ~85% decline over the period 1973–2008. This contrasts with stable or increasing catch rates in commercial gillnetting off southwest Western Australia. Balancing these trends, it is inferred that the population has undergone a reduction approaching 30% over the last three generations (59 years) and the Smooth Hammerhead is assessed as Near Threatened. International co-operation and conservation instruments will likely be vital to ensure the species does not become threatened in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	Low	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	Mod.	Target
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	High
Connectivity	Assess connectivity	Medium

Current Management

- CITES Appendix II (export limits)
- CMS Appendix II (EPBC listing exemption)
- Commercial fishery mixed-species quota (NSW)
- General commercial fishery controls

Conservation Actions

- Monitor population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat



Largetooth Sawfish. Image: Brittany Finucci

Narrow Sawfish

CAAB Code 37 025002

Anoxypristis cuspidata (Latham, 1794)

IUCN Red List Category & Criteria

Vulnerable A2d*

*See Supporting Information on following page

Reasons for Listing

Suspected population reduction of >30% over the last 3 generations (18 years) based on catch levels

Distribution: Indo-West Pacific

Habitat: Continental shelf; estuaries

Depth: 0–40 m

Maximum size: 350 cm TL



Assessment Justification: The Narrow Sawfish is a common ray with a wide northern Australian range. Outside of Australian waters, it once had a wide tropical Indo-West Pacific distribution. This species is the most biologically productive of the sawfishes (Amat, 3 years; Amax, 9 years; GL, 6 years; litter size, 5–16 pups). All Australian sawfish populations were depleted historically with the development of gillnet and trawl fisheries due to their high catchability. This species remains the most regularly caught sawfish in the Commonwealth-managed Northern Prawn Fishery (NPF), as well as in state and territory-managed trawl and gillnet fisheries. Estimates of fishing mortality rates for the species in the NPF are reportedly below a rate that would lead to significant population declines, although when combined with gillnet catches, it is inferred to exceed sustainable levels. The significant population reduction in the Narrow Sawfish largely occurred prior to the last three generations (pre-2000s), noting that protection and management measures have reduced mortality over the last 1–2 decades. Over the last three generations (18 years), it is suspected that the population has undergone a reduction of >30% and the Narrow Sawfish is assessed as Vulnerable. Although threatened here, Australia represents the most significant remaining global location for this species.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	High

Current Management

- Migratory (EPBC Act)
- CITES Appendix I
- CMS Appendices I & II
- State protections (QLD, WA)
- General commercial fishery controls

Conservation Actions

- Recover population
- Mitigate catch
- Reduce post-release mortality
- Maintain river-estuary connectivity

Supporting Information for Narrow Sawfish

IUCN Red List Category & Criteria: Vulnerable A2d

EPBC Act Status: Not listed

Recommendation: Consider listing

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Suspected population reduction of >30% over the last 3 generations (18 years) based on catch levels
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is likely > 10,000 mature individuals
D	Not applicable: population size is likely > 1,000 mature individuals; AOO > 20 km ² ; > 5 locations
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	2,824,800 km ² unknown	high low
Area of occupancy trend	> 2,000 km ² unknown	low low
No. of mature individuals trend	likely > 10,000 decreasing	low medium
No. subpopulations	1	medium
No. locations	> 10	high
Generation length*	6 years	high
Global population share	80%	low

*Generation length calculated from age data for this species (Peverell 2009).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: population reduction is suspected based on bycatch levels (Brewer *et al.* 2006, Field *et al.* 2008, 2013, Harry *et al.* 2011b, White *et al.* 2013, Wueringer 2017, Zhou & Griffiths 2008); this is the most regularly caught sawfish and interactions are inferred to be at an unsustainable level (when combining trawl and gillnet catch levels); extent of Australian decline is presumptive as species-specific time-series are lacking; if the Australian population is connected regionally (Green *et al.* 2018), heavy fishing pressure in adjacent areas and documented global declines and range contraction of sawfishes (D'Anastasi *et al.* 2013, Dulvy *et al.* 2016, Yan *et al.* 2021) will have contributed to Australian declines.

Information sources: Brewer *et al.* (2006); D'Anastasi *et al.* (2013); Dulvy *et al.* (2016); Field *et al.* (2008, 2013); Green *et al.* (2018); Harry *et al.* (2011b); Peverell (2009); White *et al.* (2013); Wueringer (2017); Yan *et al.* (2021); Zhou & Griffiths (2008).

Dwarf Sawfish

CAAB Code 37 025004

Pristis clavata Garman, 1906

IUCN Red List Category & Criteria

Endangered A2d*

*See Supporting Information on following page

Reasons for Listing

Suspected population reduction of >50% over the last 3 generations (49 years) based on catch levels

Distribution: Australasia

Habitat: Continental shelf; estuaries; rivers

Depth: 0–20 m

Maximum size: 318 cm TL



Assessment Justification: The Dwarf Sawfish is a rare ray with a wide northern Australian range. Outside of Australian waters, it only occurs in Papua New Guinea and is extinct from the rest of its former tropical Eastern Indian and Western Pacific distribution. This viviparous species has limited biological productivity (Amat, 8 years; Amax, 34 years; GL, 16.4 years; suspected annual or biennial reproductive cycle with litter size <20). All Australian sawfish populations were depleted historically with the development of gillnet and trawl fisheries due to their high catchability. This species remains a bycatch of the Commonwealth-managed Northern Prawn Fishery, as well as state and territory-managed trawl and gillnet fisheries. Because of its preference for shallow nearshore waters, it is caught much less regularly in trawl fisheries than other sawfish species, and its major threat are inshore gillnet fisheries. The significant population reduction in the Dwarf Sawfish largely occurred prior to the last three generations (pre-1970), noting that protection and management measures have reduced mortality over the last 1–2 decades. Over the last three generations (49 years), it is suspected that the population has undergone a reduction of >50% and the Dwarf Sawfish is assessed as Endangered. Although threatened here, Australia represents the most significant remaining global location for this species.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: habitat degradation; freshwater flow alteration		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	High

Current Management

- Vulnerable & Migratory (EPBC Act)
- Recovery Plan
- CITES Appendix I
- CMS Appendices I & II
- State & territory protections (NT, QLD, WA)
- General commercial fishery controls

Conservation Actions

- Recover population
- Mitigate catch
- Reduce post-release mortality
- Maintain river-estuary connectivity

Supporting Information for Dwarf Sawfish

IUCN Red List Category & Criteria: Endangered A2d

EPBC Act Status: Vulnerable

Recommendation: Consider up-listing

Recovery Plan: DoE (2015). Sawfish and river sharks multispecies recovery plan. Department of the Environment (DoE), Canberra (due for review).

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Suspected population reduction of >50% over the last 3 generations (49 years) based on catch levels
B	Not applicable: EOO>20,000 km ² ; AOO >2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is possibly <10,000 mature individuals
D	Not applicable: population size is likely >1,000 mature individuals; AOO >20 km ² ; >5 locations
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	2,453,900 km ² unknown	high low
Area of occupancy trend	>2,000 km ² unknown	low low
No. of mature individuals trend	possibly <10,000 decreasing	low medium
No. subpopulations	unknown	low
No. locations	>10	high
Generation length*	16.4 years	high
Global population share	90%	medium

*Generation length calculated from age data for this species (Peeverell 2009, Moreno Iturria 2012).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: suspected population reduction of >50% over the last three generations is more likely than current EPBC Act status of Vulnerable (>30% reduction) due to the extent of historical declines including global population reduction and reduction in extent of occurrence (Dulvy *et al.* 2016, Kyne *et al.* 2013b, Yan *et al.* 2021) (although extent of Australian decline is presumptive as species-specific time-series are lacking); local mortality is ongoing due to bycatch levels (Field *et al.* 2008, 2013, Kyne *et al.* 2013b, Wueringer 2017); some refuge in remote shallow inshore waters; if the Australian population is connected regionally, heavy fishing pressure in adjacent areas will have contributed to Australian declines.

Information sources: Dulvy *et al.* (2016); Field *et al.* (2008, 2013); Kyne *et al.* (2013b); Moreno Iturria (2012); Peeverell (2009); Phillips *et al.* (2011, 2017); Wueringer (2017); Yan *et al.* (2021).

Largetooth Sawfish

Pristis pristis (Linnaeus, 1758)

IUCN Red List Category & Criteria

Critically Endangered A2d*

*See Supporting Information on following page

Reasons for Listing

Suspected population reduction of >80% over the last 3 generations (66 years) based on catch levels

Distribution: Cosmopolitan

Habitat: Continental shelf; estuaries, rivers

Depth: 0–25 m

Maximum size: 705 cm TL



Assessment Justification: The Largetooth Sawfish was a historically common euryhaline ray with a wide northern Australian range. Outside of Australian waters, it once had a wide global tropical distribution. This viviparous species has limited biological productivity (Amat, 8 years; Amax, 36 years; GL, 22 years; annual reproductive cycle; litter size, 1–20 pups). All Australian sawfish populations were depleted historically with the development of gillnet and trawl fisheries due to their high catchability. It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF), as well as state and territory-managed trawl and gillnet fisheries. Estimates of fishing mortality rates for the species in the NPF are reportedly below a rate that would lead to significant population declines, although when combined with gillnet catches in northern Australia, it is inferred to exceed sustainable levels. The northern Australian development agenda may increase cumulative risk from habitat loss and freshwater flow regulation. Based on population depletion and ongoing mortality (at reduced levels given protection and management measures), it is suspected that the population has undergone a reduction of >80% over the last three generations (66 years) and the Largetooth Sawfish is assessed as Critically Endangered. Although threatened here, Australia represents the most significant remaining global location for this species.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	High	Target
Fishing - shark control	Low	Bycatch
Other: habitat degradation; freshwater flow alteration		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Medium

Current Management

- Vulnerable & Migratory (EPBC Act)
- Recovery Plan
- CITES Appendix I
- CMS Appendices I & II
- State & territory protections (NT, QLD, WA)
- General commercial fishery controls

Conservation Actions

- Recover population
- Mitigate catch
- Reduce post-release mortality
- Maintain river-estuary connectivity

Supporting Information for Largetooth Sawfish

IUCN Red List Category & Criteria: Critically Endangered A2d

EPBC Act Status: Vulnerable

Recommendation: Consider up-listing

Recovery Plan: DoE (2015). Sawfish and river sharks multispecies recovery plan. Department of the Environment (DoE), Canberra (due for review).

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Suspected population reduction of >80% over the last 3 generations (66 years) based on catch levels
B	Not applicable: EOO>20,000 km ² ; AOO >2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is possibly <10,000 mature individuals
D	Not applicable: population size is likely >1,000 mature individuals; AOO >20 km ² ; >5 locations
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	2,274,800 km ² unknown	high low
Area of occupancy trend	>2,000 km ² unknown	low low
No. of mature individuals trend	possibly <10,000 decreasing	low medium
No. subpopulations	>5	high
No. locations	>10	high
Generation length*	22 years	high
Global population share	60%	low

*Generation length calculated from age data for this species (Peverell 2009, Kyne *et al.* 2021b).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: suspected population reduction of >80% over the last three generations is more likely than current EPBC Act status of Vulnerable (>30% reduction) due to the extent of historical declines including global population reduction and reduction in extent of occurrence (Dulvy *et al.* 2016, Kyne *et al.* 2013a, Yan *et al.* 2021) (although extent of Australian decline is presumptive as species-specific time-series are lacking); local mortality is ongoing due to bycatch levels (Field *et al.* 2008, 2013, Kyne *et al.* 2013a, Wueringer 2017, Zhou & Griffiths 2008); natural mortality levels appear high (Buckley *et al.* 2020) (with possible suppression of recovery due to predation by the recovered Estuarine Crocodile *Crocodylus porosus*); increased susceptibility to multiple threats due to euryhaline life cycle including water resource development (Lear *et al.* 2019); if the Australian population is connected regionally, heavy fishing pressure in adjacent areas (Dulvy *et al.* 2016, Kyne *et al.* 2013a, Yan *et al.* 2021) will have contributed to Australian declines.

Information sources: Buckley *et al.* (2020); Dulvy *et al.* (2016); Feutry *et al.* (2015); Field *et al.* (2008, 2013); Kyne *et al.* (2013a, 2021b); Lear *et al.* (2019); Peverell (2009); Phillips *et al.* (2011, 2017); Wueringer (2017); Yan *et al.* (2021); Zhou & Griffiths (2008).

Green Sawfish

CAAB Code 37 025001

Pristis zijsron Bleeker, 1851

IUCN Red List Category & Criteria

Critically Endangered A2cd*

*See Supporting Information on following page

Reasons for Listing

Suspected population reduction of >80% over the last 3 generations (50 years) based on a decline in area of occupancy & catch levels

Distribution: Indo-West Pacific

Habitat: Continental shelf; estuaries

Depth: 0–70 m

Maximum size: 730 cm TL



Assessment Justification: The Green Sawfish was a historically common ray with a wide Australian range (except for southern waters). Outside of Australian waters, it once had a wide Indo-West Pacific distribution. This viviparous species has limited biological productivity (Amat, 9 years; GL, 16.5 years; suspected annual or biennial reproductive cycle with litter size <20). All Australian sawfish populations were depleted historically with the development of gillnet and trawl fisheries due to their high catchability. Once found south to Sydney, its east coast range has contracted to north Queensland. It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF), as well as state and territory-managed trawl and gillnet fisheries. Estimates of fishing mortality rates for the species in the NPF are reportedly below a rate that would lead to significant population declines, although when combined with gillnet catches it is inferred to exceed sustainable levels. Based on population depletion, a decline in area of occupancy, and ongoing mortality (noting that protection and management measures have reduced mortality over the last 1–2 decades), it is suspected that the population has undergone a reduction of >80% over the last three generations (50 years) and the Green Sawfish is assessed as Critically Endangered. Although threatened here, Australia represents the most significant remaining global location for this species.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: habitat degradation; freshwater flow alteration		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction	High
Connectivity	Assess connectivity	High

Current Management

- Vulnerable & Migratory (EPBC Act)
- Recovery Plan
- CITES Appendix I
- CMS Appendices I & II
- State & territory protections (NT, QLD, WA)
- General commercial fishery controls

Conservation Actions

- Recover population
- Mitigate catch
- Reduce post-release mortality
- Maintain river-estuary connectivity

Supporting Information for Green Sawfish

IUCN Red List Category & Criteria: Critically Endangered A2cd

EPBC Act Status: Vulnerable

Recommendation: Consider up-listing

Recovery Plan: DoE (2015). Sawfish and river sharks multispecies recovery plan. Department of the Environment (DoE), Canberra (due for review).

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Suspected population reduction of >80% over the last 3 generations (44 years) based on a decline in area of occupancy & catch levels
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is possibly < 10,000 mature individuals
D	Not applicable: population size is likely > 1,000 mature individuals; AOO > 20 km ² ; > 5 locations
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	3,383,100 km ² unknown	high low
Area of occupancy trend	> 2,000 km ² unknown	low low
No. of mature individuals trend	possibly < 10,000 decreasing	low medium
No. subpopulations	unknown	low
No. locations	> 10	high
Generation length*	16.5 years	high
Global population share	80%	low

*Generation length calculated from age data for this species (Peverell 2009).

Reason for change from EPBC Act listing

genuine change
 new knowledge
 taxonomic change
 previous mistake
 no change

Explanation: suspected population reduction of >80% over the last three generations is more likely than current EPBC Act status of Vulnerable (>30% reduction) due to the extent of historical declines including global population reduction and reduction in extent of occurrence (Dulvy *et al.* 2016, Simpfendorfer 2013, Yan *et al.* 2021); the species is Extinct in New South Wales and parts of Queensland indicating considerable population reduction and decline in area of occupancy (Harry *et al.* 2011b, NSW FSC 2008); local mortality is ongoing due to bycatch levels (Field *et al.* 2008, 2013, Harry *et al.* 2011b, Wueringer 2017, Zhou & Griffiths 2008); some refuge in remote shallow inshore waters; if the Australian population is connected regionally, heavy fishing pressure in adjacent areas (Dulvy *et al.* 2016, Simpfendorfer 2013, Yan *et al.* 2021) will have contributed to Australian declines.

Information sources: Dulvy *et al.* (2016); Field *et al.* (2008, 2013); Harry *et al.* (2011b); NSW FSC (2008); Peverell (2009); Phillips *et al.* (2011, 2017); Simpfendorfer (2013); Wueringer (2017); Yan *et al.* (2021); Zhou & Griffiths (2008).

Shark Ray

CAAB Code 37 026002

Rhina ancylostoma Bloch & Schneider, 1801

IUCN Red List Category & Criteria

Near Threatened A2d

Reasons for Listing

Suspected population reduction approaching 30% over the last 3 generations (45 years) based on catch levels

Distribution: Indo-West Pacific

Habitat: Continental shelf; reefs

Depth: 0–70 m

Maximum size: 270 cm TL



Assessment Justification: The Shark Ray is a rare and poorly-known ray with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. This viviparous species has limited biological productivity (estimated GL, 15 years; litter size, 2–11 pups). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (and should be effective at excluding this species). Estimates of fishing mortality rates for wedgefishes in the NPF are well below those that would lead to significant population declines. It is not a regular bycatch of any state or territory fishery as it seems to be rarely encountered. The global population is inferred to have undergone a reduction of >80% over the last three generations (45 years) with steep decline estimates in waters adjacent to Australia (i.e., Indonesia). Connectivity between Australia and Indonesia is suspected, and because of this, as well as limited productivity, it is suspected that the Australian population has undergone a reduction approaching 30% over the last three generations (45 years) and the Shark Ray is assessed as Near Threatened. International co-operation and conservation instruments will be vital to ensure the species does not become threatened in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	Assess connectivity	High

Current Management

- Commercial fishery mixed-species trip catch limit (QLD)
- General commercial fishery controls

Conservation Actions

- Monitor population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Bottlenose Wedgefish

CAAB Code 37 026005

Rhynchobatus australiae Whitley, 1939

IUCN Red List Category & Criteria

Near Threatened A2d

Reasons for Listing

Suspected population reduction approaching 30% over the last 3 generations (45 years) based on catch levels

Distribution: Indo-West Pacific

Habitat: Continental shelf

Depth: 0–60 m

Maximum size: 300 cm TL



Assessment Justification: The Bottlenose Wedgefish is a common ray with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. This viviparous species has limited biological productivity (estimated GL, 15 years; litter size, 7–19 pups). *Rhynchobatus* species are a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller individuals). Estimates of fishing mortality rates for wedgefishes in the NPF are below those that would lead to significant population declines. It is retained in some New South Wales and Queensland fisheries. The global population is inferred to have undergone a reduction of >80% over the last three generations (45 years) with steep decline estimates in waters adjacent to Australia (i.e., Indonesia). Connectivity between Australia and Indonesia is suspected, and with moderate fishing pressure in Australia and limited productivity, it is suspected that the Australian population has undergone a reduction approaching 30% over the last three generations (45 years) and the Bottlenose Wedgefish is assessed as Near Threatened. International co-operation and conservation instruments will be vital to ensure the species does not become threatened in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	Assess connectivity	High

Current Management

- CMS Appendix II (EPBC listing exemption)
- Commercial fishery mixed-species trip catch limit (QLD)
- General commercial fishery controls

Conservation Actions

- Monitor population
- Manage catch at sustainable levels
- Reduce post-release mortality
- Identify & protect critical habitat

Eyebrow Wedgefish

CAAB Code 37 026004

Rhynchobatus palpebratus Compagno & Last, 2008

IUCN Red List Category & Criteria

Near Threatened A2d

Reasons for Listing

Suspected population reduction approaching 30% over the last 3 generations (45 years) based on catch levels

Distribution: Australasia

Habitat: Continental shelf

Depth: 5–60 m

Maximum size: 262 cm TL



Assessment Justification: The Eyebrow Wedgefish is a common ray with a wide northern Australian range. Outside of Australian waters, its distribution is poorly-defined. This viviparous species has limited biological productivity (estimated GL, 15 years; litter size probably <20 pups like other wedgefishes). *Rhynchobatus* species are a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller individuals). Estimates of fishing mortality rates for wedgefishes in the NPF are well below those that would lead to significant population declines. It is retained in some Queensland fisheries. Outside of Australian waters, it is inferred to have undergone a severe population reduction along with all Indo-West Pacific wedgefishes (with steep decline estimates in waters adjacent to Australia i.e., Indonesia). Connectivity between Australia and Indonesia is suspected, and with moderate fishing pressure in Australia and limited productivity, it is suspected that the Australian population has undergone a reduction approaching 30% over the last three generations (45 years) and the Eyebrow Wedgefish is assessed as Near Threatened. International co-operation and conservation instruments will be vital to ensure the species does not become threatened in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	Assess connectivity	High

Current Management

- Commercial fishery mixed-species trip catch limit (QLD)
- General commercial fishery controls

Conservation Actions

- Monitor population
- Manage catch at sustainable levels
- Reduce post-release mortality
- Identify & protect critical habitat

Giant Guitarfish

CAAB Code 37 027010

Glaucostegus typus (Anonymous [Bennett], 1830)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental shelf

Depth: 0–100 m

Maximum size: 284 cm TL



Assessment Justification: The Giant Guitarfish is a common ray with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Eastern Indian and Western Pacific distribution. This viviparous species has limited biological productivity (Amat, 6–8 years; Amax, 19 years; estimated GL, 15 years; probable annual reproductive cycle with litter size <25 pups like other giant guitarfishes). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller individuals). Estimates of fishing mortality rates for this species in the NPF are below those that would lead to significant population declines. It is also a bycatch of various state and territory-managed fisheries. However, significant areas of this species’ range are only lightly fished or unfished, including intertidal waters which juveniles inhabit, and marine reserves provide further refuge. The overall population trend is suspected to be stable. There is nothing to infer or suspect population reduction at this time and the Giant Guitarfish is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	Assess connectivity	High

Current Management

- Commercial fishery mixed-species trip catch limit (QLD)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Maintain river-estuary connectivity

Goldeneye Shovelnose Ray

CAAB Code 37 027010

Rhinobatos sainsburyi Last, 2004

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australia & Indonesia

Habitat: Continental shelf

Depth: 70–200 m

Maximum size: 60 cm TL



Assessment Justification: The Goldeneye Shovelnose Ray is a common but poorly-known ray with a wide northwest Australian range. Outside of Australian waters, it occurs in Indonesia. Little biological data are available on this viviparous species (suspected to have an annual reproductive cycle with litter size <20 pups). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery which generally operates at 10–60 m. The use of Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller species such as this). It is also a bycatch of the Western Australian Pilbara Fish Trawl Fishery, which operates primarily at depths of 50–110 m, and the Northern Territory Demersal Fishery and Timor Reef Fishery. Collectively, these fisheries largely operate outside the species’ depth range and with considerable areas of Western Australia’s North Coast Bioregion and the Northern Territory closed to trawling through spatial management arrangements, much of its range receives limited to no fishing effort. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Goldeneye Shovelnose Ray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Eastern Shovelnose Ray

CAAB Code 37 027009

Aptychotrema rostrata (Shaw, 1794)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–220 m

Maximum size: 120 cm TL



Assessment Justification: The Eastern Shovelnose Ray is a common endemic ray with a wide eastern Australian range. This viviparous species has limited biological productivity (annual reproductive cycle; litter size, 4–20 pups). It is a regular component of the bycatch of inshore and shelf trawl fisheries, as well as other fishing gear and parts of its geographic and depth range are under relatively significant pressure from trawling activities. It is one of the most abundant bycatch sharks and rays in the Queensland East Coast Trawl Fishery. Turtle Exclusion Devices, which are mandatory, are likely to reduce the capture of larger individuals but have been shown to have limited effectiveness at reducing overall capture rates. In other inshore fisheries, it is retained and marketed (particularly in New South Wales) and it is also regularly taken by recreational fishers. Despite high levels of bycatch and its occurrence within a geographic area which is subject to considerable fishing activities, post-release survivorship is high, it remains abundant in a variety of habitats, and some refuges are available in marine protected areas, in particular Moreton Bay Marine Park. While it is possible that some declines have occurred in areas with a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Eastern Shovelnose Ray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Mod.	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess age	Low
Connectivity	–	–

Current Management

- Commercial fishery mixed-species trip catch limit (QLD)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Spotted Shovelnose Ray

CAAB Code 37 027007

Aptychotrema timorensis Last, 2004

IUCN Red List Category & Criteria

Vulnerable B1ab(v)*

*See Supporting Information on following page

Reasons for Listing

Extent of occurrence <20,000 km²; known from 1 location; inferred continuing decline in the number of mature individuals

Distribution: Australia & Indonesia**Habitat:** Continental shelf**Depth:** 124 m**Maximum size:** 58 cm TL

Assessment Justification: The Spotted Shovelnose Ray is a rare and poorly-known ray with a restricted Timor Sea range off the Northern Territory on the very edge of Australia's Exclusive Economic Zone (EEZ) (extent of occurrence <20,000 km²). Little biological data are available on this viviparous species (probable annual reproductive cycle with litter size <20 pups). It is a possible bycatch of northern Australian trawl fisheries, although this is likely to be negligible based on its depth of occurrence. Fishing pressure in Indonesian waters of the Timor Sea adjacent to the Australian EEZ is intense and unregulated. A continuing decline is inferred from a likely connected Indonesian population subject to unregulated fisheries (where rays are targeted), and from illegal fishing in Australian waters which is an ongoing issue (although with a significant decrease in recent years). It is even possible that steep declines may have occurred historically for this species as there have only been a few specimens encountered despite extensive survey work throughout their range. While there is considerable uncertainty concerning the population status of this species, the Spotted Shovelnose Ray is assessed as Vulnerable due to an estimated extent of occurrence of <20,000 km², occurrence in 1 location, and an inferred continuing decline in the number of mature individuals.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	Assess connectivity	High

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Protect species
- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for Spotted Shovelnose Ray

IUCN Red List Category & Criteria: Vulnerable B1ab(v)

EPBC Act Status: Not listed

Recommendation: Prioritise data collection

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Not applicable: no data or evidence to support population reduction approaching the thresholds
B	Extent of occurrence ~18,000 km ² ; known from 1 location; inferred continuing decline in the number of mature individuals
C	Not applicable: there is no reliable estimate of population size although it is possibly <10,000 mature individuals
D	Not applicable: although <5 locations, population size is likely >1,000 mature individuals; AOO is likely >20 km ²
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	~18,000 km ² unknown	medium low
Area of occupancy trend	unknown unknown	low low
No. of mature individuals trend	possibly <10,000 decreasing	low low
No. subpopulations	1	low
No. locations	1	high
Generation length*	13 years	low
Global population share	50%	low

*Generation length is inferred from the Shortnose Guitarfish *Zapteryx brevirostris* (Carmo *et al.* 2018, D'Alberto *et al.* 2019).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: extent of occurrence calculated as below the Criterion B thresholds; species records are on the edge of the Australian Exclusive Economic Zone (Last 2004) and rays are heavily exploited in adjacent Indonesia (White & Dharmadi 2007) (in addition to illegal fishing in Australian waters), inferring a continuing decline from high levels of exploitation (Last *et al.* 2015); further data are required to strengthen the evidence-base underlying this assessment.

Information sources: Carmo *et al.* (2018), D'Alberto *et al.* (2019); Last (2004); Last *et al.* (2015); White & Dharmadi (2007).

Western Shovelnose Ray

CAAB Code 37 027001

Aptychotrema vincentiana (Haacke, 1885)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic**Habitat:** Continental shelf**Depth:** 0–125 m**Maximum size:** 84 cm TL

Assessment Justification: The Western Shovelnose Ray is a common endemic ray with a wide southern and Western Australian range. This viviparous species has limited biological productivity (suspected annual reproductive cycle; litter size, 14–16 pups). It is subject to capture in a variety of fisheries throughout its range, yet bycatch data for this species is poorly reported. It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery, primarily in the Great Australian Bight. In Western Australia (the core of its range), it is commonly encountered in trawl and to a lesser extent, gillnet fisheries. Information on post-release survivorship suggested that >50% of trawl caught Western Shovelnose Rays off southwest Western Australia died from capture. There is some commercial retention in Western Australia, as well as some recreational take. However, there are significant areas of its distribution (e.g., western Great Australian Bight; shallow inshore waters) with limited or no fishing effort, which would provide the species with some refuge from major fishing gear. While it is possible that some declines have occurred in areas with a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Western Shovelnose Ray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Mod.	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Southern Fiddler Ray

CAAB Code 37 027011

Trygonorrhina dumerilii Castelnau, 1873

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 5–205 m

Maximum size: 146 cm TL



Assessment Justification: The Southern Fiddler Ray is a common endemic ray with a wide southern Australian range. This viviparous species has limited biological productivity (Amax, 15 years; annual reproductive cycle; litter size, 2–5 pups). It is subject to capture in a variety of fisheries throughout its range, yet bycatch data for this species are poorly reported. It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), primarily in the Great Australian Bight, where standardised catch-per-unit-effort between 2000 and 2006 showed no overall trend (although acknowledging the short length of this time-series). There is some retention as byproduct in the SESSF but the majority is discarded. Post-release survival is thought to be high in fiddler rays. It is also a bycatch of South Australian and Western Australian state trawl, demersal longline, and to a lesser extent, demersal gillnet fisheries. However, there are significant areas of its distribution (e.g., western Great Australian Bight; shallow inshore waters) with limited or no fishing effort, which would provide the species with some refuge from major fishing gear. While it is possible that some declines have occurred in areas with a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Southern Fiddler Ray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Mod.	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Eastern Fiddler Ray

CAAB Code 37 027006

Trygonorrhina fasciata Müller & Henle, 1841

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–100 m

Maximum size: 120 cm TL



Assessment Justification: The Eastern Fiddler Ray is a common endemic ray with a relatively restricted eastern Australian range (although with an extent of occurrence >20,000 km²). This viviparous species is suspected to have limited biological productivity (life history parameters probably like the Southern Fiddler Ray: Amax, 15 years; annual reproductive cycle; litter size, 2–5 pups). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where standardised catch-per-unit-effort (CPUE) between 1998 and 2006 suggested a decreasing trend. This is, however, likely due a very high CPUE in the first year of the time-series, dropping in the second year, after which it remained stable. There is some retention as byproduct in the SESSF but the majority is discarded. In New South Wales and southern Queensland, it is a bycatch of trawl fisheries with some retention in the former. Despite high levels of bycatch and its occurrence within a geographic area which is subject to considerable fishing activities, post-release survivorship is high, it remains abundant in a variety of habitats, and some refuge is available in shallow waters. While it is possible that some declines have occurred in areas with a long history of fishing, it is not suspected to be close to reaching the population reduction threshold and the Eastern Fiddler Ray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Mod.	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Western Numbfish

CAAB Code 37 028004

Narcinops lasti (de Carvalho & Séret, 2002)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental slope

Depth: 180–320 m

Maximum size: 37 cm TL



Assessment Justification: The Western Numbfish is a poorly-known endemic ray with a wide northwest and Western Australian range. Little biological data are available on this viviparous species (litter size, 2 pups). It is a probable bycatch of deeper water trawl fisheries, however there is limited fishing effort across most of the species' distribution. The Western Numbfish is generally at depths beyond inshore fisheries, while Commonwealth-managed deeper water trawl fisheries off Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery) have limited effort with only a small number of active vessels. It is a bycatch of the Northern Territory Demersal Fishery but it occurs at depths mostly outside those fished. Electric rays have no commercial value and are discarded when caught (although post-release mortality is unknown). Considerable areas of Western Australia's North Coast Bioregion and the Northern Territory are closed to trawling through spatial management arrangements, which may provide a refuge. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Western Numbfish is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Eastern Numbfish

CAAB Code 37 028008

Narcinops nelsoni (de Carvalho, 2008)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 140–540 m

Maximum size: 35 cm TL



Assessment Justification: The Eastern Numbfish is a poorly-known endemic ray with a relatively restricted northeast Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this viviparous species (litter size is suspected to be small). It is a possible bycatch of deeper water fisheries, however there is limited fishing effort across the species' distribution. The Eastern Numbfish is generally at depths beyond inshore fisheries, while the Commonwealth-managed Coral Sea Fishery is a relatively small-scale fishery with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery). Additionally, significant protection is now provided by the Coral Sea Marine Park. It is unlikely to regularly interact with Queensland-managed fisheries due to limited fishing effort where it occurs. Electric rays have no commercial value and are discarded when caught (although post-release mortality is unknown). Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Eastern Numbfish is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Ornate Numbfish

CAAB Code 37 028007

Narcinops ornata (de Carvalho, 2008)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 48–130 m

Maximum size: 24 cm TL



Assessment Justification: The Ornate Numbfish is a poorly-known endemic ray with a wide northern Australian range. Little biological data are available on this viviparous species (litter size is suspected to be small). The Ornate Numbfish is mostly at depths beyond the Commonwealth-managed Northern Prawn Fishery which generally operates at 10–60 m. At times, vessels operate at greater depths (to 300 m) targeting scampi, but the level of effort is minimal and highly sporadic. It is also a possible bycatch of the Northern Territory Demersal Fishery. Electric rays have no commercial value and are discarded when caught (although post-release mortality is unknown). Considerable areas of Western Australia's North Coast Bioregion and the Northern Territory are closed to trawling through spatial management arrangements, which may provide a refuge. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Ornate Numbfish is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Tasmanian Numbfish

CAAB Code 37 028002

Narcinops tasmaniensis (Richardson, 1841)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 5–640 m

Maximum size: 47 cm TL



Assessment Justification: The Tasmanian Numbfish is a common endemic ray with a wide southern Australian range. Little biological data are available on this viviparous species (litter size, 1–8 pups). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery, with an increasing trend in catch-per-unit-effort between 2000 and 2006 (although acknowledging the short length of this time-series). It is also a probable bycatch of state-managed trawl fisheries in New South Wales and South Australia. There are areas of the species' range which receive only low levels of fishing effort, or where trawling is largely absent (e.g., shallow inshore waters; Bass Strait) which would provide some refuge from major fishing gear in that area. Electric rays have no commercial value and are discarded when caught (although post-release mortality is unknown). Based on an apparent increasing population trend, there is nothing to infer or suspect population reduction at this time and the Tasmanian Numbfish is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Banded Numbfish

CAAB Code 37 028005

Narcinops westraliensis (McKay, 1966)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 10–70 m

Maximum size: 29 cm TL



Assessment Justification: The Banded Numbfish is a common endemic ray with a relatively restricted Western Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this viviparous species (litter size is suspected to be small). It is a bycatch of inshore Western Australian prawn and fish trawl fisheries, but both fishing effort and the operational area of these fisheries are small relative to the species' range. Considerable areas of Western Australia's North Coast Bioregion are closed to trawling through spatial management arrangements. Electric rays have no commercial value and are discarded when caught (although post-release mortality is unknown). Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Banded Numbfish is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Coffin Ray

CAAB Code 37 028001

Hypnos monopterygius (Shaw, 1795)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–220 m

Maximum size: 63 cm TL



Assessment Justification: The Coffin Ray is a common endemic ray with a wide Australian range. Little biological data are available on this viviparous species (litter size, 4–8 pups). It is a very hardy species, apparently capable of surviving out of the water for several hours. It is a bycatch of various inshore and shelf trawl fisheries across its range, with its limited mobility and behavioural ecology (cryptic benthic ambush predator) increasing its catchability. It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery and is also a bycatch of various state-managed fisheries including the Queensland East Coast Otter Trawl Fishery and the New South Wales Ocean Trawl Fishery. However, there are significant areas of its distribution (e.g., western Great Australian Bight; northwest Western Australia) with limited or no fishing effort, which would provide the species with some refuge from major fishing gear. Electric rays have no commercial value and are discarded when caught, and post-release survival is likely to be high in the Coffin Ray given its hardy nature. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Coffin Ray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Great Torpedo

CAAB Code 37 028003

Tetronarce nobiliana (Bonaparte, 1835)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Indo-Pacific; Eastern Atlantic

Habitat: Continental shelf & slope

Depth: 0–925 m

Maximum size: 180 cm TL



Assessment Justification: The Great Torpedo is a common ray with a wide Australian range. Outside of Australian waters, it has a wide but patchy Indo-Pacific and Eastern Atlantic temperate distribution. Little biological data are available on this viviparous species (litter size, 8–60 pups). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where standardised catch-per-unit-effort between 2001 and 2006 showed no overall trend (although acknowledging the short length of this time-series). It is also likely taken as bycatch in various state-managed fisheries. However, there are significant areas of its geographic distribution (e.g., western Great Australian Bight; Western Australia) with limited or no trawling effort, which would provide the species with some refuge from major fishing gear. It also has some refuge in deepwater given the closure to trawling of most SESSF waters deeper than 700 m. Electric rays have no commercial value and are discarded when caught (although post-release mortality is unknown). The overall population trend is unknown, although it is suspected to be stable based on the observed SESSF trend and its wide range with refugia from trawling. There is nothing to infer or suspect population reduction at this time and the Great Torpedo is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Eaton's Skate

CAAB Code 37 031750

Bathyraja eatonii (Günther, 1876)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Southern Ocean

Habitat: Insular shelf & slope

Depth: 15–1,500 m

Maximum size: 126 cm TL



Assessment Justification: Eaton's Skate is a common ray with a relatively restricted range on the Kerguelen Plateau (although with an Australian extent of occurrence >20,000 km²). Outside of Australian waters, it has a wide but patchy Southern Ocean distribution. Little biological data are available on this oviparous species (probable slow growth rate and limited biological productivity like other large skates). The species is a bycatch of the Heard Island and McDonald Islands Fishery where monitoring has indicated that the relative abundance of Eaton's Skate in the trawl fishery increased since 2006, but that there has been a decrease in the average total length. Little change in abundance was evident in the deeper water longline fishery. Skates are discarded but post-release survival is unknown. A transition away from trawling in the toothfish fishery will reduce interactions as this species is not caught as regularly on longline. A 13 nm area around the islands is closed to fishing, and the Heard Island and McDonald Islands Marine Reserve provides further closed areas. Monitoring has indicated that fishing mortality levels do not appear to be causing a decline and strong management measures around Heard and McDonald Islands are likely beneficial to skates. It is not suspected to be close to reaching the population reduction threshold and Eaton's Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Kerguelen Skate

CAAB Code 37 031049

Bathyraja irrasa Hureau & Ozouf-Costaz, 1980

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Southern Ocean

Habitat: Insular slope

Depth: 300–1,220 m

Maximum size: 120 cm TL



Assessment Justification: The Kerguelen Skate is a common ray with a relatively restricted range on the Kerguelen Plateau (although with an Australian extent of occurrence >20,000 km²). Outside of Australian waters, it occurs in the French Kerguelen Islands territory. Little biological data are available on this oviparous species (probable slow growth rate and limited biological productivity like other large skates). The species is a bycatch of the Heard Island and McDonald Islands Fishery which targets Patagonian Toothfish and Mackerel Icefish using trawl and longline. Monitoring has shown a small decrease in relative abundance in the longline fishery since 2006, but no decrease in average total length. Skates are discarded but post-release survival is unknown. A 13 nm area around the islands is closed to fishing, and the Heard Island and McDonald Islands Marine Reserve provides further closed areas. Monitoring has indicated that fishing mortality levels do not appear to be causing a significant decline and strong management measures around Heard and McDonald Islands are likely beneficial to skates. While a small decrease in relative abundance has been noted, it is not suspected to be close to reaching the population reduction threshold and the Kerguelen Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Abyssal Skate

CAAB Code 37 031016

Bathyraja ishiharai Stehmann, 2005

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Australian endemic

Habitat: Abyssal plain

Depth: 2,320–2,800 m

Maximum size: 123 cm TL



Assessment Justification: The Abyssal Skate is a poorly-known endemic ray recorded from two widely-separated locations off southern Australia. Its range is expected to be wider than presently documented given a lack of survey effort in its exceptionally deep habitat. Little biological data are available on this oviparous species (probable slow growth rate and limited biological productivity like other large skates). The species is only known from limited specimens collected during scientific research surveys. The Abyssal Skate occurs at depths beyond current fishing operations, and there are no apparent threats to this species. Population trend is unknown, although it is suspected to be stable based on a lack of threats within its range. There is nothing to infer or suspect population reduction at this time and the Abyssal Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

McCain's Skate

CAAB Code 37 031751

Bathyraja maccaini Springer, 1971

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Southern Ocean

Habitat: Continental shelf & slope

Depth: 91–500 m

Maximum size: 120 cm TL



Assessment Justification: McCain's Skate is a poorly-known ray with a relatively restricted range in Prydz Bay, Antarctica (although with an extent of occurrence likely to be >20,000 km²). Outside of Australian waters, it occurs elsewhere in Antarctic waters as well as the French Kerguelen Islands territory. Its range is poorly-defined and it may occur more widely in Australian Antarctic and Sub-Antarctic waters, including around Heard and McDonald Islands (given its occurrence on the French Kerguelen Plateau). Little biological data are available on this oviparous species (probable slow growth rate and limited biological productivity like other large skates). Interactions with Antarctic fisheries require examination. It is not likely to be a bycatch of the krill fishery in Prydz Bay as trawls are midwater, but it is a likely bycatch of an exploratory Antarctic Toothfish demersal longline fishery in that area, and possibly in illegal fishing activities. Since the species' range is not fully defined, and it is unknown if these fishing activities are causing a population reduction, there is currently inadequate information available to assess McCain's Skate beyond Data Deficient. Observer coverage in Antarctic fisheries should allow species-specific data to be collected on skate bycatch and help resolve the species' range and bycatch levels.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Understand population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Murray's Skate

CAAB Code 37 031048

Bathyraja murrayi (Günther, 1880)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Southern Ocean

Habitat: Insular shelf & slope

Depth: 20–800 m

Maximum size: 60 cm TL



Assessment Justification: Murray's Skate is a common ray with a relatively restricted range on the Kerguelen Plateau (although with an Australian extent of occurrence >20,000 km²). Outside of Australian waters, it occurs in the French Kerguelen Islands territory. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). The species is a bycatch of the Heard Island and McDonald Islands Fishery which targets Patagonian Toothfish and Mackerel Icefish using trawl and longline. Monitoring from 1997–2014 indicated that the relative abundance of Murray's Skate in the trawl fishery increased since 2006, with an increase in the average total length. Skates are discarded but post-release survival is unknown. A 13 nm area around the islands is closed to fishing, and the Heard Island and McDonald Islands Marine Reserve provides further closed areas. A transition away from trawling in the toothfish fishery will reduce interactions as this species is not caught as regularly on longline. Monitoring has indicated that fishing mortality levels do not appear to be causing a decline and strong management measures around Heard and McDonald Islands are likely beneficial to skates. It is not suspected to be close to reaching the population reduction threshold and Murray's Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- Commercial fishery mixed-species quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Richardson's Skate

CAAB Code 37 031046

Bathyraja richardsoni (Garrick, 1961)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; deepwater refuge

Distribution: Pacific & Atlantic

Habitat: Continental slope; abyssal plain

Depth: 500–3,055 m

Maximum size: 175 cm TL



Assessment Justification: Richardson's Skate is a rarely-encountered and poorly-known ray recorded from a single specimen on the South Tasman Rise (extent of occurrence unknown). Outside of Australian waters, it occurs in New Zealand and the North Atlantic. Its range is expected to be wider than presently documented given a lack of fishing and survey effort in its exceptionally deep habitat, and it is suspected to be globally distributed. Little biological data are available on this oviparous species (probable slow growth rate and limited biological productivity like other large skates). It may have been a bycatch of the South Tasman Rise Trawl Fishery (STRTF) when it was in operation. This fishery has been closed since 2007 to protect stocks of the target species, Orange Roughy. As such there is no commercial fishing activity in its Australian range, and there are no apparent threats to this species. There is nothing to infer or suspect population reduction at this time and Richardson's Skate is assessed as Least Concern. If the STRTF reopens, any bycatch of this species should be monitored.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Eastern Looseskin Skate

CAAB Code 37 031021

Insentiraja laxipella (Yearsley & Last, 1992)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; occurs in an area of limited fishing effort; deepwater refuge

Distribution: Australian endemic**Habitat:** Continental slope**Depth:** 800–880 m**Maximum size:** 57 cm TL

Assessment Justification: The Eastern Looseskin Skate is a poorly-known endemic ray with a restricted northeast Australian range (extent of occurrence <20,000 km²). It is known only from a limited number of specimens collected from scientific research surveys and may occur more widely than presently recorded. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). While the area of the Commonwealth-managed Coral Sea Fishery overlaps with the species' range, this is a relatively small-scale fishery with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted) and no line fishing within the range of the Eastern Looseskin Skate. Additionally, significant protection is now provided by the Coral Sea Marine Park. The species occurs beyond the depth range of current demersal fishing activities and there are no apparent threats to this species. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Eastern Looseskin Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Western Looseskin Skate

CAAB Code 37 031022

Insentiraja subtilispinosa (Stehmann, 1989)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in areas of limited fishing effort; deepwater refuge

Distribution: Indo-West Pacific

Habitat: Continental slope

Depth: 320–1,460 m

Maximum size: 57 cm TL



Assessment Justification: The Western Looseskin Skate is a common ray with a wide Western Australian range. Outside of Australian waters, it has a patchy Southeast Asian distribution. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). It is a probable bycatch of Commonwealth-managed deeper water trawl fisheries off Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery), however these fisheries have limited effort with only a small number of active vessels. Furthermore, its wide depth range provides it with refuge at depths beyond current fishing activities, particularly since it is reportedly most abundant at depths of 900–1,100 m. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Western Looseskin Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Southern Round Skate

CAAB Code 37 031001

Irolita waitii (McCulloch, 1911)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 50–200 m

Maximum size: 52 cm TL



Assessment Justification: The Southern Round Skate is a poorly-known endemic ray with a wide southern Australian range. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). It is a bycatch of the Great Australian Bight Trawl Sector of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery. This fishery includes a continental shelf component in depths of <200 m with trawling usually occurring at 120–200 m depth, and therefore overlapping with the depth range of the Southern Round Skate. Overall though, most of the range of this species receives very little fishing pressure with the area to the west of this shelf fishery being only lightly fished, and further refuge in inshore areas outside of the fishery. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Southern Round Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Western Round Skate

CAAB Code 37 031017

Irolita westraliensis Last & Gledhill, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 140–210 m

Maximum size: 43 cm TL



Assessment Justification: The Western Round Skate is a poorly-known endemic ray with a relatively restricted Western Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). It is a possible bycatch of trawl fisheries, however it generally occurs at depths too shallow for the Commonwealth-managed deeper water trawl fisheries. These fisheries (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery) have limited effort with only a small number of active vessels. Its range overlaps with the Western Australian-managed Pilbara Fish Trawl Fishery, however, that fishery operates primarily at depths of 50–110 m which is shallower than the depth range of the species. Furthermore, considerable areas of Western Australia's North Coast Bioregion are closed to trawling through spatial management arrangements, providing a refuge. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Western Round Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Blue Skate

CAAB Code 37 031018

Notoraja azurea McEachran & Last, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 765–1,440 m

Maximum size: 65 cm TL



Assessment Justification: The Blue Skate is a poorly-known endemic ray with a wide southern Australian range. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). It was previously a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF). However, given the closure to trawling of most SESSF waters deeper than 700 m, the Blue Skate occurs at depths beyond current fishing operations, and there are no apparent threats to this species. Population trend is unknown, although it is suspected to be stable based on a lack of threats within its range. There is nothing to infer or suspect population reduction at this time and the Blue Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Ghost Skate

CAAB Code 37 031015

Notoraja hirticauda Last & McEachran, 2006

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 500–760 m

Maximum size: 45 cm TL



Assessment Justification: The Ghost Skate is a poorly-known endemic ray with a relatively restricted Western Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). It is a possible bycatch of Commonwealth-managed deeper water trawl fisheries off Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery), however these fisheries have limited effort with only a small number of active vessels. Furthermore, the Ghost Skate is likely to have some refuge in depths beyond current fishing activities. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Ghost Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Pale Skate

CAAB Code 37 031019

Notoraja ochroderma McEachran & Last, 1994

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental slope

Depth: 350–445 m

Maximum size: 37 cm TL



Assessment Justification: The Pale Skate is a poorly-known endemic ray with a restricted northeast Australian range (extent of occurrence <math><20,000\text{ km}^2</math>). It is known only from a limited number of specimens collected from scientific research surveys and may occur more widely than presently recorded. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). While the area of the Commonwealth-managed Coral Sea Fishery overlaps with the species' range, this is a relatively small-scale fishery with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted) and no line fishing within the range of the Pale Skate. Additionally, significant protection is now provided by the Coral Sea Marine Park. The species occurs beyond the depth range of current demersal fishing activities and there are no apparent threats to this species. There is nothing to infer or suspect population reduction at this time and the Pale Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Blotched Skate

CAAB Code 37 031020

Notoraja sticta McEachran & Last, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 820–1,200 m

Maximum size: 63 cm TL



Assessment Justification: The Blotched Skate is a poorly-known endemic ray with a relatively restricted Great Australian Bight range (although with an extent of occurrence >20,000 km²). It is known only from a limited number of specimens and may occur more widely than presently recorded. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). It was previously a bycatch of the Great Australian Bight Trawl Sector of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF). The deepwater fishery of that sector operated at depths >700 m targeting Orange Roughy but was closed in 2007 due to unsustainability of target stocks. Bycatch levels in Orange Roughy fisheries have been reported as less than in many other trawl fisheries since aggregations are primarily targeted. Given the closure to trawling of most SESSF waters deeper than 700 m, the Blotched Skate occurs at depths beyond current fishing operations, and there are no apparent threats to this species. There is nothing to infer or suspect population reduction at this time and the Blotched Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Allen's Skate

CAAB Code 37 031027

Pavoraja alleni McEachran & Fechhelm, 1982

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental slope

Depth: 305–460 m

Maximum size: 35 cm TL



Assessment Justification: Allen's Skate is a common endemic ray with a relatively restricted northwest Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). This species has a limited known depth range, thereby it may be restricted to a narrow band of habitat. It is a bycatch of the Commonwealth-managed North West Slope Trawl Fishery, which operates at depths >200 m, although fishing effort is low with only a small number of active vessels and there are no other apparent threats to this species. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and Allen's Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Sandy Skate

CAAB Code 37 031023

Pavoraja arenaria Last, Mallick & Yearsley, 2008

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australian endemic

Habitat: Continental slope

Depth: 190–710 m

Maximum size: 34 cm TL



Assessment Justification: The Sandy Skate is a poorly-known endemic ray with a wide southern Australian range. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). It is a bycatch of the Great Australian Bight Trawl Sector of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery. This fishery includes an upper continental slope fishery which operates at depths of 200–700 m, overlapping completely with the depth range of the Sandy Skate. Furthermore, although the species occurs at 190–710 m, it is most common at 300–400 m which represents a narrow band of habitat. Small skate species are generally discarded in the fishery, but mortality is expected to be high. Fishing effort is concentrated on the eastern half of the species' range and it has some refuge in the western portion of its range. However, since it is unknown if this fishery is causing a population reduction (which has been noted in some other southern skate species), there is currently inadequate information available to assess the Sandy Skate beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Mosaic Skate

CAAB Code 37 031024

Pavoraja mosaica Last, Mallick & Yearsley, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental slope

Depth: 300–490 m

Maximum size: 28 cm TL



Assessment Justification: The Mosaic Skate is a poorly-known endemic ray with a relatively restricted northeast Australian range (although with an extent of occurrence >20,000 km²). It is known only from a limited number of specimens and may occur more widely than presently recorded. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). While the area of the Commonwealth-managed Coral Sea Fishery overlaps with the species' range, this is a relatively small-scale fishery with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted) and limited line fishing within the range of the Mosaic Skate. Additionally, significant protection is now provided by the Coral Sea Marine Park. It is unlikely to regularly interact with Queensland-managed fisheries due to a lack of fishing with gear likely to catch small skates where it occurs. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Mosaic Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Peacock Skate

CAAB Code 37 031009

Pavoraja nitida (Günther, 1880)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 30–450 m

Maximum size: 37 cm TL



Assessment Justification: The Peacock Skate is a common endemic ray with a wide southeast Australian range. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). It is one of the most abundant skates within its habitat and range. It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF). Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of skates of 83%. These surveys did not record the Peacock Skate, likely because it primarily occurs on the shelf. More recently, standardised catch-per-unit-effort in the SESSF between 2001 and 2006 showed no trend. This species has no commercial value and is discarded when caught, but mortality is expected to be high. It is possible that some declines have occurred in areas with a long history of fishing, however any declines in fished areas would be balanced by unfished or lightly fished shallower waters and in Bass Strait where there is a lack of trawling. Given these refuges, it is not suspected to be close to reaching the population reduction threshold and the Peacock Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

False Peacock Skate

CAAB Code 37 031025

Pavoraja pseudonitida Last, Mallick & Yearsley, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental slope

Depth: 210–510 m

Maximum size: 37 cm TL



Assessment Justification: The False Peacock Skate is a common but poorly-known endemic ray with a relatively restricted northeast Australian range (although with an extent of occurrence >20,000 km²). This is probably the most abundant skate on the northeast upper continental slope. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). While the area of the Commonwealth-managed Coral Sea Fishery overlaps with the species' range, this is a relatively small-scale fishery with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted) and limited line fishing within the range of the False Peacock Skate. Additionally, significant protection is now provided by the Coral Sea Marine Park. It is a possible bycatch of the Queensland-managed eastern king prawn deepwater sector of the East Coast Trawl Fishery, although it has not been recorded in surveys of this fishery which operates only at the southern extent of the species' range. Overall, its range receives low levels of demersal fishing, with significant refuge in deep waters. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the False Peacock Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Dusky Skate

CAAB Code 37 031026

Pavoraja umbrosa Last, Mallick & Yearsley, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; significant areas of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 360–730 m

Maximum size: 37 cm TL



Assessment Justification: The Dusky Skate is a common but poorly-known endemic ray with a restricted eastern Australian range (extent of occurrence of ~20,000 km²). Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). The area and depth from which the species is presently known receives little demersal fishing effort, being too deep for shelf trawl fisheries, but possibly overlapping with deepwater prawn sectors of the New South Wales Ocean Trawl Fishery and the Queensland East Coast Trawl Fishery. However, in general there is very limited fishing effort on the upper continental slope from central New South Wales to southern Queensland. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Dusky Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Boreal Skate

CAAB Code 37 031041

Amblyraja hyperborea (Collett, 1879)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Cosmopolitan (but patchy)

Habitat: Continental slope; abyssal plain

Depth: 165–3,165 m

Maximum size: 112 cm TL



Assessment Justification: The Boreal Skate is common ray with a relatively restricted southeast Australian range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it has a wide but patchy global temperate distribution. Little biological data are available on this oviparous species (probable slow growth rate and limited biological productivity like other large skates). The global depth range is wide (165–3,165 m) and indeed this is one of the deepest occurring chondrichthyan fishes, while in Australian waters it has been recorded at depths of 980–2,000 m. It was previously a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF). However, given the closure to trawling of most SESSF waters deeper than 700 m, the Boreal Skate occurs at depths beyond current fishing operations, and there are no apparent threats to this species. There is nothing to infer or suspect population reduction at this time and the Boreal Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge



Sydney Skate

CAAB Code 37 031041

Dentiraja australis (Macleay, 1884)

IUCN Red List Category & Criteria

Vulnerable A2bd*

*See Supporting Information on following page

Reasons for Listing

Inferred population reduction of >30% over the last 3 generations (21 years) based on trend data & catch levels

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 20–325 m

Maximum size: 55 cm TL



Assessment Justification: The Sydney Skate is a common endemic ray with a relatively restricted eastern Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size; estimated GL, 7 years). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) where it is discarded, but mortality is expected to be high. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of skates of 83%. The Sydney Skate dominated the catches in the shallower part of the surveys. These declines were documented prior to the last three generations (21 years; 1999–2020), however fishing pressure has been ongoing and there is no reason to suspect that declines have ceased. More recently, standardised catch-per-unit-effort in the SESSF showed a rise-peak-decline trend between 1998 and 2006. Based on overlap with well-established trawl fisheries, reported declines, and significant catches, together with likely high productivity and areas of lower fishing effort (e.g., northern New South Wales), it is inferred that the population has undergone a reduction of >30% over the last three generations (21 years) and the Sydney Skate is assessed as Vulnerable.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Protect species
- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for Sydney Skate

IUCN Red List Category & Criteria: Vulnerable A2bd

EPBC Act Status: Not listed

Recommendation: Prioritise data collection

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Inferred population reduction of >30% over the last 3 generations (21 years) based on trend data & catch levels
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is likely > 10,000 mature individuals
D	Not applicable: although < 5 locations, population size is likely > 1,000 mature individuals; AOO > 20 km ²
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	285,100 km ² unknown	high low
Area of occupancy trend	> 2,000 km ² unknown	low low
No. of mature individuals trend	likely > 10,000 decreasing	low high
No. subpopulations	unknown	low
No. locations	4	medium
Generation length*	7 years	low
Global population share	100%	high

*Generation length inferred from the Whitespotted Skate *Dentiraja cerva* (Treloar 2008).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: declines the equivalent of 83% population reduction over three generations in the southern part of the species' range (~30% of the range) (Graham *et al.* 2001, Stevens & Valenti 2009); while these declines were documented prior to the last three generations, fishing pressure has been ongoing and there is no reason to suspect that declines have ceased; there is no deepwater refuge but given relatively light fishing effort across most of the remainder of its range (Patterson *et al.* 2019) (with some exceptions, e.g., southern Queensland), a level of decline of <30% is suspected outside southeast Australia; therefore, when considered across the species' national extent, an overall population reduction of >30% is inferred over the last three generations and the causes of this reduction have not ceased; there is a need to obtain more recent data on catch rates for comparison with previous work.

Information sources: Graham *et al.* (2001); Patterson *et al.* (2019); Stevens & Valenti (2009); Treloar (2008); Walker & Gason (2007).

Whitespotted Skate

CAAB Code 37 031003

Dentiraja cerva (Whitley, 1939)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (21 years) based on trend data & catch levels

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 60–470 m

Maximum size: 66 cm TL



Assessment Justification: The Whitespotted Skate is a common endemic ray with a wide southern Australian range. This oviparous species is relatively biologically productive (Amat, 5 years; Amax, 9 years; GL, 7 years). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery where most of the catch is discarded, but mortality is expected to be high. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of skates of 83%. While these declines do not apply directly to this species because its distribution begins at the southern extent of the survey area, it does demonstrate skate decline under intense fishing pressure in southern Australia. It is inferred that the species has undergone population reduction where intense trawl fisheries overlap with its range. The western part of the species' range is only lightly fished, and trawling is limited in Bass Strait, so the species has some refuge in these areas. Based on overlap with well-established trawl fisheries and significant levels of bycatch, together with high productivity and areas of lower trawl fishing effort, it is inferred that the population has undergone a reduction approaching 30% over the last three generations (21 years) and the Whitespotted Skate is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Monitor population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat



Australian Longnose Skate

CAAB Code 37 031005

Dentiraja confusus (Last, 2008)

IUCN Red List Category & Criteria

Critically Endangered A2bd*

*See Supporting Information on following page

Reasons for Listing

Inferred population reduction of >80% over the last 3 generations (29 years) based on trend data & catch levels

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 20–390 m

Maximum size: 70 cm TL



Assessment Justification: The Australian Longnose Skate was a historically common endemic ray with a relatively restricted southeast Australian range (although with an extent of occurrence >20,000 km²). This oviparous species is likely to be relatively productive given its small size and early age-at-maturity (Amat, 7 years; Amax, 12 years; GL, 9.5 years). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) where most of the catch has historically been retained. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of skates (which included this species) of 83%, the equivalent of a 92% population reduction over three generations (29 years) of the Australian Longnose Skate. While these declines were recorded largely outside the last three generations (1991–2020), more recently, standardised catch-per-unit-effort in the SESSF between 1998 and 2004 showed a decline of 96%. The Australian Longnose Skate appears to have been depleted on heavily fished grounds, but it may have some refuge in areas of less trawl effort, such as Bass Strait. It is inferred that the population has undergone a reduction of >80% over the last three generations (29 years) and the Australian Longnose Skate is assessed as Critically Endangered.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Protect species
- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for Australian Longnose Skate

IUCN Red List Category & Criteria: Critically Endangered A2bd

EPBC Act Status: Not listed

Recommendation: Consider listing

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Inferred population reduction of >80% over the last 3 generations (29 years) based on trend data & catch levels
B	Not applicable: EOO>20,000 km ² ; AOO >2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is likely >10,000 mature individuals
D	Not applicable: although <5 locations, population size is likely >1,000 mature individuals; AOO >20 km ²
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	587,200 km ² unknown	high low
Area of occupancy trend	>2,000 km ² unknown	low low
No. of mature individuals trend	likely >10,000 decreasing	low high
No. subpopulations	unknown	low
No. locations	2	medium
Generation length*	9.5 years	high
Global population share	100%	high

*Generation length is calculated from age data for this species (Treloar 2008).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: declines the equivalent of 92% population reduction over three generations off eastern Australia (Graham *et al.* 2001, Kyne & Sherman 2016); while these declines were documented prior to the last three generations, fishing pressure has been ongoing and between 1998 and 2004, a decline of 96% was documented off eastern Australia (not scaled to three generations given short time-series) (Walker & Gason 2007); as the species' range is restricted to southeast Australia and there is no deepwater refuge, these declines are considered representative of most of the range, although there may be some refuge in areas of relatively light fishing effort (~25% of the species' range) (Patterson *et al.* 2019); therefore, when considered across the species' national extent, an overall population reduction of >80% is inferred over the last three generations and the causes of this reduction have not ceased; there is a need to obtain more recent data on catch rates for comparison with previous work.

Information sources: Graham *et al.* (2001); Kyne & Sherman (2016); Patterson *et al.* (2019); Treloar (2008); Walker & Gason (2007).

Endeavour Skate

CAAB Code 37 031043

Dentiraja endeavouri (Last, 2008)

IUCN Red List Category & Criteria

Near Threatened A2d

Reasons for Listing

Suspected population reduction approaching 30% over the last 3 generations (23 years) based on catch levels

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 110–370 m

Maximum size: 37 cm TL



Assessment Justification: The Endeavour Skate is a common endemic ray with a relatively restricted eastern Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size; estimated GL, 7.5 years). It is a bycatch of the Queensland-managed eastern king prawn deepwater sector of the East Coast Trawl Fishery, where it is discarded (with high on-deck mortality). It is also a likely bycatch of New South Wales Ocean Trawl Fishery. The upper continental slope of northern New South Wales receives little trawling effort, and as such it may have some refuge there at the deeper extent of its depth range. However, based on overlap with well-established trawl fisheries, significant levels of bycatch, low post-release survivorship, and a relatively restricted range, it is suspected that the population has undergone a reduction approaching 30% over the last three generations (23 years) and the Endeavour Skate is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	Medium
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Monitor population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

False Argus Skate

CAAB Code 37 031030

Dentiraja falloargus (Last, 2008)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 60–255 m

Maximum size: 49 cm TL



Assessment Justification: The False Argus Skate is a poorly-known endemic ray with a wide northwest Australian range. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). It is a possible bycatch of trawl fisheries however it is generally at depths too shallow for the Commonwealth-managed North West Slope Trawl Fishery, which has limited effort with only a small number of active vessels. Its range does overlap with the Western Australian-managed Pilbara Fish Trawl Fishery, with that fishery operating primarily at depths of 50–110 m; therefore, about half of the species' depth range is lightly fished or unfished. It is a possible bycatch of the Northern Territory Demersal Fishery, but that fishery is at the edge of the species' range. Furthermore, considerable areas of Western Australia's North Coast Bioregion and the Northern Territory are closed to trawling through spatial management arrangements, providing a refuge. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the False Argus Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Pygmy Thornback Skate

CAAB Code 37 031038

Dentiraja flindersi Last & Gledhill, 2008

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 20–55 m

Maximum size: 33 cm TL



Assessment Justification: The Pygmy Thornback Skate is a rare and poorly-known endemic ray with a restricted South Australian range (although with an extent of occurrence >20,000 km²). The population size is suspected to be small based on its narrow geographic and depth range. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). The species' range is outside of the area of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery Great Australian Bight Trawl Sector, however it does overlap with gillnet and hook sectors. Small skates have limited catchability with these gears, so bycatch is unlikely to be an issue in relation to Commonwealth fisheries. The Pygmy Thornback Skate is a potential bycatch of South Australian prawn trawl fisheries which operate over a portion of the range of this species. Fishing effort is minimal in the Investigator Strait while unsuitable trawling ground limits fishing in the Backstairs Passage. Combined, these areas may provide some refuge for the species. Overall, it is unknown if fisheries are causing a population reduction, and as such there is currently inadequate information available to assess the Pygmy Thornback Skate beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Heald's Skate

CAAB Code 37 031011

Dentiraja healdi (Last, White & Pogonoski, 2008)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental slope

Depth: 305–520 m

Maximum size: 72 cm TL



Assessment Justification: Heald's Skate is a common but poorly-known endemic ray with a relatively restricted northwest Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). This species has a limited known depth range, thereby it may be restricted to a narrow band of habitat. It is a possible bycatch of the Commonwealth-managed North West Slope Trawl Fishery however this fishery has limited effort with only a small number of active vessels. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and Heald's Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Australian Thornback Skate

CAAB Code 37 031007

Dentiraja lemprieri (Richardson, 1845)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 1–170 m

Maximum size: 55 cm TL



Assessment Justification: The Australian Thornback Skate is a common endemic ray with a relatively restricted southeast Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). It is the most common inshore skate species of southeast Australian waters. It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery. A very small portion of the catch has historically been retained while the majority is discarded, but mortality is expected to be high. However, since it is most common at depths of <40 m, it has a significant inshore refuge outside of areas subject to demersal trawling, as well as in Bass Strait where trawling is limited. It is possible that some declines have occurred in areas with a long history of fishing, however any declines in fished areas would be balanced by these unfished or lightly fished waters. Given these refuges, it is not suspected to be close to reaching the population reduction threshold and the Australian Thornback Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess reproduction, age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Australian Ocellate Skate

CAAB Code 37 031031

Dentiraja oculus (Last, 2008)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental slope

Depth: 200–390 m

Maximum size: 56 cm TL



Assessment Justification: The Australian Ocellate Skate is a poorly-known endemic ray with a relatively restricted Western Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). This species has a limited known depth range, thereby it may be restricted to a narrow band of habitat on the upper continental slope. It is a possible bycatch of the Commonwealth-managed Western Deepwater Trawl Fishery however this fishery has limited effort with only a small number of active vessels. Overall, its range receives low levels of demersal fishing and there are no other apparent threats. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Australian Ocellate Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Argus Skate

CAAB Code 37 031042

Dentiraja polyommata (Ogilby, 1910)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 135–400 m

Maximum size: 38 cm TL



Assessment Justification: The Argus Skate is a common endemic ray with a relatively restricted northeast Australian range (although with an extent of occurrence >20,000 km²). This oviparous species has relatively high biological productivity (Amat, 5 years; Amax, 10 years; GL, 7.5 years; continuous reproductive cycle; average ovarian fecundity, 8 follicles). It is a bycatch of the eastern king prawn deepwater sector of the Queensland East Coast Trawl Fishery, where it is discarded, but mortality is expected to be high. That fishery operates only at the southern extent of the species' range, and it has refuge from fishing in the northern part of its range, as well as in deeper waters beyond trawled depths. It is a possible bycatch of the Commonwealth-managed Coral Sea Fishery, although that fishery has limited effort across the species' range with no trawling effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery). Additionally, significant protection is now provided by the Coral Sea Marine Park. Overall, its range receives low levels of demersal fishing and there are no other apparent threats. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Argus Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Australian Deepwater Skate

CAAB Code 37 031035

Dipturus acrobelus Last, White & Pogonoski, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 445–1,330 m

Maximum size: 137 cm TL



Assessment Justification: The Australian Deepwater Skate is a common endemic ray with a wide southern Australian range. Little biological data are available on this oviparous species (probable slow growth rate and limited biological productivity like other large skates). It is a bycatch or byproduct of the Southern and Eastern Scalefish and Shark Fishery (SESSF). However, only a portion of the catch has historically been retained while the majority is discarded (although post-release mortality is unknown). It has refuge in deepwater given the closure to trawling of most SESSF waters deeper than 700 m, particularly since it is reportedly most abundant at depths of 800–1,000 m. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Australian Deepwater Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Medium
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Maintain deepwater refuge

Pale Tropical Skate

CAAB Code 37 031032

Dipturus apricus Last, White & Pogonoski, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 195–605 m

Maximum size: 77 cm TL



Assessment Justification: The Pale Tropical Skate is a common endemic ray with a relatively restricted northeast Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species (probable slow growth rate and limited biological productivity like other large skates). It is a possible bycatch of the Commonwealth-managed Coral Sea Fishery, although this fishery has limited effort across the species' range with no trawling effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery). Additionally, significant protection is now provided by the Coral Sea Marine Park. It is also a possible bycatch of the Queensland-managed eastern king prawn deepwater sector of the East Coast Trawl Fishery, although it has not been recorded in surveys of this fishery. That fishery operates only at the southern extent of the species' range, and it would have refuge from fishing in the northern part of its range, as well as in deeper waters beyond trawled depths. Overall, its range receives low levels of demersal fishing, with significant refuge in deep waters, and there are no other apparent threats. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Pale Tropical Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch



Grey Skate

CAAB Code 37 031028

Dipturus canutus Last, 2008

IUCN Red List Category & Criteria

Endangered A2bd*

*See Supporting Information on following page

Reasons for Listing

Inferred population reduction of >50% over the last 3 generations (36 years) based on trend data & catch levels

Distribution: Australian endemic

Habitat: Continental slope

Depth: 155–1,050 m

Maximum size: 90 cm TL



Assessment Justification: The Grey Skate was a historically common endemic ray with a wide southeast Australian range. Little biological data are available on this oviparous species (estimated GL, 12 years). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery where most of the catch is discarded (although post-release mortality is unknown). Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of skates (with this species one of the dominant skates) of 83%, the equivalent of a 96% population reduction over three generations (36 years) of the Grey Skate. Fishing pressure is ongoing in the southeast and it is expected that declines have continued. This species is most common at 400–600 m but has a wide depth range with some refuge in deeper waters. There are lower levels of fishing effort along the northern and western edge of its range, and the declines seen on the southeast slope are not thought to be ubiquitous throughout its range. Overall, it is inferred that the population has undergone a reduction of >50% over the last three generations (36 years) and the Grey Skate is assessed as Endangered.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Medium
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Protect species
- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for Grey Skate

IUCN Red List Category & Criteria: Endangered A2bd

EPBC Act Status: Not listed

Recommendation: Prioritise data collection

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Inferred population reduction of >50% over the last 3 generations (36 years) based on trend data & catch levels
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is likely > 10,000 mature individuals
D	Not applicable: although < 5 locations, population size is likely > 1,000 mature individuals; AOO > 20 km ²
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	1,816,200 km ² unknown	high low
Area of occupancy trend	>2,000 km ² unknown	low low
No. of mature individuals trend	likely > 10,000 decreasing	low high
No. subpopulations	unknown	low
No. locations	2	medium
Generation length*	12 years	low
Global population share	100%	high

*Generation length is inferred from the Yellowspotted Skate *Leucoraja wallacei* (Walmsley-Hart *et al.* 1999).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: declines the equivalent of >96% population reduction over three generations off eastern Australia (~25% of the range) (Graham *et al.* 2001, Sherman 2016); there is some deepwater refuge although the species' core depth range overlaps with high levels of fishing effort as does the bulk of the species' range (with the exception of lower levels of fishing effort along the western and northern edges of its range) (Patterson *et al.* 2019); therefore, when considered across the species' national extent, an overall population reduction of >50% is inferred over the last three generations and the causes of this reduction have not ceased; there is a need to obtain more recent data on catch rates for comparison with previous work.

Information sources: Graham *et al.* (2001); Patterson *et al.* (2019); Sherman (2016); Walker & Gason (2007); Walmsley-Hart *et al.* (1999).

Graham's Skate

CAAB Code 37 031029

Dipturus grahami Last, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 145–490 m

Maximum size: 64 cm TL



Assessment Justification: Graham's Skate is a common endemic ray with a relatively restricted eastern Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery in the south of its range. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of skates of 83%. This included small numbers of Graham's Skate on the northern survey grounds off Sydney, and fewer records south of Sydney. The area south of Sydney represents about 20% of the species' range, and it is expected that population reduction has occurred there due to a long history of trawling and the documented declines in skates. However, off Sydney, the species' preferred depth range of 200–400 m is unproductive commercially and consequently is much less intensively trawled than greater depths, and much of its range off northern New South Wales receives little trawling effort. Despite probable population reductions in the southern fifth of its range, due to refuge and areas of low fishing effort, it is not suspected to be close to reaching the population reduction threshold and Graham's Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Bight Skate

CAAB Code 37 031010

Dipturus gudgeri (Whitley, 1940)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (44 years) based on trend data & catch levels

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 160–765 m

Maximum size: 184 cm TL



Assessment Justification: The Bight Skate is a common endemic ray with a wide southern Australian range. This oviparous species has limited biological productivity like other large skates (Amat, 13 years; Amax, 16 years; GL, 14.5 years). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery where most of the catch is discarded (although post-release mortality is unknown). Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of skates (with this species one of the dominant skates) of 83%, the equivalent of a 98% population reduction over three generations (44 years) of the Bight Skate. Fishing pressure is ongoing in the southeast and it is expected that declines have continued since this time. However, the range of the species includes extensive areas that are unfished or only lightly fished (e.g., western Great Australian Bight; southwest slope) and the declines seen off the southeast are not thought to be ubiquitous throughout its range. Overall, it is inferred that the population has undergone a reduction approaching 30% over the last three generations (44 years) and the Bight Skate is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Monitor population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Blacktip Skate

CAAB Code 37 031033

Dipturus melanospilus Last, White & Pogonoski, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 240–695 m

Maximum size: 78 cm TL



Assessment Justification: The Blacktip Skate is a poorly-known endemic ray with a wide eastern Australian range. Little biological data are available on this oviparous species (probable slow growth rate and limited biological productivity like other large skates). It is a possible bycatch of the Commonwealth- managed Coral Sea Fishery, although this is a relatively small-scale fishery with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery). Additionally, significant protection is now provided by the Coral Sea Marine Park. It is also a possible bycatch of the Queensland-managed eastern king prawn deepwater sector of the East Coast Trawl Fishery, although it may only marginally overlap with this fishery. Overall, its range receives low levels of demersal fishing, with significant refuge in deep waters, and there are no other apparent threats. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Blacktip Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Queensland Deepwater Skate

CAAB Code 37 031036

Dipturus queenslandicus Last, White & Pogonoski, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; occurs in an area of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 400–605 m

Maximum size: 76 cm TL



Assessment Justification: The Queensland Deepwater Skate is a poorly-known endemic ray with a restricted northeast Australian range (extent of occurrence <math><20,000\text{ km}^2</math>). It is known from only one location, the Saumarez Plateau, although its range may not be fully defined. Little biological data are available on this oviparous species (probable slow growth rate and limited biological productivity like other large skates). The species' range is outside the management area of the Commonwealth-managed Coral Sea Fishery, and deeper than the depths fished by the Queensland-managed eastern king prawn deepwater sector of the East Coast Trawl Fishery. Therefore, the species is not suspected to be under any pressure from demersal fishing, with refuge in deep waters, and there are no other apparent threats. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Queensland Deepwater Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Weng's Skate

CAAB Code 37 031034

Dipturus wengi Séret & Last, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 485–1,165 m

Maximum size: 128 cm TL



Assessment Justification: Weng's Skate is a poorly-known endemic ray with a wide eastern Australian range. Little biological data are available on this oviparous species (probable slow growth rate and limited biological productivity like other large skates). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) in the south of its range, and possibly in the Coral Sea Fishery (CSF) in the north of its range. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of skates of 83%. This included small numbers of Weng's Skate in deeper waters of the surveys. It is inferred that some significant declines have occurred in areas with a long history of fishing in the southern part of its range. However, it has refuge in deepwater given the closure to trawling of most SESSF waters deeper than 700 m, particularly since it is reportedly most abundant at depths of 600–1,000 m. The CSF is a relatively small-scale fishery with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery). Additionally, significant protection is now provided by the Coral Sea Marine Park. Given refuges and little fishing effort in the north of its range (where it is most common), it is not suspected to be close to reaching the population reduction threshold and Weng's Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Sawback Skate

CAAB Code 37 031039

Leucoraja pristispina Last, Stehmann & Séret, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental slope

Depth: 200–505 m

Maximum size: 40 cm TL



Assessment Justification: The Sawback Skate is a poorly-known endemic ray with a wide Western Australian range. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). It is a probable bycatch of Commonwealth-managed deeper water trawl fisheries off Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery), however these fisheries have limited effort with only a small number of active vessels. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Sawback Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Arafura Skate

CAAB Code 37 031044

Okamejei arafurensis Last & Gledhill, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australia & Indonesia

Habitat: Continental slope

Depth: 180–300 m

Maximum size: 50 cm TL



Assessment Justification: The Arafura Skate is a poorly-known ray with a relatively restricted range in the Arafura Sea off northwest Australia (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it occurs in adjacent Indonesian waters. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). This species has a limited known depth range, thereby it may be restricted to a narrow band of habitat. It is a possible bycatch of the Commonwealth-managed North West Slope Trawl Fishery and the Northern Territory Demersal Fishery, but both fisheries have low fishing effort where the species occurs. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Arafura Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Australian Thintail Skate

CAAB Code 37 031013

Okamejei leptoura Last & Gledhill, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

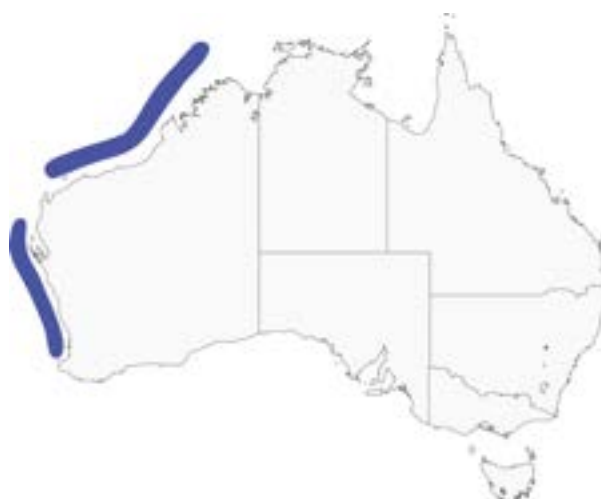
Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in areas of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 200–735 m

Maximum size: 56 cm TL



Assessment Justification: The Australian Thintail Skate is a poorly-known endemic ray with a wide Western Australian range. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). It is a possible bycatch of the Commonwealth-managed North West Slope Trawl Fishery and Western Deepwater Trawl Fishery, but both fisheries have low fishing effort with only a small number of active vessels. Furthermore, its depth range provides it with refuge at depths beyond current fishing activities. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Australian Thintail Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Challenger Skate

CAAB Code 37 031040

Rajella challenger Last & Stehmann, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 860–1,500 m

Maximum size: 56 cm TL



Assessment Justification: The Challenger Skate is a common but poorly-known endemic ray with a wide southeast Australian range. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). Although it may historically have been a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), the species' depth range is entirely beyond current fishing activities given the closure to trawling of most SESSF waters deeper than 700 m. Population trend is unknown, although it is suspected to be stable based on the lack of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Challenger Skate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge



Melbourne Skate

CAAB Code 37 031006

Spiniraja whitleyi (Iredale, 1938)

IUCN Red List Category & Criteria

Vulnerable A2bd*

*See Supporting Information on following page

Reasons for Listing

Inferred population reduction of >30% over the last 3 generations (56 years) based on trend data & catch levels

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 1–345 m

Maximum size: 200 cm TL



Assessment Justification: The Melbourne Skate is a common endemic ray with a wide southern Australian range. Little biological data are available on this oviparous species (probable slow growth rate and limited biological productivity like other large skates; estimated GL, 18.5 years). It is a byproduct or bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where most of the catch is discarded (although post-release mortality is unknown). Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of skates of 83%, the equivalent of a >99% population reduction over three generations (56 years). This included the Melbourne Skate in the shallower waters of the surveys. More recently, standardised catch-per-unit-effort in the SESSF showed increasing trends between 2001 and 2006 in the Great Australian Bight and between 1998 and 2006 off southeast Australia (although acknowledging the short length of these time-series). These increases are thought to be a result of a shift in fishing effort onto the shelf. Based on overlap with well-established trawl fisheries, reported declines, significant catches, and low biological productivity, together with areas of lower trawl fishing effort where catches are lower, it is inferred that the population has undergone a reduction of >30% over the last three generations (56 years) and the Melbourne Skate is assessed as Vulnerable.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Byproduct
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Protect species
- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for Melbourne Skate

IUCN Red List Category & Criteria: Vulnerable A2bd

EPBC Act Status: Not listed

Recommendation: Prioritise data collection

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Inferred population reduction of >30% over the last 3 generations (56 years) based on trend data & catch levels
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is likely > 10,000 mature individuals
D	Not applicable: population size is likely > 1,000 mature individuals; AOO > 20 km ² ; > 5 locations
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	2,975,900 km ² unknown	high low
Area of occupancy trend	> 2,000 km ² unknown	low low
No. of mature individuals trend	likely > 10,000 decreasing	low high
No. subpopulations	unknown	low
No. locations	6	medium
Generation length*	18.5 years	low
Global population share	100%	high

*Generation length is inferred from the New Zealand Smooth Skate *Dipturus innominatus* (Francis *et al.* 2001).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: declines the equivalent of >99% population reduction over three generations have been demonstrated off eastern Australia (~20% of the range) (Graham *et al.* 2001, Treloar 2009); there is no deepwater refuge and at least 50% of its range is under moderate to high levels of fishing effort; there are some areas of relatively light fishing effort (especially in shallow areas of the shelf; although increasing catch trends in some areas suggest a shift in fishing effort onto the shelf) (Patterson *et al.* 2019, Walker & Gason 2007); therefore, when considered across the species' national extent, an overall population reduction of >30% is inferred over the last three generations and the causes of this reduction have not ceased; there is a need to obtain more recent data on catch rates for comparison with previous work.

Information sources: Francis *et al.* (2001); Graham *et al.* (2001); Patterson *et al.* (2019); Treloar (2008, 2009); Walker & Gason (2007).

Maugean Skate

CAAB Code 37 031037

Zearaja maugeana Last & Gledhill, 2007

IUCN Red List Category & Criteria

Endangered B1ab(i,ii,iii,iv)+2ab(i,ii,iii,iv)*

*See Supporting Information on following page

Reasons for Listing

Extent of occurrence <5,000 km²; area of occupancy <500 km²; known from 2 locations; inferred continuing decline in extent of occurrence, area of occupancy, quality of habitat, & number of locations

Distribution: Australian endemic

Habitat: Estuaries

Depth: 0–40 m

Maximum size: 84 cm TL



Assessment Justification: The Maugean Skate is a rare endemic ray with a restricted range in Macquarie and Bathurst Harbours, western Tasmania (representing two distinct subpopulations). The extent of occurrence is <1,900 km²; area of occupancy is <300 km²; and, it is known from only two locations. This species is unique among skates in that it is restricted to brackish estuarine waters. Limited biological data are available on this oviparous species (Amat, 5–8 years; Amax, 15+ years; GL, 11.5 years). One location (Macquarie Harbour) is facing increasing human activity, which is projected to lead to a decrease in extent of occurrence, area of occupancy, and quality of habitat due to increasing pressures from salmon aquaculture and pollution. Macquarie Harbour currently has anoxic conditions, particularly in the depth range where the species' eggs are found, and these conditions are continuing. These persistent water quality issues could drastically reduce the survival of deposited eggs (and therefore breeding success) which would be catastrophic for this subpopulation. Furthermore, the species is also regularly caught by recreational and commercial gillnetting in Macquarie Harbour. The second subpopulation (Bathurst Harbour) has not been verified in ~20 years, despite dedicated surveys, and may be locally extinct. The Maugean Skate is assessed as Endangered.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	High	Bycatch
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: aquaculture		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age, reproduction	High
Connectivity	–	–

Current Management

- Endangered (EPBC Act)
- State protection (TAS)
- General commercial fishery controls

Conservation Actions

- Recover population
- Mitigate catch
- Reduce post-release mortality
- Protect critical habitat

Supporting Information for Maugean Skate

IUCN Red List Category & Criteria: Endangered B1ab(i,ii,iii,iv)+2ab(i,ii,iii,iv)

EPBC Act Status: Endangered

Recommendation: Maintain & improve management

Recovery Plan: None; a Recovery Plan is required for this species.

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Not applicable: no data or evidence to support population reduction approaching the thresholds
B	Extent of occurrence <5,000 km ² ; area of occupancy <500 km ² ; known from 2 locations; inferred continuing decline in extent of occurrence, area of occupancy, quality of habitat, & number of locations
C	Not applicable: while Macquarie Harbour population size has been estimated as ~3,200 individuals there is high uncertainty and the number of mature individuals has not been specified; however, population size most certainly <10,000 mature individuals, probably <2,500 mature individuals; continuing decline inferred from ongoing threats; 100% of mature individuals now potentially in one subpopulation (Macquarie Harbour) given lack of contemporary records from Bathurst Harbour; further consideration required
D	Not applicable: although <5 locations, population size is likely >1,000 mature individuals; AOO >20 km ²
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	1,900 km ² decreasing	high medium
Area of occupancy trend	300 km ² decreasing	high medium
No. of mature individuals trend	probably <2,500 decreasing	low medium
No. subpopulations	2	high
No. locations	2	high
Generation length*	11.5 years	low
Global population share	100%	high

*Generation length was estimated from limited age data for this species (Bell *et al.* 2016).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: no change from current EPBC Act listing; IUCN criteria are provided here; population size (number of mature individuals) requires examination as species probably also meets Criterion C; exploration of different methods to evaluate population trend including visual-based approaches is critically required.

Information sources: Bell *et al.* (2016); Last *et al.* (2016b); Lyle *et al.* (2014); Moreno *et al.* (2020); Treloar *et al.* (2017); Weltz *et al.* (2018, 2019).

West Australian Legskate

CAAB Code 37 033001

Sinobatis bulbicauda Last & Séret, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort; deepwater refuge

Distribution: Australia & Indonesia

Habitat: Continental slope

Depth: 150–1,125 m

Maximum size: 56 cm TL



Assessment Justification: The West Australian Legskate is a common ray with a wide Western Australian range. Outside of Australian waters, it occurs off eastern Indonesia. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). It is a probable bycatch of Commonwealth-managed deeper water trawl fisheries off Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery), however these fisheries have limited effort with only a small number of active vessels. Furthermore, its wide depth range provides it with refuge at depths beyond current fishing activities. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the West Australian Legskate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Indigo Legskate

CAAB Code 37 033003

Sinobatis caerulea Last & Séret, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 480–1,170 m

Maximum size: 68 cm TL



Assessment Justification: The Indigo Legskate is a poorly-known endemic ray with a relatively restricted Western Australian range (although with an extent of occurrence >20,000 km²). It is known only from a limited number of specimens and may occur more widely than presently recorded. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). It is a possible bycatch of Commonwealth-managed deeper water trawl fisheries off Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery), however these fisheries have limited effort with only a small number of active vessels, and the species' range falls only marginally into the management area of the North West Slope Trawl Fishery. Furthermore, its wide depth range provides it with refuge at depths beyond current fishing activities. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Indigo Legskate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

East Australian Legskate

CAAB Code 37 033002

Sinobatis filicauda Last & Séret, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 605–880 m

Maximum size: 55 cm TL



Assessment Justification: The East Australian Legskate is a poorly-known endemic ray with a restricted northeast Australian range (extent of occurrence <20,000 km²). It is known only from a limited number of specimens and may occur more widely than presently recorded. Little biological data are available on this oviparous species (likely to be relatively biologically productive given its small size). While the area of the Commonwealth-managed Coral Sea Fishery overlaps with the species' range, this is a relatively small-scale fishery with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery) although it is unknown if the species is taken by line fishing. Both fishing methods occur primarily in shallower water than the species' depth range. As such, its deep occurrence gives it refuge beyond the depth range of current demersal fishing activities and there are no other apparent threats to this species. Furthermore, there is now significant protection provided by the Coral Sea Marine Park. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the East Australian Legskate is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Sixgill Stingray

CAAB Code 37 037002

Hexatrygon bickelli Heemstra & Smith, 1980

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in areas of limited fishing effort; deepwater refuge

Distribution: Indo-Pacific

Habitat: Continental slope

Depth: 360–1,120 m

Maximum size: 170 cm TL



Assessment Justification: The Sixgill Stingray is a rare and poorly-known ray with a widely-separated northwest and northeast Australian range. Outside of Australian waters, it has a wide but patchy tropical and warm-temperate Indo-Pacific distribution. Its Australian range is expected to be wider than presently documented given a lack of survey effort in its deep habitat. This viviparous species has limited biological productivity (probable slow growth rate; litter size, 2–3 pups). It is a possible bycatch of deeper water fisheries, although Commonwealth-managed fisheries off Queensland (Coral Sea Fishery; CSF) and Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery) have limited effort with only a small number of active vessels (with no trawl effort since the 2006/07 fishing season in the CSF; trawling is no longer permitted in the fishery). Significant protection is now also provided by the Coral Sea Marine Park. Furthermore, its deep occurrence gives it refuge beyond the depth range of current demersal fishing activities and there are no other apparent threats to this species. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Sixgill Stingray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Giant Stingaree

CAAB Code 37 038023

Plesiobatis daviesi (Wallace, 1967)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in areas of limited fishing effort; deepwater refuge

Distribution: Indo-Pacific

Habitat: Continental slope

Depth: 275–680 m

Maximum size: 270 cm TL



Assessment Justification: The Giant Stingaree is a poorly-known ray with a wide but separated eastern and Western Australian range. Outside of Australian waters, it has a wide but patchy tropical and warm-temperate Indo-Pacific distribution. Little biological data are available on this presumably viviparous species (probable slow growth rate and limited biological productivity). It is a possible bycatch of a variety of deeper water fisheries, however there is limited fishing effort across most of its range. The Giant Stingaree occurs at depths beyond inshore fisheries, while Commonwealth-managed fisheries off Queensland (Coral Sea Fishery; CSF) and Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery) have limited effort with only a small number of active vessels (with no trawl effort since the 2006/07 fishing season in the CSF; trawling is no longer permitted in the fishery). Significant protection is now also provided by the Coral Sea Marine Park. The species may also be taken as bycatch in state-managed fisheries off Queensland, although effort is limited within its depth range. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Giant Stingaree is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Smooth Stingray

CAAB Code 37 035001

Bathytoshia brevicaudata (Hutton, 1875)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-Pacific

Habitat: Continental shelf & slope

Depth: 0–480 m

Maximum size: 210 cm DW



Assessment Justification: The Smooth Stingray is a common ray with a wide southern Australian range. Outside of Australian waters, it has a wide but patchy temperate Indo-Pacific distribution. This viviparous species has limited biological productivity (litter size, 6–10 pups). It is a bycatch or byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where a small portion of the catch has historically been retained. Standardised catch-per-unit-effort in the SESSF showed no trend between 2001 and 2006 (although acknowledging the short length of this time-series). The Smooth Stingray is also a bycatch or byproduct of some state-managed line fisheries, however there are considerable parts of its range which receive limited fishing effort, providing it with refuge from major fishing gear. Post-release survivorship from discarding is apparently high. It is protected in the West Coast and South Coast Bioregions of Western Australia due to tourism values (representing about a quarter of the species' Australian range). The overall population trend is suspected to be stable based on trends in the SESSF, refugia, protection, and high post-release survivorship. There is nothing to infer or suspect population reduction at this time and the Smooth Stingray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- State protection (WA: West Coast & South Coast Bioregions)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Brown Stingray

Bathytoshia lata (Garman, 1880)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Indo-Pacific; Eastern Atlantic

Habitat: Continental shelf & slope

Depth: 0–800 m

Maximum size: 260 cm DW



Assessment Justification: The Brown Stingray is a common ray with a wide southern Australian range. Outside of Australian waters, it has a wide but patchy tropical and temperate Indo-Pacific and Eastern Atlantic distribution. This viviparous species has limited biological productivity (Amat, 15 years; Amax, 28 years; GL, 21.5 years; litter size, 2–6 pups). It is a bycatch or byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where most of the catch is discarded (although post-release mortality is unknown). Standardised catch-per-unit-effort in the SESSF showed no trend between 2001 and 2006 in the Great Australian Bight and between 1998 and 2006 off southeast Australia (although acknowledging the short length of these time-series). The Brown Stingray is also a bycatch or byproduct of some state-managed line and trawl fisheries, however there are considerable parts of its wide range which receive limited fishing effort, providing it with refuge from major fishing gear. It is protected in the West Coast and South Coast Bioregions of Western Australia due to tourism values (representing about a quarter of the species’ Australian range). The overall population trend is suspected to be stable based on trends in the SESSF, refugia, and protection. There is nothing to infer or suspect population reduction at this time and the Brown Stingray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess reproduction	Low
Connectivity	Assess connectivity	Low

Current Management

- State protection (WA: West Coast & South Coast Bioregions)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels



Estuary Stingray

CAAB Code 37 035008

Hemistrygon fluviorum (Ogilby, 1908)

IUCN Red List Category & Criteria

Vulnerable A2cd*

*See Supporting Information on following page

Reasons for Listing

Suspected population reduction of >30% over the last 3 generations (51 years) based on a decline in area of occupancy & catch levels

Distribution: Australian endemic

Habitat: Continental shelf; estuaries

Depth: 0–28 m

Maximum size: 93 cm DW



Assessment Justification: The Estuary Stingray is a rare endemic ray with a wide eastern and northern Australian range. This viviparous species has limited biological productivity (Amat, 13 years; Amax, 21 years; GL, 17 years; annual reproductive cycle). The species appears particularly sensitive to decline due to its localised occurrence, habitat specialisation (mangrove-fringed lower reaches of rivers and estuaries), and intrinsic biological susceptibility. Range contractions and population reductions in New South Wales and southern Queensland have been reported based on comparisons of historical records with contemporary range. It was apparently once common in parts of New South Wales but is now considered uncommon anywhere along the coast of that state, although recent records point to some areas of potential critical habitat. A decline in the species' area of occupancy is inferred from habitat degradation due to foreshore development and a population reduction is suspected from continuing bycatch in commercial fisheries, persecution by shellfish farmers, recreational fishers, and during some commercial fishing activities. It likely faces less pressure in more remote northern parts of its range, but information is lacking on the occurrence of the species outside of the east coast. Overall, it is suspected that the population has undergone a reduction of >30% over the last three generations (51 years) and the Estuary Stingray is assessed as Vulnerable.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Mod.	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: habitat degradation		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Protect species
- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for Estuary Stingray

IUCN Red List Category & Criteria: Vulnerable A2cd

EPBC Act Status: Not listed

Recommendation: Prioritise data collection

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Suspected population reduction of >30% over the last 3 generations (51 years) based on a decline in area of occupancy & catch levels
B	Not applicable: EOO>20,000 km ² ; AOO >2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is possibly <10,000 mature individuals
D	Not applicable: population size is likely >1,000 mature individuals; AOO >20 km ² ; >5 locations
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	3,934,300 km ² unknown	low low
Area of occupancy trend	>2,000 km ² unknown	low low
No. of mature individuals trend	possibly <10,000 decreasing	low low
No. subpopulations	unknown	low
No. locations	>10	high
Generation length*	17 years	high
Global population share	100%	high

*Generation length was calculated from age data for this species (Pierce & Bennett 2010a).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: declines and range contractions have been reported across ~30% of the species' range, based on comparisons of historical records with contemporary range (Kyne *et al.* 2016, Pierce & Bennett 2010a, 2010b); declines are inferred over the remainder of the range given on-going threats (bycatch and habitat degradation), localised occurrence, habitat specialisation, and intrinsic biological susceptibility (Kyne *et al.* 2016, Pierce & Bennett 2010a, 2010b); there may be refuge in more remote parts of northern Australia, however, its range is not well understood outside of what appears to be core distribution in eastern Australia (Kyne *et al.* 2016, Pierce & Bennett 2010a, 2010b); its range across northern Australia and in New South Wales (Gladstone *et al.* 2012) requires further investigation; when considered across the species' national extent, an overall population reduction of >30% is suspected over the last three generations and the causes of this reduction have not ceased; further data are required to strengthen the evidence-base underlying this assessment.

Information sources: Gladstone *et al.* (2012); Kyne *et al.* (2016); Pierce & Bennett (2010a, 2010b).

Dwarf Black Stingray

CAAB Code 37 035021

Hemistrygon parvonigra (Last & White, 2008)

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Indo-West Pacific

Habitat: Continental shelf

Depth: 60–185 m

Maximum size: 51 cm DW



Assessment Justification: The Dwarf Black Stingray is a rare and poorly-known ray with a restricted northwest Australian range (extent of occurrence <20,000 km²). Outside of Australian waters, it has a patchy Southeast Asian distribution. It is known only from a limited number of specimens and may occur more widely than presently recorded. Little biological data are available on this viviparous species (it is likely to have a small litter size). It is a possible bycatch of trawl fisheries however it occurs at depths too shallow for the Commonwealth-managed North West Slope Trawl Fishery which has limited fishing effort with only a small number of active vessels. The Western Australian-managed Pilbara Fish Trawl Fishery operates primarily at depths of 50–110 m and may catch this species as bycatch. Considerable areas of Western Australia’s North Coast Bioregion are closed to trawling through spatial management arrangements, which may provide a refuge. Overall though, given the species’ very small range, it is unknown if fisheries are causing a population reduction, and as such there is currently inadequate information available to assess the Dwarf Black Stingray beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Australian Whipray

CAAB Code 37 035003

Himantura australis Last, White & Naylor, 2016

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Continental shelf; estuaries

Depth: 0–45 m

Maximum size: 183 cm DW



Assessment Justification: The Australian Whipray is a common but poorly-known ray with a wide northern Australian range. Outside of Australian waters, it occurs in New Guinea. Little biological data are available on this viviparous species (litter size, up to 4 pups). As well as occurring in marine habitats, this species enters brackish tidal rivers and estuaries. It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF) and the Queensland East Coast Trawl Fishery (and likely other state and territory fisheries). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller individuals). Estimates of fishing mortality rates for whiprays in the NPF are well below those that would lead to significant population declines and there are significant areas of this species' range that are only lightly fished or unfished. The overall population trend is suspected to be stable based on catch rates and refugia. There is nothing to infer or suspect population reduction at this time and the Australian Whipray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Leopard Whipray

CAAB Code 37 035026

Himantura leoparda Manjaji-Matsumoto & Last, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental shelf

Depth: 0–70 m

Maximum size: 140 cm DW



Assessment Justification: The Leopard Whipray is a poorly-known ray with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. Little biological data are available on this viviparous species (it is likely to have a small litter size). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller individuals). Estimates of fishing mortality rates for whiprays in the NPF are well below those that would lead to significant population declines. There are significant areas of this species' range that are only lightly fished or unfished. The overall population trend is suspected to be stable based on catch rates and refugia. There is nothing to infer or suspect population reduction at this time and the Leopard Whipray is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Blackspotted Whipray

CAAB Code 37 035020

Maculabatis astra (Last, Manjaji-Matsumoto & Pogonoski, 2008)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Continental shelf

Depth: 0–140 m

Maximum size: 92 cm DW



Assessment Justification: The Blackspotted Whipray is a common ray with a wide northern Australian range. Outside of Australian waters, it occurs across southern New Guinea. This viviparous species has limited biological productivity (Amat, 8–10 years; Amax, 31 years; GL, 19.5–20.5 years; litter size, 1–3 pups). This species is very common in the Gulf of Carpentaria where it is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF). It is also a bycatch of the Queensland East Coast Trawl Fishery (and likely other state and territory fisheries). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller species such as this). Estimates of fishing mortality rates for whiprays in the NPF are well below those that would lead to significant population declines. There are significant areas of this species' range that are only lightly fished or unfished. The overall population trend is suspected to be stable based on mortality rates and refugia. There is nothing to infer or suspect population reduction at this time and the Blackspotted Whipray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve nomenclature	High
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Brown Whipray

CAAB Code 37 035022

Maculabatis toshi (Whitley, 1939)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Continental shelf

Depth: 0–140 m

Maximum size: 82 cm DW



Assessment Justification: The Brown Whipray is a common ray with a wide northern Australian range. Outside of Australian waters, it occurs in southern Papua New Guinea. Little biological data are available on this viviparous species (it is likely to have a small litter size). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF) and the Queensland East Coast Trawl Fishery (and likely other state and territory fisheries). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller species such as this). Estimates of fishing mortality rates for whiprays in the NPF are well below those that would lead to significant population declines. There are significant areas of this species' range that are only lightly fished or unfished. Its preference for very shallow inshore waters may have resulted in localised impacts due to habitat loss and degradation in developed parts of the east coast, and there is a lack of recent records at the southeastern most limit of its range. Surveys are required to examine its occurrence in New South Wales. Despite this, it is not suspected to be close to reaching the population reduction threshold and the Brown Whipray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	Resolve nomenclature	High
Distribution	Clarify range	Low
Population trend	Monitor catch	Medium
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Smalleye Stingray

CAAB Code 37 035028

Megatrygon microps (Annandale, 1908)

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Indo-West Pacific

Habitat: Pelagic; continental shelf

Depth: 0–200 m

Maximum size: 222 cm DW



Assessment Justification: The Smalleye Stingray is a rare and poorly-known ray recorded from widely-separated locations off northern and northeast Australia. Outside of Australian waters, it has a wide but patchy tropical Indo-West Pacific distribution. It may be more widespread in Australian waters than presently recorded. Observations elsewhere indicate that it is possibly semi-pelagic, which may account for its rarity in catches throughout its range compared to demersal stingray species. This viviparous species has limited biological productivity (litter size, 1 pup). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (and likely some state and territory fisheries). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller individuals). Overall though, given the species' rarity, it is unknown if Australian fisheries are causing a population reduction, and as such there is currently inadequate information available to assess the Smalleye Stingray beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	High
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Plain Maskray

CAAB Code 37 035012

Neotrygon annotata (Last, 1987)

IUCN Red List Category & Criteria

Near Threatened A2d

Reasons for Listing

Suspected population reduction approaching 30% over the last 3 generations (26 years) based on catch levels

Distribution: Australasia & Indonesia

Habitat: Continental shelf

Depth: 10–60 m

Maximum size: 30 cm DW



Assessment Justification: The Plain Maskray is a common ray with a relatively restricted northern Australian range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it occurs in Papua New Guinea and eastern Indonesia. This viviparous species has limited biological productivity despite early maturity (Amat, 3–4 years; Amax, 13 years; GL, 8.5 years; litter size, 1–3 pups). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF). The core areas of the fishery overlap considerably with the distribution of the Plain Maskray, and its more restricted range compared to other northern maskray species means that it does not have the same refuge in lightly fished or unfished areas. Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays, but they are ineffective at excluding smaller maskray species. However, estimates of fishing mortality rates for the species in the NPF are well below those that would lead to significant population declines. Despite this, given the considerable overlap between high fishing effort and the species’ relatively restricted geographic and depth range (without major refuge), significant levels of bycatch, and low biological productivity, it is suspected that the population has undergone a reduction approaching 30% over the last three generations (26 years) and the Plain Maskray is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Monitor population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Australian Bluespotted Maskray

CAAB Code 37 035004

Neotrygon australiae Last, White & Séret, 2016

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia & Indonesia

Habitat: Continental shelf

Depth: 25–90 m

Maximum size: 47 cm DW



Assessment Justification: The Australian Bluespotted Maskray is a common ray with a wide northern and Western Australian range. Outside of Australian waters, it occurs in Papua New Guinea and eastern Indonesia. Little biological data are available on this viviparous species (probable annual reproductive cycle with litter sizes of 1–3 pups like other maskrays). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays, but they are ineffective at excluding smaller maskray species. However, estimates of fishing mortality rates for the species in the NPF are well below those that would lead to significant population declines. It is also a bycatch of inshore Western Australian prawn and fish trawl fisheries, but both fishing effort and the operational area of these fisheries are small relative to the species' range. Considerable areas of Western Australia's North Coast Bioregion and the Northern Territory are closed to trawling through spatial management arrangements and there are significant areas of this species' range that are only lightly fished or unfished. It is not suspected to be close to reaching the population reduction threshold and the Australian Bluespotted Maskray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Painted Maskray

CAAB Code 37 035013

Neotrygon leylandi (Last, 1987)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 15–200 m

Maximum size: 27 cm DW



Assessment Justification: The Painted Maskray is a common endemic ray with a relatively restricted northwest Australian range (although with an extent of occurrence >20,000 km²). This viviparous species has limited biological productivity (probable annual reproductive cycle; litter size, 1–3 pups). It is a bycatch of inshore Western Australian prawn and fish trawl fisheries, but both fishing effort and the operational area of these fisheries are small relative to the species' range. One of these fisheries, the Pilbara Fish Trawl Fishery, operates primarily at depths of 50–110 m which covers only a portion of the species' depth range. Considerable areas of Western Australia's North Coast Bioregion are closed to trawling through spatial management arrangements which may provide a refuge. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Painted Maskray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Ningaloo Maskray

CAAB Code 37 035030

Neotrygon ningalooensis Last, White & Puckridge, 2010

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–5 m

Maximum size: 30 cm DW



Assessment Justification: The Ningaloo Maskray is a rare and poorly-known endemic ray with a patchy and relatively restricted northern and Western Australian range (although with an extent of occurrence >20,000 km²). It is known only from a limited number of specimens and its distribution is not well defined (it may occur more widely across northwest Australia). Little biological data are available on this viviparous species (probable annual reproductive cycle with litter sizes of 1–3 pups like other maskrays). This species appears to be highly habitat-specific, occurring only in very shallow waters (<5 m) on soft sediments close to reef. Its occurrence in very shallow waters precludes capture in most fisheries operating in the region and it occurs shallower than the depths fished by trawl fisheries. The species has refuge from threats in protected areas at Ningaloo and Shark Bay, and other parts of its range are remote without significant human pressure. Any future development across its small range could have negative local impacts. Population trend is unknown, although it is suspected to be stable based on the refugia in shallow waters and protected areas. There is nothing to infer or suspect population reduction at this time and the Ningaloo Maskray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Speckled Maskray

CAAB Code 37 035029

Neotrygon picta Last & White, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Continental shelf

Depth: 5–100 m

Maximum size: 32 cm DW



Assessment Justification: The Speckled Maskray is a common ray with a wide northern and eastern Australian range. Outside of Australian waters, it occurs in southern Papua New Guinea. This viviparous species has limited biological productivity despite early maturity (Amat, 3–4 years; Amax, 18 years; GL, 10.5–11 years; annual reproductive cycle; litter size, 1–3 pups). This species is very common in the Gulf of Carpentaria where it is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF). It is also a bycatch of the Queensland East Coast Trawl Fishery (and likely other state and territory fisheries). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays, but they are ineffective at excluding smaller maskray species. However, estimates of fishing mortality rates for the species in the NPF are well below those that would lead to significant population declines. There are significant areas of this species’ range that are only lightly fished or unfished, providing a refuge. It is not suspected to be close to reaching the population reduction threshold and the Speckled Maskray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Coral Sea Maskray

CAAB Code 37 035031

Neotrygon trigonoides (Castelnau, 1873)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Continental shelf; reefs

Depth: 0–170 m

Maximum size: 35 cm DW



Assessment Justification: The Coral Sea Maskray is a common ray with a wide eastern Australian range. Outside of Australian waters, it occurs in New Caledonia. This viviparous species has limited biological productivity (Amat, 6 years; Amax, 13 years; GL, 9.5 years; annual reproductive cycle; litter size, 1–3 pups). This species occupies a variety of habitats including coral reefs. It is a bycatch of the Queensland East Coast Trawl Fishery. Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays, but they are ineffective at excluding smaller maskray species. The Coral Sea Maskray is also taken in other inshore fisheries, but it has considerable refuge in marine reserves within its range. It remains abundant, and although localised reductions are possible on some heavily fished trawl grounds, it is not suspected to be close to reaching the population reduction threshold and the Coral Sea Maskray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Broad Cowtail Ray

CAAB Code 37 035011

Pastinachus ater (Macleay, 1883)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental shelf; estuaries

Depth: 0–60 m

Maximum size: 200 cm DW



Assessment Justification: The Broad Cowtail Ray is a common ray with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. Little biological data are available on this viviparous species (litter size, 2 pups). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF) and the Queensland East Coast Trawl Fishery (and likely other state and territory fisheries). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller individuals). Estimates of fishing mortality rates for the species in the NPF are well below those that would lead to significant population declines. There are significant areas of this species' range that are only lightly fished or unfished and the Broad Cowtail Ray also has considerable refuge in marine reserves within its range. The overall population trend is suspected to be stable. There is nothing to infer or suspect population reduction at this time and the Broad Cowtail Ray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Pink Whipray

CAAB Code 37 035024

Pateobatis fai (Jordan & Seale, 1906)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-Pacific

Habitat: Continental shelf; reefs

Depth: 0–70 m

Maximum size: 170 cm DW



Assessment Justification: The Pink Whipray is a common but surprisingly poorly-known ray with a wide northern Australian range. Outside of Australian waters, it has a wide but patchy tropical Indo-Pacific distribution. Little biological data are available on this viviparous species (it is likely to have a small litter size). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF) and may also be a bycatch of the Queensland East Coast Trawl Fishery (and likely other state and territory fisheries). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller individuals). Estimates of fishing mortality rates for whiprays in the NPF are well below those that would lead to significant population declines. The Pink Whipray may interact less with trawl fisheries than other whiprays due to its affinity to coral reefs, and it has considerable refuge in marine reserves and significant areas of this species' range are only lightly fished or unfished. The overall population trend is suspected to be stable. There is nothing to infer or suspect population reduction at this time and the Pink Whipray is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Hortle’s Whipray

CAAB Code 37 035033

Pateobatis hortlei (Last, Manjaji-Matsumoto & Kailola, 2006)

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australasia

Habitat: Continental shelf; estuaries; rivers

Depth: 1–7 m

Maximum size: 112 cm DW



Assessment Justification: Hortle’s Whipray is a rare and poorly-known ray recorded only from the Pentecost, Durack, and Daly Rivers of northwest Australia. Outside of Australian waters, it occurs in southern New Guinea. It is only known from a limited number of records and it may occur more widely in northern rivers and estuaries. Little biological data are available on this viviparous species (it is likely to have a small litter size). It has only been recorded in brackish to marine waters of macrotidal rivers so may show seasonal movements into river systems during the higher salinities of the dry season. It is a bycatch of trawl fisheries in marine waters of New Guinea, but it is unknown if it is caught in the Commonwealth-managed Northern Prawn Fishery which fishes in Joseph Bonaparte Gulf adjacent to the known range of Hortle’s Whipray. A lack of commercial fishing in the rivers it has been recorded in provides refuge in these habitats. Overall though, given the species’ very small known range and apparent rarity, it is unknown if fisheries are causing a population reduction, and as such there is currently inadequate information available to assess Hortle’s Whipray beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: freshwater flow alteration		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	High

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Mitigate catch
- Reduce post-release mortality
- Maintain river-estuary connectivity
- Identify & protect critical habitat

Jenkins' Whipray

CAAB Code 37 035025

Pateobatis jenkinsii (Annandale, 1909)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental shelf

Depth: 0–90 m

Maximum size: 150 cm DW



Assessment Justification: Jenkins' Whipray is a poorly-known ray with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. Little biological data are available on this viviparous species (it is likely to have a small litter size). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller individuals). Estimates of fishing mortality rates for whiprays in the NPF are well below those that would lead to significant population declines. There are significant areas of this species' range that are only lightly fished or unfished. The overall population trend is suspected to be stable based on mortality rates and refugia. There is nothing to infer or suspect population reduction at this time and Jenkins' Whipray is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Pelagic Stingray

CAAB Code 37 035010

Pteroplatytrygon violacea (Bonaparte, 1832)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Cosmopolitan

Habitat: Pelagic

Depth: 0–381 m

Maximum size: 80 cm DW



Assessment Justification: The Pelagic Stingray is a common ray with a wide offshore Australian range. Outside of Australian waters, it has a circumglobal tropical and temperate distribution. This viviparous species has moderate biological productivity given its early maturity (Amat, 3 years; Amax, 10 years; GL, 6.5 years; litter size, 2–13 pups). This is possibly the only stingray species occurring in the oceanic pelagic zone. The major fishing gear that interacts with the Pelagic Stingray are pelagic longlines for tunas and billfishes. The species is a bycatch of both the Commonwealth-managed Eastern Tuna and Billfish Fishery and the Western Tuna and Billfish Fishery, which operate off the east and west coast of Australia, respectively. The species is not retained but post-release mortality can be high due to jaw damage. Fishing effort and the number of active vessels has declined substantially in recent decades in both fisheries. Relative abundance trends outside of Australian waters appear to fluctuate over time with no consistent significant trend. Given these factors, and the large areas of Australian waters which are not subject to pelagic longline fishing, the overall population trend is suspected to be stable. There is nothing to infer or suspect population reduction at this time and the Pelagic Stingray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Bluespotted Fantail Ray

CAAB Code 37 035009

Taeniura lymma (Forsskål, 1775)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental shelf; reefs

Depth: 0–20 m

Maximum size: 35 cm DW



Assessment Justification: The Bluespotted Fantail Ray is a common but surprisingly poorly-known ray with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. Little biological data are available on this viviparous species (it is likely to have a small litter size). This species is associated with coral reefs, and the Great Barrier Reef is an important local site. Available literature and research have not recorded it as bycatch in major trawl fisheries of eastern and northern Australia, including the Commonwealth-managed Northern Prawn Fishery and the Queensland East Coast Trawl Fishery. This is likely due to its affinity to coral reefs and untrawlable ground. It is collected in the aquarium harvest fishery and while no data are available on catch rates, these are likely insignificant compared to the local population. The species has considerable refuge in marine reserves, is common where it occurs, and the overall population trend is suspected to be stable. There is nothing to infer or suspect population reduction at this time and the Bluespotted Fantail Ray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Target
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Blotched Fantail Ray

CAAB Code 37 035017

Taeniurops meyeri (Müller & Henle, 1841)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental shelf; reefs

Depth: 0–400 m

Maximum size: 180 cm DW



Assessment Justification: The Blotched Fantail Ray is a common ray with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. Little biological data are available on this viviparous species (litter size, up to 7 pups). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF). It may also be a bycatch of the Queensland East Coast Trawl Fishery (and likely other state and territory fisheries). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller individuals). Estimates of fishing mortality rates for the Blotched Fantail Ray in the NPF are above those that that would lead to significant population declines (although the species is rarely caught and there was high uncertainty around the estimates). The species has considerable refuge in marine reserves and significant areas of its range are only lightly fished or unfished. The overall population trend is suspected to be stable based on catch mortality and refugia. There is nothing to infer or suspect population reduction at this time and the Blotched Fantail Ray is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Mumburarr Whipray

CAAB Code 37 035032

Urogymnus acanthobothrium Last, White & Kyne, 2016

IUCN Red List Category & Criteria

Data Deficient

Reasons for Listing

Inadequate information to make a direct, or indirect, assessment of extinction risk based on distribution & population status

Distribution: Australasia

Habitat: Continental shelf; estuaries; rivers

Depth: 2–60 m

Maximum size: 161 cm DW



Assessment Justification: The Mumburarr Whipray is a rare and poorly-known ray with a relatively restricted northern Australian range (although with an extent of occurrence of >20,000 km²). It is known from only a very small number of records from four locations, but it is likely to be more wide-ranging than currently known. Outside of Australian waters, it occurs in southern Papua New Guinea. Little biological data are available on this viviparous species (it is likely to have a small litter size). Juveniles have been recorded in the brackish reaches of tidal rivers and estuaries, and the only Australian adult record was captured in marine waters. It may be a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF) which operates where the adult specimen was recorded. Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller individuals). Juveniles have been recorded in areas closed to commercial fishing, including within Kakadu National Park. However, given a restricted distribution and apparent rarity of the species, an assessment of the risk of population reduction from bycatch in the NPF needs to be made, and as such there is currently inadequate information available to assess the Mumburarr Whipray beyond Data Deficient.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: freshwater flow alteration		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Understand population
- Mitigate catch
- Reduce post-release mortality
- Maintain river-estuary connectivity
- Identify & protect critical habitat

Porcupine Whipray

CAAB Code 37 035027

Urogymnus asperrimus (Bloch & Schneider, 1801)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific; Eastern Atlantic

Habitat: Continental shelf; reefs

Depth: 0–130 m

Maximum size: 147 cm DW



Assessment Justification: The Porcupine Ray is a rare and poorly-known ray with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific and Eastern Atlantic distribution. Little biological data are available on this viviparous species (it is likely to have a small litter size). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF) and may also be a bycatch of some state and territory fisheries. Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller individuals). Estimates of fishing mortality rates for the Porcupine Ray in the NPF are above those that would lead to significant population declines (although the species is rarely caught and there was high uncertainty around the estimates). It has been assessed as highly vulnerable to climate change effects due to its dependence on coral reef habitats. However, the species has considerable refuge in marine reserves and significant areas of its range are only lightly fished or unfished. The overall population trend is suspected to be stable. There is nothing to infer or suspect population reduction at this time and the Porcupine Ray is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Freshwater Whipray

CAAB Code 37 035023

Urogymnus dalyensis (Last & Manjaji-Matsumoto, 2008)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Estuaries; rivers

Depth: 0–10 m

Maximum size: 124 cm DW



Assessment Justification: The Freshwater Whipray is a common ray with a wide but patchy northern Australian range. Outside of Australian waters, it occurs in southern Papua New Guinea. It is a euryhaline species, occupying fresh and estuarine waters. Little biological data are available on this viviparous species (it is likely to have a small litter size). The physical constraints of their environment limit the ability of freshwater and euryhaline sharks and rays to evade both habitat alteration/degradation and exploitation. Impoundments and artificial barriers on rivers have the potential to restrict movements and reduce available habitat of this species. An increasing emphasis on developing northern Australia, including water resources which may see the construction of in-stream barriers, is a potential future pressure. This species has been assessed as highly vulnerable to climate change effects. There are no major commercial fisheries which regularly take the species, although Indigenous harvest occurs in some localised areas. It is provided refuge in Northern Territory rivers closed to commercial fishing, and in Kakadu National Park, and much of the species' range is remote without significant threats. The overall population trend is suspected to be stable. There is nothing to infer or suspect population reduction at this time and the Freshwater Whipray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	High	Target
Fishing - shark control	None	–
Other: habitat degradation; freshwater flow alteration		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain river-estuary connectivity

Mangrove Whipray

CAAB Code 37 035019

Urogymnus granulatus (Macleay, 1883)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Continental shelf; reefs

Depth: 0–85 m

Maximum size: 141 cm DW



Assessment Justification: The Mangrove Whipray is a rare ray with a wide northern Australian range. Outside of Australian waters, it has a wide but patchy tropical Indo-West Pacific distribution. Little biological data are available on this viviparous species (it is likely to have a small litter size). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF). It may also be a bycatch of the Queensland East Coast Trawl Fishery (and likely other state and territory fisheries). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller individuals). Estimates of fishing mortality rates for whiprays in the NPF are well below those that would lead to significant population declines. The Mangrove Whipray may interact less with trawl fisheries than other whiprays due to its affinity to mangroves and shallow inshore areas. It has considerable refuge in marine reserves and significant areas of its range are only lightly fished or unfished. The overall population trend is suspected to be stable. There is nothing to infer or suspect population reduction at this time and the Mangrove Whipray is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Australian Butterfly Ray

CAAB Code 37 037001

Gymnura australis (Ramsay & Ogilby, 1886)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Continental shelf

Depth: 0–250 m

Maximum size: 94 cm DW



Assessment Justification: The Australian Butterfly Ray is a common ray with a wide northern Australian range. Outside of Australian waters, it occurs across southern New Guinea. This viviparous species has limited biological productivity (annual reproductive cycle; litter size, 1–6 pups). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF) and the Queensland East Coast Trawl Fishery (and likely other state and territory fisheries). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller species such as this). Estimates of fishing mortality rates for the species in the NPF are well below those that would lead to significant population declines. There are significant areas of this species' range that are only lightly fished or unfished. The overall population trend is suspected to be stable. There is nothing to infer or suspect population reduction at this time and the Australian Butterfly Ray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Yellow Shovelnose Stingaree

CAAB Code 37 038013

Trygonoptera galba Last & Yearsley, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 100–210 m

Maximum size: 39 cm TL



Assessment Justification: The Yellow Shovelnose Stingaree is a poorly-known endemic ray with a relatively restricted southwest Australian range (although with an extent of occurrence >20,000 km²). Little biological data are available on this viviparous species (stingarees generally have limited biological productivity: annual or biennial reproductive cycles; litter sizes as small as 1–2 pups). The area and depth where this species occurs receives little fishing effort, being too deep for inshore prawn trawl fisheries and at the edge of the low-effort Commonwealth-managed Western Deepwater Trawl Fishery. If the species was to be taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Yellow Shovelnose Stingaree is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Eastern Shovelnose Stingaree

CAAB Code 37 038014

Trygonoptera imitata Yearsley, Last & Gomon, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–120 m

Maximum size: 80 cm TL



Assessment Justification: The Eastern Shovelnose Stingaree is a common endemic ray with a relatively restricted southeast Australian range (although with an extent of occurrence >20,000 km²). This viviparous species has limited biological productivity (Amat, ~5 years; Amax, 12 years; GL, 8.5 years; annual reproductive cycle; litter size, 1–7 pups). It is a bycatch of the Southern and Eastern Scalefish and Shark Fishery; trawl effort in that fishery is limited within Bass Strait which would provide the species with some refuge from major fishing gear. This species has no commercial value and is discarded when caught. Where the species is taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. The Eastern Shovelnose Stingaree is common inshore in large bays in Victoria but has a patchy distribution elsewhere. In Port Phillip Bay, an increase in biomass was documented between 1972–75 and 1990–91, which is suspected to be related to reductions in other species, and therefore reduced competition. There is nothing to infer or suspect population reduction at this time and the Eastern Shovelnose Stingaree is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Western Shovelnose Stingaree

CAAB Code 37 038015

Trygonoptera mucosa Whitley, 1939

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–40 m

Maximum size: 47 cm TL



Assessment Justification: The Western Shovelnose Stingaree is a common endemic ray with a wide southern Australian range. This viviparous species has limited biological productivity (Amat, ~5 years; Amax, 17 years; GL, 11 years; annual reproductive cycle; litter size, 1–2 pups). It is a bycatch in the Great Australian Bight Trawl Sector of the Southern and Eastern Scalefish and Shark Fishery, but that fishery generally operates in waters deeper than the occurrence of the species. Parts of the species' distribution are unfished or have extremely low fishing pressure, particularly inshore areas of the Great Australian Bight. This species has no commercial value and is discarded when caught. It is also a common component of bycatch in localised inshore scallop and prawn fisheries that operate in some parts of its range. Where the species is taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Population trend is unknown, although it is suspected to be stable based on relatively limited fishing effort across its range overall. There is nothing to infer or suspect population reduction at this time and the Western Shovelnose Stingaree is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Striped Stingaree

CAAB Code 37 038016

Trygonoptera ovalis Last & Gomon, 1987

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–43 m

Maximum size: 61 cm TL



Assessment Justification: The Striped Stingaree is a poorly-known endemic ray with a wide southwest Australian range. Little biological data are available on this viviparous species, (stingarees generally have limited biological productivity: annual or biennial reproductive cycles; litter sizes as small as 1–2 pups). There are only low levels of fishing effort across the distribution of the Striped Stingaree, and the species is sparsely recorded as bycatch in localised prawn and scallop trawl fisheries off Western Australia. Its preference for rocky reef areas provides refuge from most trawling activities. Where the species is taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Striped Stingaree is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Masked Stingaree

CAAB Code 37 038017

Trygonoptera personata Last & Gomon, 1987

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–115 m

Maximum size: 55 cm TL



Assessment Justification: The Masked Stingaree is a common endemic ray with a relatively restricted southwest Australian range (although with an extent of occurrence >20,000 km²). This viviparous species has limited biological productivity (Amat, 4 years; Amax, 16 years; GL, 10 years; annual reproductive cycle; litter size, 1–2 pups). It is a common bycatch in localised inshore scallop and prawn fisheries that operate in some parts of its range, but overall trawl fishing pressure across the species' range is low. This species has no commercial value and is discarded when caught. Where the species is taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Masked Stingaree is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Common Stingaree

CAAB Code 37 038006

Trygonoptera testacea (Müller & Henle, 1841)

IUCN Red List Category & Criteria

Near Threatened A2d

Reasons for Listing

Suspected population reduction approaching 30% over the last 3 generations (30 years) based on catch levels

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–135 m

Maximum size: 52 cm TL



Assessment Justification: The Common Stingaree is a common endemic ray with a relatively restricted eastern Australian range (although with an extent of occurrence >20,000 km²). This viviparous species has limited biological productivity (estimated GL, 10 years; probable annual or biennial reproductive cycle like other stingarees; litter size, 1–2 pups). It is a regular component of the bycatch of estuarine, inshore, and shelf trawl fisheries, as well as other fishing gear and parts of its geographic and bathymetric range are under relatively significant pressure from trawling activities. It is generally discarded; post-release survivorship from trawling is low and females may regularly abort pups upon capture. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of stingarees of ~66%, and up to ~90% on one survey ground. Although these surveys were deeper than the occurrence of the Common Stingaree, it demonstrates the susceptibility of stingarees to population reduction on heavily trawled grounds. Based on overlap with well-established fisheries, significant catches, low post-release survivorship, and low biological productivity, it is suspected that the population has undergone a reduction approaching 30% over the last three generations (30 years) and the Common Stingaree is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Identify & protect critical habitat

Sandyback Stingaree

CAAB Code 37 038001

Urolophus bucculentus Macleay, 1884

IUCN Red List Category & Criteria

Vulnerable A2bd*

*See Supporting Information on following page

Reasons for Listing

Inferred population reduction of >30% over the last 3 generations (29 years) based on trend data & catch levels

Distribution: Australasia

Habitat: Continental shelf & slope

Depth: 65–274 m

Maximum size: 89 cm TL



Assessment Justification: The Sandyback Stingaree is a common ray with a wide southeast Australian range. Outside of Australian waters, it occurs off Papua New Guinea. This viviparous species has limited biological productivity (Amat, ~5 years; Amax, 14 years; GL, 9.5 years; biennial reproductive cycle; litter size, 1–5 pups). It is a bycatch of the Southern and Eastern Scalefish and Shark Fishery with most of the catch discarded. Where it is discarded, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of stingarees of ~66%, and up to ~90% on one survey ground. The Sandyback Stingaree was one of the most commonly caught stingarees in the surveys, and the overall declines are the equivalent of a 78% population reduction over three generations (29 years). These declines were documented mostly prior to the last three generations (1991–2020), however fishing pressure has been ongoing and there is no reason to suspect that declines have ceased. Other areas of the species’ range have lower levels of trawl fishing effort (e.g., Bass Strait; northern New South Wales). Overall, it is inferred that the population has undergone a reduction of >30% over the last three generations (29 years) and the Sandyback Stingaree is assessed as Vulnerable.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	High
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Protect species
- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for Sandyback Stingaree

IUCN Red List Category & Criteria: Vulnerable A2bd

EPBC Act Status: Not listed

Recommendation: Prioritise data collection

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Inferred population reduction of >30% over the last 3 generations (29 years) based on trend data & catch levels
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is likely > 10,000 mature individuals
D	Not applicable: although < 5 locations, population size is likely > 1,000 mature individuals; AOO > 20 km ²
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	1,236,800 km ² unknown	high low
Area of occupancy trend	> 2,000 km ² unknown	low low
No. of mature individuals trend	likely > 10,000 decreasing	low medium
No. subpopulations	unknown	low
No. locations	4	medium
Generation length*	9.5 years	high
Global population share	80%	medium

*Generation length was calculated from age data for this species (Trinnie, unpubl. data in Kyne *et al.* 2019a).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: declines the equivalent of 78% population reduction over three generations in the central part of the species' range (~25% of the range) (Graham *et al.* 2001, Kyne *et al.* 2019a); although these declines were documented mostly prior to the last three generations, fishing pressure has been ongoing and there is no reason to suspect that declines have ceased; declines are inferred outside this area where fishing effort is high (~25% of the range) but a level of decline of <30% is suspected elsewhere given relatively light fishing effort in some parts of the range (Patterson *et al.* 2019); therefore, when considered across the species' national extent, an overall population reduction of >30% is inferred over the last three generations and the causes of this reduction have not ceased; there is a need to obtain more recent data on catch rates for comparison with previous work.

Information sources: Adams *et al.* (2018); Campbell *et al.* (2018); Graham *et al.* (2001); Kyne *et al.* (2019a); Patterson *et al.* (2019); Trinnie *et al.* (2012); Walker & Gason (2007).

Circular Stingaree

CAAB Code 37 038020

Urolophus circularis McKay, 1966

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–120 m

Maximum size: 60 cm TL



Assessment Justification: The Circular Stingaree is a poorly-known endemic ray with a relatively restricted southwest Australian range (although with an extent of occurrence >20,000 km²). It is rarely-encountered due to its cryptic nature and habitat preferences (rocky reefs and kelp forests). Little biological data are available on this viviparous species (stingarees generally have limited biological productivity: annual or biennial reproductive cycles; litter sizes as small as 1–2 pups). There are limited commercial trawl fisheries which operate in the known distribution of the species, and it is only occasionally taken by those fisheries; its habitat preferences provide this species with a refuge from trawling activities. Where the species is taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Circular Stingaree is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Banded Stingaree

CAAB Code 37 038002

Urolophus cruciatus (Lacépède, 1804)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 0–210 m

Maximum size: 50 cm TL



Assessment Justification: The Banded Stingaree is a common endemic ray with a relatively restricted southeast Australian range (although with an extent of occurrence >20,000 km²). This viviparous species has limited biological productivity (Amat, ~6 years; estimated GL, 10 years; biennial reproductive cycle; litter size, 1–4 pups). It is a bycatch of the Southern and Eastern Scalefish and Shark Fishery, where it is discarded when caught. Where the species is taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of stingarees of ~66%, and up to ~90% on one survey ground. The Banded Stingaree was one of the four stingaree species taken in the surveys, although at smaller quantities than other species. These declines are not considered representative of the whole range of the species as it largely occurs in shallower unfished or lightly fished shelf waters and in Bass Strait where there is a lack of trawling. It is not suspected to be close to reaching the population reduction threshold and the Banded Stingaree is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Wide Stingaree

CAAB Code 37 038008

Urolophus expansus McCulloch, 1916

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 130–420 m

Maximum size: 52 cm TL



Assessment Justification: The Wide Stingaree is a common endemic ray with a wide southern Australian range. Little biological data are available on this viviparous species (Amat, 7 years; stingarees generally have limited biological productivity: annual or biennial reproductive cycles; litter sizes as small as 1–2 pups). It is a bycatch in the Great Australian Bight Trawl Sector of the Southern and Eastern Scalefish and Shark Fishery (SESSF). This species has no commercial value and is discarded when caught. It is also subject to demersal trawling from the Western Deepwater Trawl Fishery in the western most part of its range, however, this is a limited entry fishery with low fishing effort. Where the species is taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Standardised catch-per-unit-effort data from the SESSF between 2001 and 2006 showed no trend (although acknowledging the short length of this time-series), and the overall population trend is suspected to be stable given levels of fishing effort across the species' range, including areas which are unfished or only lightly fished. There is nothing to infer or suspect population reduction at this time and the Wide Stingaree is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Patchwork Stingaree

CAAB Code 37 038010

Urolophus flavomosaicus Last & Gomon, 1987

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 60–320 m

Maximum size: 59 cm TL



Assessment Justification: The Patchwork Stingaree is a poorly-known endemic ray with a wide but separated northeast and Western Australian range. Little biological data are available on this viviparous species (stingarees generally have limited biological productivity: annual or biennial reproductive cycles; litter sizes as small as 1–2 pups). The Patchwork Stingaree generally occurs at depths beyond inshore trawl fisheries, while Commonwealth-managed deeper water fisheries off Queensland (Coral Sea Fishery; CSF) and Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery) have limited effort with only a small number of active vessels. Furthermore, there has been no trawl effort since the 2006/07 fishing season in the CSF (trawling is no longer permitted in this fishery) and significant protection is now provided by the Coral Sea Marine Park. Queensland deeper water fisheries may also capture this species (including a developmental fishery for which little information is available). Where the species is taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Patchwork Stingaree is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Spotted Stingaree

CAAB Code 37 038003

Urolophus gigas Scott, 1954

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic**Habitat:** Continental shelf**Depth:** 0–50 m**Maximum size:** 80 cm TL

Assessment Justification: The Spotted Stingaree is a common endemic ray with a wide southern Australian range. This viviparous species has limited biological productivity (biennial reproductive cycle; litter size, 11–13 pups). It is a bycatch of the Southern and Eastern Scalefish and Shark Fishery. The lack of trawling in Bass Strait and lower levels of fishing pressure in the western Great Australian Bight, as well as its occurrence around rocky reefs provides it with refuge from major fishing gears. This species has no commercial value and is discarded when caught. Where the species is taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Spotted Stingaree is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Kapala Stingaree

CAAB Code 37 038018

Urolophus kapalensis Yearsley & Last, 2006

IUCN Red List Category & Criteria

Near Threatened A2d

Reasons for Listing

Suspected population reduction approaching 30% over the last 3 generations (30 years) based on catch levels

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 10–130 m

Maximum size: 52 cm TL



Assessment Justification: The Kapala Stingaree is a common endemic ray with a relatively restricted eastern Australian range (although with an extent of occurrence >20,000 km²). This viviparous species has limited biological productivity (estimated GL, 10 years; probable annual or biennial reproductive cycle like other stingarees; litter size, 1 pup). A considerable proportion of the species' relatively restricted distribution overlaps with trawl fishing, both from Commonwealth and state-managed fisheries. It is discarded when caught, may have low post-release survivorship, and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of stingarees of ~66%, and up to ~90% on one survey ground. Although these surveys were deeper than the occurrence of the Kapala Stingaree, it demonstrates the susceptibility of stingarees to population reduction on heavily trawled grounds. Based on overlap with well-established trawl fisheries, levels of bycatch, low post-release survivorship, and low biological productivity, it is suspected that the population has undergone a reduction approaching 30% over the last three generations (30 years) and the Kapala Stingaree is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Monitor population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Lobed Stingaree

CAAB Code 37 038021

Urolophus lobatus McKay, 1966

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic**Habitat:** Continental shelf**Depth:** 0–30 m**Maximum size:** 43 cm TL

Assessment Justification: The Lobed Stingaree is a common endemic ray with a relatively restricted southwest Australian range (although with an extent of occurrence >20,000 km²). This viviparous species has limited biological productivity despite early maturity (Amat, 3 years; Amax, 14 years; GL, 8.5 years; annual reproductive cycle; litter size, 1–2 pups). It is a common bycatch in localised inshore scallop and prawn fisheries that operate in some parts of its range, but overall trawl fishing pressure across the species' range is low. This species has no commercial value and is discarded when caught. Where the species is taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Lobed Stingaree is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Mitotic Stingaree

CAAB Code 37 038011

Urolophus mitosis Last & Gomon, 1987

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 100–200 m

Maximum size: 33 cm TL



Assessment Justification: The Mitotic Stingaree is a poorly-known endemic ray with a restricted northwest Australian range (extent of occurrence <math><20,000\text{ km}^2</math>). Little biological data are available on this viviparous species (stingarees generally have limited biological productivity: annual or biennial reproductive cycles; litter sizes as small as 1–2 pups). It is a possible bycatch of the Commonwealth-managed North West Slope Trawl Fishery, although fishing effort is low with only a small number of active vessels which fish beyond the known depth range of the species. If the species was to be taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Mitotic Stingaree is assessed as Least Concern. Given a restricted geographic and depth range as currently known, this assessment would need to be revisited if it was shown that commercial fishing was regularly interacting with the species.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Coastal Stingaree

CAAB Code 37 038022

Urolophus orarius Last & Gomon, 1987

IUCN Red List Category & Criteria

Endangered A2bd*

*See Supporting Information on following page

Reasons for Listing

Inferred population reduction of >50% over the last 3 generations (26 years) based on trend data & catch levels

Distribution: Australian endemic

Habitat: Continental shelf

Depth: 5–50 m

Maximum size: 31 cm TL



Assessment Justification: The Coastal Stingaree is a rare endemic ray with a relatively restricted eastern Great Australian Bight range (estimated extent of occurrence 143,500 km²). Little biological data are available on this viviparous species (estimated GL, 8.5 years; stingarees generally have limited biological productivity: annual or biennial reproductive cycles; litter sizes as small as 1–2 pups). During trawl surveys at 120 sites in the Spencer Gulf in 2007, the species was recorded at 11 sites (14 individuals) while during surveys at 65 sites in 2013, only a single individual was recorded. Notwithstanding the lower number of sites sampled, the recording of only a single individual in 2013 is of concern. During both surveys, the Coastal Stingaree was only recorded at sites with low trawling intensity. The South Australian Prawn Fisheries operate over about half of its known range. Commercial prawn trawling commenced in the 1960s and historically, fishing pressure has been intense in parts of this fishery, particularly in the Spencer Gulf. Where the species is taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. It is inferred that the population has undergone a reduction of >50% over the last three generations (26 years) and the Coastal Stingaree is assessed as Endangered.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Protect species
- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for Coastal Stingaree

IUCN Red List Category & Criteria: Endangered A2bd

EPBC Act Status: Not listed

Recommendation: Prioritise data collection

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Inferred population reduction of >50% over the last 3 generations (26 years) based on trend data & catch levels
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is possibly < 10,000 mature individuals
D	Not applicable: although < 5 locations, population size is likely > 1,000 mature individuals; AOO > 20 km ²
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	143,500 km ² unknown	high low
Area of occupancy trend	> 2,000 km ² unknown	low low
No. of mature individuals trend	possibly < 10,000 decreasing	low high
No. subpopulations	unknown	low
No. locations	4	medium
Generation length*	8.5 years	low
Global population share	100%	high

*Generation length is inferred from the Lobed Stingaree *Urolophus lobatus* (White *et al.* 2001).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: declines are inferred in fished areas of the species' range (~50% of the range) based on trawl surveys recording a lower catch rate in 2013 compared with 2007 (Kyne *et al.* 2019b, PIRSA 2017); although only a limited number of individuals were recorded in both surveys, only one animal was documented in 2013, and in both surveys the species was only recorded at sites with low trawling intensity (Kyne *et al.* 2019b, PIRSA 2017); there are possible areas of refuge outside trawl grounds; therefore, when considered across the species' national extent, an overall population reduction of >50% is inferred over the last three generations and the causes of this reduction have not ceased; there is a need to obtain more recent data on catch rates for comparison with previous work; further data are required to strengthen the evidence-base underlying this assessment.

Information sources: Adams *et al.* (2018); Burnell *et al.* (2015); Campbell *et al.* (2018); Kyne *et al.* (2019b); Patterson *et al.* (2019); PIRSA (2017); White *et al.* (2001).

Sparsely-spotted Stingaree

CAAB Code 37 038004

Urolophus paucimaculatus Dixon, 1969

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic**Habitat:** Continental shelf**Depth:** 0–150 m**Maximum size:** 57 cm TL

Assessment Justification: The Sparsely-spotted Stingaree is a common endemic ray with a wide southern Australian range. This viviparous species has limited biological productivity (Amat, 5 years; Amax, 14 years; GL, 9.5 years; annual reproductive cycle; litter size, 1–6 pups). It is a bycatch in several commercial shelf fisheries, is generally not utilised commercially, and is discarded. Where the species is taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Standardised catch-per-unit-effort data from the Southern and Eastern Scalefish and Shark Fishery between 1998 and 2006 showed a significant decline. However, it is thought that this is the result of shifting fishing effort rather than a true decline in abundance. In Port Phillip Bay, Victoria, increases in the abundance of the Sparsely-spotted Stingaree were recorded from 1970 to 1991, probably due to a reduction in the abundance of competitors. There are areas of the species' range which receive only low levels of fishing effort, or where trawling is largely absent (e.g., Bass Strait; western Great Australian Bight) which would provide some refuge from major fishing gear in that area. It is not suspected to be close to reaching the population reduction threshold and the Sparsely-spotted Stingaree is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	–	–
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Coral Sea Stingaree

CAAB Code 37 038019

Urolophus piperatus Séret & Last, 2003

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 170–370 m

Maximum size: 48 cm TL



Assessment Justification: The Coral Sea Stingaree is a poorly-known endemic ray with a relatively restricted northeast Australian range (although with an extent of occurrence >20,000 km²). This viviparous species has limited biological productivity (probable annual or biennial reproductive cycle like other stingarees; litter size, 3 pups). It is a bycatch in the Queensland-managed eastern king prawn deepwater sector of the East Coast Trawl Fishery, and possibly of a Queensland developmental deepwater trawl fishery (for which little information is available). The Commonwealth-managed Coral Sea Fishery has limited fishing effort across the species' range (no trawling effort since the 2006/07 fishing season; trawling is no longer permitted in the fishery). Significant protection is now also provided by the Coral Sea Marine Park. Where the species is taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Population trend is unknown, although it is suspected to be stable based on the overall low level of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Coral Sea Stingaree is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Yellowback Stingaree

CAAB Code 37 038005

Urolophus sufflavus Whitley, 1929

IUCN Red List Category & Criteria

Vulnerable A2bd*

*See Supporting Information on following page

Reasons for Listing

Inferred population reduction of >30% over the last 3 generations (26 years) based on trend data & catch levels

Distribution: Australian endemic

Habitat: Continental shelf & slope

Depth: 45–320 m

Maximum size: 42 cm TL



Assessment Justification: The Yellowback Stingaree is a common endemic ray with a relatively restricted eastern Australian range (although with an extent of occurrence >20,000 km²). This viviparous species has limited biological productivity (estimated GL, 8.5 years; probable annual or biennial reproductive cycle like other stingarees; litter size, 2 pups). It is a bycatch of the Southern and Eastern Scalefish and Shark Fishery and is discarded when caught; it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of stingarees of ~66%, and up to ~90% on one survey ground. The Yellowback Stingaree was one of the four stingaree species taken in the surveys, although at smaller quantities than other species, and the overall declines are the equivalent of a 75% population reduction over three generations (26 years). These declines were documented mostly prior to the last three generations (1994–2020), however fishing pressure has been ongoing and there is no reason to suspect that declines ceased. Other areas of the species' range have lower levels of trawl fishing effort (e.g., northern New South Wales). Overall, it is inferred that the population has undergone a reduction of >30% over the last three generations (26 years) and the Yellowback Stingaree is assessed as Vulnerable.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	High
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Protect species
- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for Yellowback Stingaree

IUCN Red List Category & Criteria: Vulnerable A2bd

EPBC Act Status: Not listed

Recommendation: Prioritise data collection

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Inferred population reduction of >30% over the last 3 generations (26 years) based on trend data & catch levels
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is likely > 10,000 mature individuals
D	Not applicable: although < 5 locations, population size is likely > 1,000 mature individuals; AOO > 20 km ²
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	224,300 km ² unknown	high low
Area of occupancy trend	>2,000 km ² unknown	low low
No. of mature individuals trend	likely > 10,000 decreasing	low high
No. subpopulations	unknown	low
No. locations	4	medium
Generation length*	8.5 years	low
Global population share	100%	high

*Generation length is inferred from the Lobed Stingaree *Urolophus lobatus* (White *et al.* 2001).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: declines the equivalent of 75% population reduction over three generations in the southern part of the species' range (>30% of the range) (Graham *et al.* 2001, Kyne *et al.* 2019c); although these declines were documented mostly prior to the last three generations, fishing pressure has been ongoing and there is no reason to suspect that declines have ceased; given relatively light fishing effort across most of the remainder of its range (Patterson *et al.* 2019) (with some exceptions, e.g., southern Queensland), a level of decline of <30% is suspected outside southeast Australia; therefore, when considered across the species' national extent, an overall population reduction of >30% is inferred over the last three generations and the causes of this reduction have not ceased; there is a need to obtain more recent data on catch rates for comparison with previous work.

Information sources: Adams *et al.* (2018); Campbell *et al.* (2018); Graham *et al.* (2001); Kyne *et al.* (2019c); Patterson *et al.* (2019); Walker & Gason (2007); White *et al.* (2001).

Greenback Stingaree

CAAB Code 37 038007

Urolophus viridis McCulloch, 1916

IUCN Red List Category & Criteria

Vulnerable A2bd*

*See Supporting Information on following page

Reasons for Listing

Inferred population reduction of >30% over the last 3 generations (30 years) based on trend data & catch levels

Distribution: Australian endemic**Habitat:** Continental shelf & slope**Depth:** 20–330 m**Maximum size:** 51 cm TL

Assessment Justification: The Greenback Stingaree is a common endemic ray with a wide southeast Australian range. This viviparous species has limited biological productivity (estimated GL, 10 years; annual reproductive cycle; litter size, 1–3 pups). It is a bycatch of the Southern and Eastern Scalefish and Shark Fishery and is discarded when caught; it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of stingarees of ~66%, and up to ~90% on one survey ground. The Greenback Stingaree was one of the most commonly caught stingarees in the surveys, and the overall declines are the equivalent of a 80% population reduction over three generations (30 years). These declines were documented mostly prior to the last three generations (1990–2020), however fishing pressure has been ongoing and there is no reason to suspect that declines have ceased. Other areas of the species' range have lower levels of trawl fishing effort (e.g., Bass Strait; northern New South Wales). Overall, it is inferred that the population has undergone a reduction of >30% over the last three generations (30 years) and the Greenback Stingaree is assessed as Vulnerable.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Protect species
- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for Greenback Stingaree

IUCN Red List Category & Criteria: Vulnerable A2bd

EPBC Act Status: Not listed

Recommendation: Prioritise data collection

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Inferred population reduction of >30% over the last 3 generations (30 years) based on trend data & catch levels
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is likely > 10,000 mature individuals
D	Not applicable: although < 5 locations, population size is likely > 1,000 mature individuals; AOO > 20 km ²
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	1,018,400 km ² unknown	high low
Area of occupancy trend	>2,000 km ² unknown	low low
No. of mature individuals trend	likely > 10,000 decreasing	low high
No. subpopulations	unknown	low
No. locations	4	medium
Generation length*	10 years	low
Global population share	100%	high

*Generation length is inferred from the Masked Stingaree *Trygonoptera personata* (White *et al.* 2002).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: declines the equivalent of 80% population reduction over three generations in the central part of the species' range (~25% of the range) (Graham *et al.* 2001, Kyne *et al.* 2019d); although these declines were documented mostly prior to the last three generations, fishing pressure has been ongoing and there is no reason to suspect that declines have ceased; declines are inferred outside this area where fishing effort is high (~25% of the range) but a level of decline of <30% is suspected elsewhere given relatively light fishing effort in some parts of the range (Patterson *et al.* 2019); therefore, when considered across the species' national extent, an overall population reduction of >30% is inferred over the last three generations and the causes of this reduction have not ceased; there is a need to obtain more recent data on catch rates for comparison with previous work.

Information sources: Adams *et al.* (2018); Campbell *et al.* (2018); Graham *et al.* (2001); Kyne *et al.* (2019d); Patterson *et al.* (2019); Trinnie *et al.* (2015); Walker & Gason (2007); White *et al.* (2002).

Brown Stingaree

CAAB Code 37 038009

Urolophus westraliensis Last & Gomon, 1987

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australian endemic**Habitat:** Continental shelf**Depth:** 60–220 m**Maximum size:** 36 cm TL

Assessment Justification: The Brown Stingaree is a poorly-known endemic ray with a wide but separated northwest and northern Australian range. Little biological data are available on this viviparous species (stingarees generally have limited biological productivity: annual or biennial reproductive cycles; litter sizes as small as 1–2 pups). It is an occasional bycatch of the Northern Territory Demersal Fishery and is a possible bycatch of the Commonwealth-managed North West Slope Trawl Fishery. Both fisheries are limited entry, with low fishing effort where the species occurs. Where the species is taken as bycatch, it may have low post-release survivorship and females may regularly abort pups upon capture as demonstrated for trawl caught stingarees. Considerable areas of Western Australia's North Coast Bioregion and the Northern Territory are closed to trawling through spatial management arrangements, which provides a refuge. Population trend is unknown, although it is suspected to be stable based on the overall low level of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Brown Stingaree is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Spotted Eagle Ray

Aetobatus ocellatus (Kuhl, 1823)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-Pacific

Habitat: Pelagic; continental shelf; reefs

Depth: 0–40 m

Maximum size: 300 cm DW



Assessment Justification: The Spotted Eagle Ray is a common ray with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-Pacific distribution. This viviparous species has limited biological productivity (probable biennial reproductive cycle; litter size, 1–4 pups). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF) and may also be a bycatch of the Queensland East Coast Trawl Fishery (and likely other state and territory fisheries). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller individuals). Estimates of fishing mortality rates for the species in the NPF are well below those that would lead to significant population declines. The Spotted Eagle Ray may interact less with trawl fisheries than other rays due to its pelagic swimming behaviour and affinity to coral reefs. It has considerable refuge in marine reserves and significant areas of this species' range are only lightly fished or unfished. The overall population trend is suspected to be stable. There is nothing to infer or suspect population reduction at this time and the Spotted Eagle Ray is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Bluebanded Eagle Ray

CAAB Code 37 039002

Aetomylaeus caeruleofasciatus White, Last & Baje, 2015

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Pelagic; continental shelf

Depth: 10–115 m

Maximum size: 59 cm DW



Assessment Justification: The Bluebanded Eagle Ray is a rare and poorly-known ray with a wide northern Australian range. Outside of Australian waters, it occurs across southern New Guinea. This viviparous species has limited biological productivity (probable annual or biennial reproductive cycle; litter size, 4 pups). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF) and the Queensland East Coast Trawl Fishery (and likely other state and territory fisheries). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller species such as this). Estimates of fishing mortality rates for the species in the NPF are below those that would lead to significant population declines. The Bluebanded Eagle Ray may interact less with trawl fisheries than other rays due to its pelagic swimming behaviour. It has considerable refuge in marine reserves and significant areas of this species’ range are only lightly fished or unfished. The overall population trend is suspected to be stable. There is nothing to infer or suspect population reduction at this time and the Bluebanded Eagle Ray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Ornate Eagle Ray

CAAB Code 37 039005

Aetomylaeus vespertilio (Bleeker, 1852)

IUCN Red List Category & Criteria

Near Threatened A2d

Reasons for Listing

Suspected population reduction approaching 30% over the last 3 generations (45 years) based on catch levels

Distribution: Indo-West Pacific

Habitat: Pelagic; continental shelf; reefs

Depth: 0–110 m

Maximum size: 300 cm DW



Assessment Justification: The Ornate Eagle Ray is a rare and poorly-known ray with a wide northern Australian range. Outside of Australian waters, it has a wide but patchy tropical Indo-West Pacific distribution. Little biological data are available on this viviparous species, but eagle rays generally have limited biological productivity (estimated GL, 15 years; probable annual or biennial reproductive cycle; litter size, 1–4 pups). It is a bycatch of the Commonwealth-managed Northern Prawn Fishery (NPF). It may also be a bycatch of the Queensland East Coast Trawl Fishery (and likely other state and territory fisheries). Turtle Exclusion Devices, which are mandatory, have been shown to reduce the catch of large rays by 94% (although they are not as effective at excluding smaller individuals). Estimates of fishing mortality rates for the species in the NPF are well below those that would lead to significant population declines. Despite this, pressure on the species outside of Australian waters is intense and largely unregulated, and it is globally threatened (Endangered). Given the pelagic nature of the species, it is inferred that Australian and adjacent stocks have a high degree of connectivity (although this requires examination) and it is suspected that the population has undergone a reduction approaching 30% over the last three generations (45 years) and the Ornate Eagle Ray is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	High

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Monitor population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Purple Eagle Ray

CAAB Code 37 039004

Myliobatis hamlyni Ogilby, 1911

IUCN Red List Category & Criteria

Vulnerable A2bd*

*See Supporting Information on following page

Reasons for Listing

Suspected population reduction of >30% over the last 3 generations (45 years) based on trend data & catch levels

Distribution: Indo-West Pacific

Habitat: Pelagic; continental slope

Depth: 120–350 m

Maximum size: 114 cm DW



Assessment Justification: The Purple Eagle Ray is a rare and poorly-known ray with a wide but separated eastern and Western Australian range. Outside of Australian waters, it has a wide but patchy Southeast Asian distribution. Little biological data are available on this viviparous species, but eagle rays generally have limited biological productivity (estimated GL, 15 years; probable annual or biennial reproductive cycle; litter size, 1–4 pups). This species occupies a narrow band of habitat on the outer continental shelf and upper slope. Despite many years of survey work along the east coast, it has rarely been encountered. Although catch rates are low, it was recorded more regularly during surveys off New South Wales in than late 1970s than it was in the late 1990s. The species' east coast range overlaps with some areas of high fishing effort, while its west coast range is subject to low levels of fishing effort. Given a long history of fishing on its east coast range, its occurrence in a narrow band of habitat, and its rarity, it is suspected to have undergone a significant population reduction on the east coast, while it is not likely to have declined off the west coast. Overall, it is suspected that the population has undergone a reduction of >30% over the last three generations (45 years) and the Purple Eagle Ray is assessed as Vulnerable.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	High

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Protect species
- Recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Supporting Information for Purple Eagle Ray

IUCN Red List Category & Criteria: Vulnerable A2bd

EPBC Act Status: Not listed

Recommendation: Prioritise data collection

Current eligibility against IUCN Red List Criteria

IUCN Criterion	Criteria eligibility
A	Suspected population reduction of >30% over the last 3 generations (45 years) based on trend data & catch levels
B	Not applicable: EOO > 20,000 km ² ; AOO > 2,000 km ²
C	Not applicable: there is no reliable estimate of population size although it is possibly < 10,000 mature individuals
D	Not applicable: although = 5 locations, population size is likely > 1,000 mature individuals; AOO > 20 km ²
E	Not applicable: no population viability analysis undertaken

IUCN Red List assessment data

Parameter	Estimate	Reliability
Extent of occurrence trend	4,877,100 km ² unknown	high low
Area of occupancy trend	>2,000 km ² unknown	low low
No. of mature individuals trend	possibly < 10,000 decreasing	low high
No. subpopulations	unknown	low
No. locations	5	medium
Generation length*	15 years	low
Global population share	40%	low

*Generation length is inferred from the Bat Eagle Ray *Myliobatis californicus* (Martin & Cailliet 1988a, 1988b).

Reason for change from EPBC Act listing

genuine change new knowledge taxonomic change previous mistake no change

Explanation: declines are inferred in the eastern part of the species' range (~60% of the range) based on the fact it was recorded more regularly in trawl surveys in the 1970s than the 1990s, together with its rarity, narrow habitat range, and intrinsic biological susceptibility (White *et al.* 2016); there is nothing to infer or suspect population reduction in the western part of its range; therefore, when considered across the species' national extent, an overall population reduction of >30% is suspected over the last three generations and the causes of this reduction have not ceased; there is a need to obtain more recent data on catch rates for comparison with previous work; further data are required to strengthen the evidence-base underlying this assessment.

Information sources: Martin & Cailliet (1988a, 1988b); Patterson *et al.* (2019); White *et al.* (2016).

Southern Eagle Ray

CAAB Code 37 039001

Myliobatis tenuicaudatus Hector, 1877

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Pelagic; continental shelf

Depth: 0–420 m

Maximum size: 160 cm DW



Assessment Justification: The Southern Eagle Ray is a common ray with a wide southern Australian range. Outside of Australian waters, it occurs in New Zealand. This viviparous species has limited biological productivity (probable annual or biennial reproductive cycle; litter size, 2–20 pups, mean 6). This species occupies a variety of habitats but is most commonly found inshore. It is a byproduct or bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF), where about half of the catch has historically been retained while the rest is discarded (although post-release mortality is unknown). Standardised catch-per-unit-effort in the SESSF showed no trend between 1998 and 2006 (although acknowledging the short length of this time-series). The Southern Eagle Ray is also a bycatch or byproduct of some state-managed fisheries, however there are considerable parts of its wide range which receive limited fishing effort, providing it with refuge from major fishing gear. The overall population trend is suspected to be stable based on trends in the SESSF and refugia. There is nothing to infer or suspect population reduction at this time and the Southern Eagle Ray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	Mod.	Target
Fishing - Indigenous	Low	Bycatch
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Australian Cownose Ray

CAAB Code 37 040001

Rhinoptera neglecta Ogilby, 1912

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Pelagic; continental shelf

Depth: 0–50 m

Maximum size: 140 cm DW



Assessment Justification: The Australian Cownose Ray is a poorly-known ray with a wide eastern and northern Australian range. Outside of Australian waters, it occurs in southern Papua New Guinea. Little biological data are available on this viviparous species, but cownose rays generally have limited biological productivity (annual or biennial reproductive cycles; litter size, 1 pup). The species can form significant aggregations which are occasionally observed off the east coast. Interactions with Australian commercial fisheries are poorly-defined, but it appears to have limited catchability in most fisheries across its range. This is possibly related to its surface-swimming nature, although it is susceptible to capture in gillnets (and to a lesser extent, trawls, and is a bycatch of shark control programs). Population trend is unknown, although it is suspected to be stable based on the apparent limited interactions with fisheries. There is nothing to infer or suspect population reduction at this time and the Australian Cownose Ray is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	Low	Bycatch
Fishing - Indigenous	Low	Target
Fishing - shark control	High	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Reef Manta Ray

Mobula alfredi (Krefft, 1868)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-Pacific; Eastern Atlantic

Habitat: Pelagic; continental shelf; reefs

Depth: 0–432 m

Maximum size: 550 cm DW



Assessment Justification: The Reef Manta Ray is a common ray with a wide Australian range (except for southern waters). Outside of Australian waters, it has a wide Indo-Pacific and Eastern Atlantic tropical and subtropical distribution. This viviparous species has limited biological productivity (Amat, 8–17 years; Amax, 45 years; GL, 26.5–31 years; reproductive cycle, usually 4–5 years; litter size, 1 pup). This species is typically resident and not highly-mobile like the Giant Manta Ray. It does not regularly interact with Australian fisheries due to habitat, behaviour, and limited catchability. Many key local aggregation sites are protected in marine reserves. The overall population trend is suspected to be stable. There is nothing to infer or suspect population reduction at this time and the Reef Manta Ray is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor sightings	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	High

Current Management

- Migratory (EPBC Act)
- CITES Appendix II (export restriction)
- CMS Appendices I & II
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Giant Manta Ray

CAAB Code 37 041004

Mobula birostris (Walbaum, 1792)

IUCN Red List Category & Criteria

Endangered A2bd

Reasons for Listing

Suspected population reduction of >50% over the last 3 generations (87 years) based on trend data & catch levels

Distribution: Cosmopolitan

Habitat: Pelagic; continental shelf

Depth: 0–1,000 m

Maximum size: 700 cm DW



Assessment Justification: The Giant Manta Ray is a common ray with a wide Australian range (except for southern waters). Outside of Australian waters, it has a circumglobal tropical and subtropical distribution. This viviparous species has limited biological productivity (Amat, 12 years; Amax, 45 years; GL, 29 years; reproductive cycle possibly 4–5 years like the Reef Manta Ray; litter size, 1 pup). This is a highly-mobile species, and individuals occurring in Australia are not expected to be resident, but rather connected to the wider global population, at least regionally. It does not regularly interact with Australian fisheries due to habitat, behaviour, and limited catchability. However, the global population is suspected to have undergone a reduction of >50% over the last three generations (87 years). This is based on an extremely low rate of population increase, current and ongoing levels of exploitation and trade, and steep decline estimates in some areas (including waters adjacent to Australia, i.e., Indonesia). The Australian assessment of the Giant Manta Ray reflects the global category of Endangered. International co-operation and conservation instruments will be vital to allow the recovery of the species in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	Low	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor sightings	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	High

Current Management

- Migratory (EPBC Act)
- CITES Appendix II (export restriction)
- CMS Appendices I & II
- General commercial fishery controls

Conservation Actions

- Engage internationally to recover population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Long-horned Pygmy Devilray

CAAB Code 37 041001

Mobula eregoodoo (Cantor, 1849)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Pelagic; continental shelf

Depth: 0–50 m

Maximum size: 130 cm DW



Assessment Justification: The Long-horned Pygmy Devilray is a poorly-known ray with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. The extent of its Australian range is poorly-defined due to confusion with Kuhl’s Devilray. These two viviparous species have limited biological productivity (reproductive cycle possibly 1–3 years like other devilrays; litter size, 1 pup). These pelagic species primarily occur inshore, not extending into offshore waters like other devilrays. Pygmy devil ray species are a bycatch of shark control programs, particularly in New South Wales, and of the Northern Territory Offshore Net and Line Fishery (and likely in some other state fisheries). The species-specific catch composition remains unresolved. Primarily susceptible to gillnet fisheries, these species do not appear to interact regularly with fisheries across most of their wide Australian range, and overall fishing mortality is expected to be low. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within their range. There is nothing to infer or suspect population reduction at this time and the Long-horned Pygmy Devilray is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	High	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	High

Current Management

- CITES Appendix II (export restriction)
- CMS Appendices I & II
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Kuhl's Devilray

CAAB Code 37 041007

Mobula kuhlii (Müller & Henle, 1841)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Indo-West Pacific

Habitat: Pelagic; continental shelf

Depth: 0–50 m

Maximum size: 135 cm DW



Assessment Justification: Kuhl's Devilray is a poorly-known ray with a wide northern Australian range. Outside of Australian waters, it has a wide tropical Indo-West Pacific distribution. The extent of its Australian range is poorly-defined due to confusion with the Long-horned Pygmy Devilray. These two viviparous species have limited biological productivity (reproductive cycle possibly 1–3 years like other devilrays; litter size, 1 pup). These pelagic species primarily occur inshore, not extending into offshore waters like other devilrays. Pygmy devil ray species are a bycatch of shark control programs, particularly in New South Wales, and of the Northern Territory Offshore Net and Line Fishery (and likely in some other state fisheries). The species-specific catch composition remains unresolved. Primarily susceptible to gillnet fisheries, these species do not appear to interact regularly with fisheries across most of their wide Australian range, and overall fishing mortality is expected to be low. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within their range. There is nothing to infer or suspect population reduction at this time and Kuhl's Devilray is assessed as Least Concern. This species is globally threatened; therefore, Australia represents a global refuge.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	High	Bycatch
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Medium
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	High

Current Management

- CITES Appendix II (export restriction)
- CMS Appendices I & II
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Giant Devilray

CAAB Code 37 041002

Mobula mobular (Bonnaterre, 1788)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Suspected population reduction approaching 30% over the last 3 generations (38 years) based on trend data & catch levels

Distribution: Cosmopolitan (but patchy)

Habitat: Pelagic; continental shelf

Depth: 0–700 m

Maximum size: 520 cm DW



Assessment Justification: The Giant Devilray is a rarely-encountered ray with a wide but patchy Australian range. It is likely to be wider ranging in Australian waters than currently documented. Outside of Australian waters, it probably has a circumglobal tropical and warm-temperate distribution. This viviparous species has limited biological productivity (Amat, 5–6 years; Amax, 20 years; GL, 12.8 years; reproductive cycle, 1–3 years; litter size, 1–2 pups). It is not likely to regularly interact with Australian fisheries due to habitat, behaviour, and limited catchability. However, the global population has undergone a severe population reduction, and given that the species is highly-mobile, the decline is likely to have affected the portion of the population occurring in, or visiting, Australian waters. Balancing global declines with a lack of local threats, it is suspected that the population has undergone a reduction approaching 30% over the last three generations (38 years) and the Giant Devilray is assessed as Near Threatened. International co-operation and conservation instruments will be vital to ensure the species does not become threatened in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	High

Current Management

- CITES Appendix II (export restriction)
- CMS Appendices I & II
- General commercial fishery controls

Conservation Actions

- Monitor population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Chilean Devilray

CAAB Code 37 041006

Mobula tarapacana (Philippi, 1892)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Suspected population reduction approaching 30% over the last 3 generations (38 years) based on trend data & catch levels

Distribution: Cosmopolitan (but patchy)

Habitat: Pelagic; continental shelf

Depth: 0–1,896 m

Maximum size: 370 cm DW



Assessment Justification: The Chilean Devilray is a rarely-encountered and poorly-known ray with a relatively restricted southeast Australian range (although with an extent of occurrence >20,000 km²). However, it is known only from a limited number of local records and most certainly occurs more widely than presently recorded. Outside of Australian waters, it has a wide but patchy global tropical and temperate distribution. This viviparous species has limited biological productivity (estimated GL, 12.8 years; reproductive cycle possibly 1–3 years like other devilrays; litter size, 1 pup). It is not likely to regularly interact with Australian fisheries due to habitat, behaviour, and limited catchability. However, the global population has undergone a severe population reduction, and given that the species is highly-mobile, the decline is likely to have affected the portion of the population occurring in, or visiting, Australian waters. Balancing global declines with a lack of local threats, it is suspected that the population has undergone a reduction approaching 30% over the last three generations (38 years) and the Chilean Devilray is assessed as Near Threatened. International co-operation and conservation instruments will be vital to ensure the species does not become threatened in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	High

Current Management

- CITES Appendix II (export restriction)
- CMS Appendices I & II
- General commercial fishery controls

Conservation Actions

- Monitor population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Bentfin Devilray

CAAB Code 37 041003

Mobula thurstoni (Lloyd, 1908)

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Suspected population reduction approaching 30% over the last 3 generations (38 years) based on trend data & catch levels

Distribution: Cosmopolitan (but patchy)

Habitat: Pelagic; continental shelf

Depth: 0–100 m

Maximum size: 189 cm DW



Assessment Justification: The Bentfin Devilray is a rarely-encountered and poorly-known ray with a wide but separated northwest and northeast Australian range. However, it is known only from a limited number of local records and most certainly occurs more widely than presently recorded. Outside of Australian waters, it has a wide but patchy global tropical and warm-temperate distribution. This viviparous species has limited biological productivity (estimated GL, 12.8 years; reproductive cycle possibly 1–3 years like other devilrays; litter size, 1–2 pups). It is not likely to regularly interact with Australian fisheries due to habitat, behaviour, and limited catchability. However, the global population has undergone a severe population reduction, and given that the species is highly-mobile, the decline is likely to have affected the portion of the population occurring in, or visiting, Australian waters. Balancing global declines with a lack of local threats, it is suspected that the population has undergone a reduction approaching 30% over the last three generations (38 years) and the Bentfin Devilray is assessed as Near Threatened. International co-operation and conservation instruments will be vital to ensure the species does not become threatened in Australia.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	High

Current Management

- Migratory (EPBC Act)
- CITES Appendix II (export restriction)
- CMS Appendices I & II
- General commercial fishery controls

Conservation Actions

- Monitor population
- Mitigate catch
- Reduce post-release mortality
- Identify & protect critical habitat

Elephantfish

CAAB Code 37 043001

Callorhinchus milii (Bory de Saint-Vincent, 1823)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort

Distribution: Australasia

Habitat: Continental shelf

Depth: 0–200 m

Maximum size: 120 cm TL



Assessment Justification: The Elephantfish is a common chimaera with a wide southern Australian range. Outside of Australian waters, it occurs around New Zealand. This oviparous species has moderate biological productivity (Amat, 5–6 years; Amax, possibly up to 20 years; GL, 12.5–13 years; annual fecundity, 20 eggs). This species is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery, with a long history of retention since the mid-1920s. It is also a favoured target of recreational fishers, including some targeting of females inshore during the egg-laying period. Current exploitation rates are considered sustainable. Ongoing commercial catch-per-unit-effort from shark gillnet fishing has been stable since 1981, following an earlier decline. Fishing effort and catch have reduced with the implementation of management measures (including catch limits). Therefore, on the basis of a stable population trend and active species-specific management, the Elephantfish is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	High	Byproduct
Fishing - recreational	High	Target
Fishing - Indigenous	Low	Target
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	–	–
Connectivity	Assess connectivity	Low

Current Management

- Commercial fishery quota (AUS)
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels

Whitefin Chimaera

CAAB Code 37 042009

Chimaera argiloba Last, White & Pogonoski, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in an area of limited fishing effort

Distribution: Australian endemic

Habitat: Continental slope

Depth: 370–520 m

Maximum size: 78 cm PCFL



Assessment Justification: The Whitefin Chimaera is a common but poorly-known endemic chimaera with a wide Western Australian range. Little biological data are available on this oviparous species (chimaeras generally have higher biological productivity relative to deepsea sharks). This species has a limited known depth range, thereby it may be restricted to a narrow band of habitat on the upper continental slope. It is a probable bycatch of Commonwealth-managed deeper water trawl fisheries off Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery), however these fisheries have limited effort with only a small number of active vessels. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Whitefin Chimaera is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch

Southern Chimaera

CAAB Code 37 042005

Chimaera fulva Didier, Last & White, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 780–1,095 m

Maximum size: 105 cm PCFL



Assessment Justification: The Southern Chimaera is a common but poorly-known endemic chimaera with a wide southern Australian range. Little biological data are available on this oviparous species (estimated Amax, 35 years; chimaeras generally have higher biological productivity relative to deepsea sharks). It was previously a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) where standardised catch-per-unit-effort between 1994 and 2006 showed no overall trend. Given the closure to trawling of most SESSF waters deeper than 700 m, the Southern Chimaera occurs at depths beyond current fishing operations and as such there are no apparent threats to this species. Population trend is unknown, although it is suspected to be stable based on the lack of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Southern Chimaera is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Maintain deepwater refuge

Giant Chimaera

CAAB Code 37 042008

Chimaera lignaria Didier, 2002

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Australasia

Habitat: Continental slope

Depth: 400–1,800 m

Maximum size: 128 cm PCFL



Assessment Justification: The Giant Chimaera is a common but poorly-known chimaera with a relatively restricted Tasmanian and southern seamount range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it occurs around New Zealand. It is unknown if this species is restricted to specific deepwater slopes or if it is possibly more widespread in deeper waters of the Southern Ocean. Little biological data are available on this oviparous species (chimaeras generally have higher biological productivity relative to deepsea sharks). It was previously a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) and may have been a bycatch of the South Tasman Rise Trawl Fishery (STRTF). Given the closure to trawling of most SESSF waters deeper than 700 m, the closure of the STRTF in 2007, and that the Giant Chimaera primarily occurs at depths beyond current fishing operations (particularly as it mostly occurs at depths >800 m), there are no apparent threats to this species. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Giant Chimaera is assessed as Least Concern. If the STRTF reopens, any bycatch of this species should be monitored.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Longspine Chimaera

CAAB Code 37 042007

Chimaera macropsina Didier, Last & White, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in areas of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 435–1,300 m

Maximum size: 77 cm PCFL



Assessment Justification: The Longspine Chimaera is a poorly-known endemic chimaera with a wide but separated eastern and Western Australian range. Little biological data are available on this oviparous species (chimaeras generally have higher biological productivity relative to deepsea sharks). It is a possible bycatch of Commonwealth-managed deeper water trawl fisheries off Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery) but these have limited effort with only a small number of active vessels. It is not likely to interact with state-managed fisheries given its depth range, and in the northeast part of its range, the Commonwealth-managed Coral Sea Fishery has few active vessels, with no trawl effort since the 2006/07 fishing season (trawling is no longer permitted in this fishery). Additionally, significant protection is now provided by the Coral Sea Marine Park. The species' deep occurrence generally places it outside fishing activities, particularly as it mostly occurs at depths >800 m. Population trend is unknown, although it is suspected to be stable based on the lack of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Longspine Chimaera is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Shortspine Chimaera

CAAB Code 37 042006

Chimaera obscura Didier, Last & White, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in areas of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 450–1,080 m

Maximum size: 69 cm PCFL



Assessment Justification: The Shortspine Chimaera is a rare and poorly-known endemic chimaera with a wide eastern Australian range. Little biological data are available on this oviparous species (chimaeras generally have higher biological productivity relative to deepsea sharks). It is a possible bycatch of Commonwealth-managed deeper water fisheries, namely the Southern and Eastern Scalefish and Shark Fishery (SESSF) at the southern extent of its range, and the Coral Sea Fishery (CSF) at the northern extent. It is not likely to interact significantly with state-managed fisheries given its depth range. Given the closure to trawling of most SESSF waters deeper than 700 m and with no trawl effort in the CSF since the 2006/07 fishing season (trawling is no longer permitted in this fishery), the species has refuge at depths beyond current fishing operations. Additionally, significant protection is now provided by the Coral Sea Marine Park. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Shortspine Chimaera is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Ogilby's Chimaera

CAAB Code 37 042001

Chimaera ogilbyi Waite, 1898

IUCN Red List Category & Criteria

Near Threatened A2bd

Reasons for Listing

Inferred population reduction approaching 30% over the last 3 generations (56 years) based on trend data & catch levels

Distribution: Australasia & Indonesia

Habitat: Continental shelf & slope

Depth: 139–872 m

Maximum size: 85 cm PCFL



Assessment Justification: Ogilby's Chimaera is a common chimaera with a wide Australian range. Outside of Australian waters, it occurs in Papua New Guinea and Indonesia. Little biological data are available on this oviparous species (chimaeras generally have higher biological productivity relative to deepsea sharks; estimated GL, 18.6 years). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF). Fishery-independent trawl surveys between 1976/77 and 1996/97 on the upper slope off New South Wales documented an overall decline in the catch rate of Ogilby's Chimaera of 96%, the equivalent of a >99.9% population reduction over three generations (56 years). More recently, standardised catch-per-unit-effort in the SESSF between 1994 and 2006 showed no trend. This suggests that the population may have stabilised at low levels due to changes in fisheries management. The heavily fished region is estimated to be ~20% of the species' range, and fishing pressure remains high there. Fishing pressure elsewhere on the upper slope is generally low, and the population reduction recorded in the southeast is not considered representative of the whole range of the species. Overall, it is inferred that the population has undergone a reduction approaching 30% over the last three generations (56 years) and Ogilby's Chimaera is assessed as Near Threatened.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Mod.	Byproduct
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	High
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Monitor population
- Manage catch at sustainable levels
- Reduce post-release mortality
- Identify & protect critical habitat

Black Ghostshark

CAAB Code 37 042010

Hydrolagus homonycteris Didier, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Australasia

Habitat: Continental slope; seamounts

Depth: 500–1,450 m

Maximum size: 101 cm PCFL



Assessment Justification: The Black Ghostshark is a common but poorly-known chimaera with a relatively restricted southeast Australian and southern seamount range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it occurs around New Zealand. Little biological data are available on this oviparous species (chimaeras generally have higher biological productivity relative to deepsea sharks). It was a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) and the South Tasman Rise Trawl Fishery (STRTF). Given the closure to trawling of most SESSF waters deeper than 700 m, the closure of the STRTF in 2007, and that the Black Ghostshark occurs primarily at depths beyond current fishing operations, there are no apparent threats to this species. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Black Ghostshark is assessed as Least Concern. If the STRTF reopens, any bycatch of this species should be monitored.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Maintain deepwater refuge

Marbled Ghostshark

CAAB Code 37 042011

Hydrolagus marmoratus Didier, 2008

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in areas of limited fishing effort; deepwater refuge

Distribution: Australian endemic

Habitat: Continental slope

Depth: 550–995 m

Maximum size: 53 cm PCFL



Assessment Justification: The Marbled Ghostshark is a rare and poorly-known endemic chimaera with a wide eastern Australian range. Little biological data are available on this oviparous species (chimaeras generally have higher biological productivity relative to deepsea sharks). It is a bycatch of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) at the southern extent of its range, and possibly of the Coral Sea Fishery (CSF) at the northern extent. It is not likely to interact significantly with state-managed fisheries given its depth range. Given the closure to trawling of most SESSF waters deeper than 700 m and with no trawl effort in the CSF since the 2006/07 fishing season (trawling is no longer permitted in this fishery) there are no apparent threats to this species. The species' deep occurrence generally places it outside fishing activities. Additionally, significant protection is now provided by the Coral Sea Marine Park. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Marbled Ghostshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Bycatch
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Limit bycatch
- Maintain deepwater refuge

Abyssal Ghostshark

CAAB Code 37 042012

Hydrolagus trolli Didier & Séret, 2002

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; deepwater refuge

Distribution: Australasia

Habitat: Continental slope; seamounts

Depth: 610–2,000 m

Maximum size: 110 cm PCFL



Assessment Justification: The Abyssal Ghostshark is a poorly-known chimaera with a restricted eastern Victorian range (extent of occurrence <20,000 km²). Outside of Australian waters, it has a patchy tropical and temperate South Pacific distribution. It is likely to be more wide-ranging than presently recorded given its occurrence in deep waters which have received limited survey effort. Little biological data are available on this oviparous species (chimaeras generally have higher biological productivity relative to deepsea sharks). Across its wider Western Pacific range, it has been mostly collected from deeper than 1,000 m, and in Australian waters has been recorded at depths of 1,670–2,000 m. This deep occurrence places it well outside of any commercial fishing activities, particularly with the closure to trawling of most waters deeper than 700 m in the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery off southeast Australia. Population trend is unknown, although it is suspected to be stable based on the lack of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Abyssal Ghostshark is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	–	–

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Smallspine Spookfish

CAAB Code 37 044003

Harriotta haeckeli Karrer, 1972

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; deepwater refuge

Distribution: Cosmopolitan (but patchy)

Habitat: Continental slope; seamounts

Depth: 1,400–2,600 m

Maximum size: 65 cm PCFL



Assessment Justification: The Smallspine Spookfish is a poorly-known chimaera with a relatively restricted southeast Australian range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it has a wide but patchy global temperate distribution. It is likely to be more wide-ranging than presently recorded given its occurrence in deep waters which have received limited survey effort. Little biological data are available on this oviparous species (chimaeras generally have higher biological productivity relative to deepsea sharks). In Australian waters it has been recorded at depths of 1,480–1,950 m. This deep occurrence places it well outside of any commercial fishing activities, particularly with the closure to trawling of most waters deeper than 700 m in the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery off southeast Australia. Population trend is unknown, although it is suspected to be stable based on the lack of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Smallspine Spookfish is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	Clarify range	Low
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Bigspine Spookfish

CAAB Code 37 044001

Harriotta raleighana Goode & Bean, 1895

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Cosmopolitan (but patchy)

Habitat: Continental slope; seamounts

Depth: 350–2,600 m

Maximum size: 120 cm PCFL



Assessment Justification: The Bigspine Spookfish is a poorly-known chimaera with a wide southern Australian range. Outside of Australian waters, it has a wide but patchy global tropical and temperate distribution. It is likely to be more wide-ranging than presently recorded given its occurrence in deep waters which have received limited survey effort. Little biological data are available on this oviparous species (chimaeras generally have higher biological productivity relative to deepsea sharks). It is a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) and was a bycatch of the South Tasman Rise Trawl Fishery (STRTF). However, given the closure to trawling of most SESSF waters deeper than 700 m and the closure of the STRTF in 2007, the Bigspine Spookfish has refuge in deeper waters (particularly as it mostly occurs at depths of 700–900 m). Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Bigspine Spookfish is assessed as Least Concern. If the STRTF reopens, any bycatch of this species should be monitored.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	Low	Byproduct
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Maintain deepwater refuge

Paddlenose Spookfish

CAAB Code 37 044004

Rhinochimaera africana Compagno, Stehmann & Ebert, 1990

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; occurs in areas of limited fishing effort; deepwater refuge

Distribution: Indo-West Pacific

Habitat: Continental slope

Depth: 550–1,450 m

Maximum size: 112 cm PCFL



Assessment Justification: The Paddlenose Spookfish is a rare and poorly-known chimaera with a relatively restricted Western Australian range (although with an extent of occurrence >20,000 km²). Outside of Australian waters, it has a wide but patchy temperate Indo-West Pacific distribution. It is probably more wide-ranging in Australian waters than currently known given its occurrence in deep waters which have received limited survey effort. Little biological data are available on this oviparous species (chimaeras generally have higher biological productivity relative to deepsea sharks). It is a possible bycatch of Commonwealth-managed deeper water trawl fisheries off Western Australia (Western Deepwater Trawl Fishery and North West Slope Trawl Fishery), however these fisheries have limited effort with only a small number of active vessels. Furthermore, its deep occurrence would provide it with refuge beyond fished depths. Population trend is unknown, although it is suspected to be stable based on the levels of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Paddlenose Spookfish is assessed as Least Concern.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	–	–
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Maintain deepwater refuge

Pacific Spookfish

CAAB Code 37 044002

Rhinochimaera pacifica (Mitsukuri, 1895)

IUCN Red List Category & Criteria

Least Concern

Reasons for Listing

Nothing to infer or suspect population reduction or continuing decline; extent of occurrence >20,000 km²; significant areas of limited fishing effort; deepwater refuge

Distribution: Indo-Pacific

Habitat: Continental slope; seamounts

Depth: 191–1,290 m

Maximum size: 120 cm PCFL



Assessment Justification: The Pacific Spookfish is a poorly-known chimaera with a wide southern Australian and southern seamount range. Outside of Australian waters, it has a wide but patchy tropical and temperate Indo-Pacific distribution. It is likely to be more wide-ranging in the Pacific than presently recorded given its occurrence in deep waters which have received limited survey effort. Habitat appears to be primarily deepwater troughs and plateaus. Little biological data are available on this oviparous species (chimaeras generally have higher biological productivity relative to deepsea sharks). It was a byproduct of the Commonwealth-managed Southern and Eastern Scalefish and Shark Fishery (SESSF) and was possibly a bycatch of the South Tasman Rise Trawl Fishery (STRTF). In Australian waters it has been recorded at depths of 760–1,290 m. This deep occurrence places it outside of current commercial fishing activities, given the closure to trawling of most waters deeper than 700 m in the SESSF and the closure of the STRTF in 2007. Population trend is unknown, although it is suspected to be stable based on the lack of fishing effort within its range. There is nothing to infer or suspect population reduction at this time and the Pacific Spookfish is assessed as Least Concern. If the STRTF reopens, any bycatch of this species should be monitored.

Threats

Threat Factor	Extent	Intent
Fishing - commercial	None	–
Fishing - recreational	None	–
Fishing - Indigenous	None	–
Fishing - shark control	None	–
Other: no other significant threats		

Knowledge Gaps

Theme	Specific Actions	Priority
Taxonomy	–	–
Distribution	–	–
Population trend	Monitor catch	Low
Life history	Assess reproduction, age	Low
Connectivity	Assess connectivity	Low

Current Management

- No species-specific management
- General commercial fishery controls

Conservation Actions

- Maintain population
- Manage catch at sustainable levels
- Maintain deepwater refuge



NIGEL MARSH
PHOTOGRAPHY



Colclough's Shark (top) and Coffin Ray (bottom).
Images: Nigel Marsh Photography

GENERATION LENGTHS

Generation lengths (GL) for species assessed as Critically Endangered, Endangered, Vulnerable, or Near Threatened. Generation length is calculated here from female age-at-maturity and maximum age data and represents the median age of parents of the current cohort. Where species-specific age data are not available, age data from a closely-related species may be used (column *Age data source*). Thus, estimates of GL may have low reliability. Species follow the phylogenetic order used for the taxa profiles.

Family	Species	Generation length 1GL/3GL (years)	Age data source	Reference(s)
SQUALIDAE	Greeneye Spurdog <i>Squalus chloroculus</i>	21/63	This species	Rochowski (2014)
	Eastern Longnose Spurdog <i>Squalus grahami</i>	22/66	Piked Spurdog <i>Squalus megalops</i>	Rigby <i>et al.</i> (2016a)
	Philippine Spurdog <i>Squalus montalbani</i>	27/81	This species	Rigby <i>et al.</i> (2016a)
CENTROPHORIDAE	Harrison's Dogfish <i>Centrophorus harrissoni</i>	35/105	This species (age-at-maturity); Southern Dogfish <i>Centrophorus zeehaani</i> (longevity)	Fenton (2001); Whitely (2004)
	Southern Dogfish <i>Centrophorus zeehaani</i>	35/105	Harrison's Dogfish <i>Centrophorus harrissoni</i> (age-at-maturity); this species (longevity)	Fenton (2001); Whitely (2004)
	Brier Shark <i>Deania calcea</i>	29/87	This species	Irvine <i>et al.</i> (2012)
	Longsnout Dogfish <i>Deania quadrispinosa</i>	29/87	Brier Shark <i>Deania calcea</i>	Irvine <i>et al.</i> (2012)
SOMNIOSIDAE	Owston's Dogfish <i>Centroscymnus owstonii</i>	30/90	This species	Irvine (2004)
	Largespine Velvet Dogfish <i>Scymnodon macracanthus</i>	34/102	This species	Irvine (2004)
OXYNOTIDAE	Prickly Dogfish <i>Oxynotus bruniensis</i>	20/60	Genus <i>Oxynotus</i>	Finucci & Kyne (2018)
DALATIIDAE	Black Shark <i>Dalatias licha</i>	29/87	Brier Shark <i>Deania calcea</i>	Irvine <i>et al.</i> (2012)
SQUATINIDAE	Eastern Angelshark <i>Squatina albipunctata</i>	23/69	Pacific Angelshark <i>Squatina californica</i>	Cailliet <i>et al.</i> (1992)
BRACHAELURIDAE	Colclough's Shark <i>Brachaelurus colcloughi</i>	15.5/47	Blind Shark <i>Brachaelurus waddi</i>	Norén (2013)
RHINCODONTIDAE	Whale Shark <i>Rhincodon typus</i>	25/75	This species	Pierce & Norman (2016)
CARCHARIIDAE	Grey Nurse Shark <i>Carcharias taurus</i>	25/75	This species	Goldman <i>et al.</i> (2006)

Family	Species	Generation length 1GL/3GL (years)	Age data source	Reference(s)
ODONTASPIDIDAE	Smalltooth Sandtiger Shark <i>Odontaspis ferox</i>	25/75	Grey Nurse Shark <i>Carcharias taurus</i>	Goldman <i>et al.</i> (2006)
ALOPIIDAE	Pelagic Thresher <i>Alopias pelagicus</i>	18.5/56	This species	Rigby <i>et al.</i> (2019b)
	Bigeye Thresher <i>Alopias superciliosus</i>	18.5/56	This species	Chen & Yuan (2006)
	Common Thresher <i>Alopias vulpinus</i>	25.5/77	This species	Rigby <i>et al.</i> (2019c)
CETORHINIDAE	Basking Shark <i>Cetorhinus maximus</i>	34/102	This species	Rigby <i>et al.</i> (2021)
LAMNIDAE	White Shark <i>Carcharodon carcharias</i>	27/81	This species	Rigby <i>et al.</i> (2019a)
	Shortfin Mako <i>Isurus oxyrinchus</i>	24/72	This species	Bishop <i>et al.</i> (2006)
	Longfin Mako <i>Isurus paucus</i>	24/72	Shortfin Mako <i>Isurus oxyrinchus</i>	Bishop <i>et al.</i> (2006)
SCYLIORHINIDAE	Whitfin Swellshark <i>Cephaloscyllium albipinum</i>	15/45	Blacktip Sawtail Shark <i>Galeus sauteri</i>	Liu <i>et al.</i> (2011)
	Saddled Swellshark <i>Cephaloscyllium variegatum</i>	15/45	Blacktip Sawtail Shark <i>Galeus sauteri</i>	Liu <i>et al.</i> (2011)
TRIAKIDAE	School Shark <i>Galeorhinus galeus</i>	26.3/79	This species	Walker <i>et al.</i> (2020)
CARCHARHINIDAE	Grey Reef Shark <i>Carcharhinus amblyrhynchos</i>	15/45	This species	Robbins (2006)
	Silky Shark <i>Carcharhinus falciformis</i>	15/45	This species	Rigby <i>et al.</i> (2017)
	Oceanic Whitetip Shark <i>Carcharhinus longimanus</i>	20.5/62	This species	D'Alberto <i>et al.</i> (2017)
	Dusky Shark <i>Carcharhinus obscurus</i>	38/114	This species	Rigby <i>et al.</i> (2019d)
	Sandbar Shark <i>Carcharhinus plumbeus</i>	26/78	This species	McAuley <i>et al.</i> (2006)
	Northern River Shark <i>Glyphis garricki</i>	18/54	Speartooth Shark <i>Glyphis glyphis</i>	Kyne (unpubl. data)

Family	Species	Generation length 1GL/3GL (years)	Age data source	Reference(s)
	Spear-tooth Shark <i>Glyphis glyphis</i>	18/54	This species	Kyne (unpubl. data)
	Blue Shark <i>Prionace glauca</i>	10.5/32	This species	Nakano (1994)
	Whitetip Reef Shark <i>Triaenodon obesus</i>	13.5/41	This species	Robbins (2006)
GALEOCERDIDAE	Tiger Shark <i>Galeocerdo cuvier</i>	23/69	This species	Holmes <i>et al.</i> (2015)
SPHYRNIDAE	Winghead Shark <i>Eusphyrna blochii</i>	14/42	This species	Stevens & Lyle (1989); Smart <i>et al.</i> (2013)
	Scalloped Hammerhead <i>Sphyrna lewini</i>	24/72	This species	Drew <i>et al.</i> (2015)
	Great Hammerhead <i>Sphyrna mokarran</i>	23.5/71	This species	Harry <i>et al.</i> (2011b)
	Smooth Hammerhead <i>Sphyrna zygaena</i>	19.5/59	This species	Rosa <i>et al.</i> (2017)
PRISTIDAE	Narrow Sawfish <i>Anoxypristis cuspidata</i>	6/18	This species	Peverell (2009)
	Dwarf Sawfish <i>Pristis clavata</i>	16.4/49	This species	Peverell (2009); Moreno Iturria (2012)
	Largetooth Sawfish <i>Pristis pristis</i>	22/66	This species	Peverell (2009); Kyne <i>et al.</i> (2021b)
	Green Sawfish <i>Pristis zijsron</i>	16.5/50	This species	Peverell (2009)
RHINIDAE	Shark Ray <i>Rhina ancylostoma</i>	15/45	Giant Guitarfish <i>Gluacostegus typus</i>	White <i>et al.</i> (2014); Kyne <i>et al.</i> (2020)
	Bottlenose Wedgefish <i>Rhynchobatus australiae</i>	15/45	Giant Guitarfish <i>Gluacostegus typus</i>	White <i>et al.</i> (2014); Kyne <i>et al.</i> (2020)
	Eyebrow Wedgefish <i>Rhynchobatus palpebratus</i>	15/45	Giant Guitarfish <i>Gluacostegus typus</i>	White <i>et al.</i> (2014); Kyne <i>et al.</i> (2020)
TRYGONORRHINIDAE	Spotted Shovel-nose Ray <i>Aptychotrema timorensis</i>	13/39	Shortnose Guitarfish <i>Zapteryx brevirostris</i>	Carmo <i>et al.</i> (2018); D'Alberto <i>et al.</i> (2019)
RAJIDAE	Sydney Skate <i>Dentiraja australis</i>	7/21	Whitespotted Skate <i>Dentiraja cerva</i>	Treloar (2008)
	Whitespotted Skate <i>Dentiraja cerva</i>	7/21	This species	Treloar (2008)
	Australian Longnose Skate <i>Dentiraja confusus</i>	9.5/29	This species	Treloar (2008)
	Endeavour Skate <i>Dentiraja endeavouri</i>	7.5/23	Argus Skate <i>Dentiraja polyommata</i>	Rigby <i>et al.</i> (2016b)

Family	Species	Generation length 1GL/3GL (years)	Age data source	Reference(s)
	Grey Skate <i>Dipturus canutus</i>	12/36	Yellowspotted Skate <i>Leucoraja wallacei</i>	Walmsley-Hart <i>et al.</i> (1999)
	Bight Skate <i>Dipturus gudgeri</i>	14.5/44	This species	Treloar (2008)
	Melbourne Skate <i>Spiniraja whitleyi</i>	18.5/56	New Zealand Smooth Skate <i>Dipturus innominatus</i>	Francis <i>et al.</i> (2001)
	Maugean Skate <i>Zearaja maugeana</i>	11.5/35	This species	Bell <i>et al.</i> (2016)
DASYATIDAE	Estuary Stingray <i>Hemirhynchus fluviorum</i>	17/51	This species	Pierce & Bennett (2010a)
	Plain Maskray <i>Neotrygon annotata</i>	8.5/26	This species	Jacobsen & Bennett (2010)
UROLOPHIDAE	Common Stingaree <i>Trygonoptera testacea</i>	10/30	Masked Stingaree <i>Trygonoptera personata</i>	White <i>et al.</i> (2002)
	Sandyback Stingaree <i>Urolophus bucculentus</i>	9.5/29	This species	Trinnie (unpubl. data) in Kyne <i>et al.</i> (2019a)
	Kapala Stingaree <i>Urolophus kapalensis</i>	10/30	Masked Stingaree <i>Trygonoptera personata</i>	White <i>et al.</i> (2002)
	Coastal Stingaree <i>Urolophus orarius</i>	8.5/26	Lobed Stingaree <i>Urolophus lobatus</i>	White <i>et al.</i> (2001)
	Yellowback Stingaree <i>Urolophus sufflavus</i>	8.5/26	Lobed Stingaree <i>Urolophus lobatus</i>	White <i>et al.</i> (2001)
	Greenback Stingaree <i>Urolophus viridis</i>	10/30	Masked Stingaree <i>Trygonoptera personata</i>	White <i>et al.</i> (2002)
MYLIOBATIDAE	Ornate Eagle Ray <i>Aetomylaeus vespertilio</i>	15/45	Bat Eagle Ray <i>Myliobatis californicus</i>	Martin & Cailliet (1988a, 1988b)
	Purple Eagle Ray <i>Myliobatis hamlyni</i>	15/45	Bat Eagle Ray <i>Myliobatis californicus</i>	Martin & Cailliet (1988a, 1988b)
MOBULIDAE	Giant Manta Ray <i>Mobula birostris</i>	29/87	This species (age-at-maturity); Reef Manta Ray <i>Mobula alfredi</i> (longevity)	Marshall <i>et al.</i> (2020)
	Giant Devilray <i>Mobula mobular</i>	12.8/38	This species	Cuevas-Zimbrón <i>et al.</i> (2013); Pardo <i>et al.</i> (2016)
	Chilean Devilray <i>Mobula tarapacana</i>	12.8/38	Giant Devilray <i>Mobula mobular</i>	Cuevas-Zimbrón <i>et al.</i> (2013); Pardo <i>et al.</i> (2016)
	Bentfin Devilray <i>Mobula thurstoni</i>	12.8/38	Giant Devilray <i>Mobula mobular</i>	Cuevas-Zimbrón <i>et al.</i> (2013); Pardo <i>et al.</i> (2016)
CHIMAERIDAE	Ogilby's Chimaera <i>Chimaera ogilbyi</i>	18.6/56	Rabbitfish <i>Chimaera monstrosa</i>	Calis <i>et al.</i> (2005)

CONTRIBUTORS

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Cynthia Awruch	Luciana Ferreira	David Morgan
Leontine Baje	Francesco Ferretti	Brad Norman
Rodrigo Barreto	Brittany Finucci	Alexei Orlov
Angela Barker	Sonja Fordham	Nathan Pacoureau
Adam Barnett	Sarah Fowler	Sebastian Pardo
Plaxy Barratt	Malcolm Francis	Toby Patterson
Neville Barrett	Daniel Gledhill	Larry Paul
Crystal Beckmann	Ken Graham	Vic Peddemors
Michael Bennett	Marcel Green	Simon Pierce
Jennifer Bigman	Adrian Gutteridge	Richard Pillans
Matias Braccini	Alastair Harry	John Pogonoski
Russ Bradford	Matthew Heard	David Pollard
George Burgess	Carlie Heaven	Caroline Pollock
Paul Butcher	Katelyn Herman	Matt Reardon
John Carlson	Charlie Huveneers	Cassandra Rigby
Marcelo de Carvalho	Rima Jabado	Rachel Robbins
Rachel Cavanagh	Ian Jacobsen	Bastien Rochowski
Andrew Chin	Kelsey James	Evgeny Romanov
Leonard Compagno	Grant Johnson	Richard Sherley
Shannon Corrigan	Alan Jordan	Samantha Sherman
Blanche D'Anastasi	Jenny Kemper	Jonathan Smart
Dharmadi	James Knuckey	William Smyth
Dominique Didier	Dave Kulka	Matthias Stehmann
Christine Dudgeon	Peter Last	John Stevens
Clinton Duffy	Tom Lisney	Steve Taylor
Nicholas Dulvy	Kwang-Ming Liu	Susan Theiss
Jahnava Duryea	B. Mabel Manjaji-Matsumoto	Michelle Treloar
David Ebert	Andrea Marshall	Fabian Trinnie
Mario Espinoza	Lindsay Marshall	Sarah Valenti
Fahmi	Rory McAuley	Terry Walker
Bryn Farmer	Meaghen McCord	Rachel Walls
Daniel Fernando	Alec Moore	Henning Winker

KEY LITERATURE

- Adams, K.R., Fetterplace, L.C., Davis, A.R., Taylor, M.D., & Knott, N.A. (2018). Sharks, rays and abortion: The prevalence of capture-induced parturition in elasmobranchs. *Biological Conservation* 217, 11–27.
- Ahonen, H., Harcourt, R.G., & Stow, A.J. (2009). Nuclear and mitochondrial DNA reveals isolation of imperilled grey nurse shark populations (*Carcharias taurus*). *Molecular Ecology* 18, 4409–4421.
- Australian Fisheries Management Authority (AFMA). (2012). Upper-slope dogfish management strategy. Australian Fisheries Management Authority, Canberra.
- Australian Fisheries Management Authority (AFMA). (2015a). Ecological risk management strategy for the Southern and Eastern Scalefish and Shark Fishery. Australian Fisheries Management Authority, Canberra.
- Australian Fisheries Management Authority (AFMA). (2015b). School Shark (*Galeorhinus galeus*) stock rebuilding strategy. Revised 2015. Australian Fisheries Management Authority, Canberra.
- Bachman, S., Moat, J., Hill, A.W., de la Torre, J., & Scott, B. (2011). Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. In: Smith, V. & Penev, L. (Eds). e-Infrastructures for data publishing in biodiversity science. *ZooKeys* 150, 117–126.
- Bell, J.D., Lyle J.M., Semmens, J.M., Awruch, C., Moreno, D., Currie, S., Morash, A., Ross, J., & Barrett, N. (2016). Movement, habitat utilisation and population status of the endangered Maugean skate and implications for fishing and aquaculture operations in Macquarie Harbour. Fisheries Research and Development Corporation Project No. 2013/008. Institute for Marine and Antarctic Studies, University of Tasmania, Hobart.
- Bensley, N., Woodhams, J., Patterson, H.M., Rodgers, M., McLoughlin, K., Stobutzki, I., & Begg, G.A. (2010). Shark assessment report for the Australian National Plan of Action for the Conservation and Management of Sharks, final report to the Department of Agriculture, Fisheries and Forestry, Bureau of Rural Sciences, Canberra.
- Bishop, S.D.H., Francis, M.P., Duffy, C., & Montgomery, J.C. (2006). Age, growth, maturity, longevity and natural mortality of the shortfin mako shark (*Isurus oxyrinchus*) in New Zealand waters. *Marine and Freshwater Research* 57, 143–154.
- Braccini, M., Taylor, S., Bruce, B., & McAuley, R. (2017). Modelling the population trajectory of West Australian white sharks. *Ecological Modelling* 360, 363–377.
- Bradford, R.W., Thomson, R., Bravington, M., Foote, D., Gunasekera, R., Bruce, B.D., Harasti, D., Otway, N., & Feutry, P. (2018). A close-kin mark-recapture estimate of the population size and trend of east coast grey nurse shark. Report to the National Environmental Science Program, Marine Biodiversity Hub. CSIRO Oceans & Atmosphere, Hobart.
- Bravington, M., Feutry, P., Pillans, R.D., Hillary, R., Johnson, G., Saunders, T., Gunasekera, R., Bax, N.J., & Kyne, P.M. (2019). Close-kin mark-recapture population size estimate of *Glyphis garricki* in the Northern Territory. Report to the National Environmental Science Program, Marine Biodiversity Hub. CSIRO Oceans & Atmosphere, Hobart.
- Brewer, D., Heales, D., Milton, D., Dell, Q., Fry, G., Venables, B., & Jones, P. (2006). The impact of turtle excluder devices and bycatch reduction devices on diverse tropical marine communities in Australia's northern prawn trawl fishery. *Fisheries Research* 81, 176–188.
- Bruce, B., Bradford, R., Bravington, M., Feutry, P., Grewe, P., Gunasekera, R., Harasti, D., Hillary, R., & Patterson, T. (2018). A national assessment of the status of White Sharks. National Environment Science Program Marine Biodiversity Hub, Hobart.
- Buckley, K.A., Crook, D.A., Einoder, L.D., Pillans, R.D., Smith, L.D.G., & Kyne, P.M. (2020). Movement behaviours and survival of largemouth sawfish, *Pristis pristis*, released from a public aquarium. *Aquatic Conservation: Marine and Freshwater Ecosystems* 30, 2351–2369.
- Burnell, O.W., Barrett, S.L., Hooper, G.E., Beckmann, C.L., Sorokin, S.J., & Noell, C.J. (2015). Spatial and temporal assessment of by-catch in the Spencer Gulf Prawn Fishery. Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2015/000414-1. SARDI Report Series No. 860.
- Cailliet, G.M., Mollet, H.F., Pittinger, G.G., Bedford, D., & Natanson, L.J. (1992). Growth and demography of the Pacific angel shark (*Squatina californica*), based upon tag returns off California. *Australian Journal of Marine and Freshwater Research* 43, 1313–1330.
- Calis, E., Jackson, E.H., Nolan, C.P., & Jeal, F. (2005). Preliminary age and growth estimates of the Rabbitfish, *Chimaera monstrosa*, with implications for future resource management. *Journal of Northwest Atlantic Fisheries Science* 35, 21.
- Campbell, M.J., McLennan, M.F., Courtney, A.J., & Simpfendorfer, C.A. (2018). Post-release survival of two elasmobranchs, the eastern shovelnose ray (*Aptychotrema rostrata*) and the common stingaree (*Trygonoptera testacea*), discarded from a prawn trawl fishery in southern Queensland, Australia. *Marine and Freshwater Research* 69, 551–561.

- Carmo, W.P.D., Fernando Fávoro, L., & Coelho, R. (2018). Age and growth of *Zapteryx brevirostris* (Elasmobranchii: Rhinobatidae) in southern Brazil. *Neotropical Ichthyology* 16, e170005.
- Cavanagh, R.D., Kyne, P.M., Fowler, S.L., Musick, J.A., & Bennett, M.B. (2003). The conservation status of Australasian chondrichthyans: Report of the IUCN Shark Specialist Group Australia and Oceania Regional Red List Workshop, Queensland, Australia, 7–9 March 2003. School of Biomedical Sciences, The University of Queensland, Brisbane.
- Chapple, D., Tingley, R., Mitchell, N., Macdonald, S., Keogh, J.S., Shea, G., Bowles, P., Cox, N., & Woinarski, J. (2019). *The Action Plan for Australian Lizards and Snakes 2017*. CSIRO Publishing, Clayton South.
- Chen, P. & Yuan, W. (2006). Demographic analysis based on the growth parameter of sharks. *Fisheries Research* 78, 374–379.
- Chidlow, J., Gaughan, D., & McAuley, R. (2006). Identification of Western Australian Grey Nurse Shark aggregation sites. Final report to the Australian Government, Department of the Environment and Heritage. Fisheries Research Report No. 155. Department of Fisheries, Western Australia.
- Chin, A., Kyne, P.M., Walker, T.I., & McAuley, R.B. (2010). An integrated risk assessment for climate change: analysing the vulnerability of sharks and rays on Australia's Great Barrier Reef. *Global Change Biology* 16, 1365–2486.
- Convention on the Conservation of Migratory Species of Wild Animals (CMS). (2020). Convention text. www.cms.int/en/convention-text
- Courtney, A.J., Campbell, M.J., Roy, D.P., Tonks, M.L., Chilcott, K.E., & Kyne, P.M. (2008). Round scallops and square meshes: a comparison of four codend types on the catch rates of target species and by-catch in the Queensland (Australia) saucer scallop (*Amusium balloti*) trawl fishery. *Marine and Freshwater Research* 59, 849–864.
- Cuevas-Zimbrón, E., Sosa-Nishizaki, O., Pérez-Jiménez, J.C., & O'Sullivan, J. (2013). An analysis of the feasibility of using caudal vertebrae for ageing the spinetail devilray, *Mobula japanica* (Müller and Henle, 1841). *Environmental Biology of Fishes* 96, 907–914.
- Curtis, L.K., Dennis, A.J., McDonald, K.R., Kyne, P.M., & Debus, S.J.S. (2012). *Queensland's Threatened Animals*. CSIRO Publishing, Collingwood.
- Dahl, R.B., Sigsgaard, E.E., Mwangi, G., Thomsen, P.F., Jørgensen, R.D., de Oliveira Torquato, F., Olsen, L., & Møller, P.R. (2019). The sandy zebra shark: a new color morph of the zebra shark *Stegostoma tigrinum*, with a redescription of the species and a revision of its nomenclature. *Copeia* 107, 524–541.
- D'Alberto, B.M., Chin, A., Smart, J.A., Baje, L., White, W.T., & Simpfendorfer, C.A. (2017). Age, growth and maturity of oceanic whitetip shark (*Carcharhinus longimanus*) from Papua New Guinea. *Marine and Freshwater Research* 68, 1118–1129.
- D'Alberto, B.M., Carlson, J.K., Pardo, S.A., & Simpfendorfer, C.A. (2019). Population productivity of shovelnose rays: Inferring the potential for recovery. *PLoS ONE* 14(11), e0225183.
- D'Anastasi, B., Simpfendorfer, C., & van Herwerden, L. (2013). *Anoxypristis cuspidata* (errata version published in 2019). *The IUCN Red List of Threatened Species* 2013, e.T39389A141789456.
- Davenport, D., Butcher, P., Andreotti, S., Matthee, C., Jones, A., & Ovenden, J. (2021). Effective number of white shark (*Carcharodon carcharias*, Linnaeus) breeders is stable over four successive years in the population adjacent to eastern Australia and New Zealand. *Ecology and Evolution* 11, 186–198.
- Davidson, L.N.K., Krawchuk, M.A., & Dulvy, N.K. (2016). Why have global shark and ray landings declined: improved management or overfishing? *Fish and Fisheries* 17, 438–458.
- Dent, F. & Clarke, S. (2015). State of the global market for shark products. FAO Fisheries and Aquaculture Technical Paper No. 590. Food and Agriculture Organization of the United Nations (FAO), Rome.
- Department of Agriculture and Fisheries (DAF). (2018). Queensland fisheries summary. Fisheries Queensland, Department of Agriculture and Fisheries, Brisbane.
- Department of Agriculture, Fisheries and Forestry (DAFF). (2001). Australian shark assessment report for the National Plan of Action for the Conservation and Management of Sharks. Department of Agriculture, Fisheries and Forestry, Canberra.
- Department of Agriculture, Fisheries and Forestry (DAFF). (2004). National Plan of Action for the Conservation and Management of Sharks (Sharkplan). Department of Agriculture, Fisheries and Forestry, Canberra.
- Department of Agriculture, Fisheries and Forestry (DAFF). (2009). Guidelines for commercial operators in the Inshore Fin Fish Fishery. Department of Agriculture, Fisheries and Forestry, Brisbane.
- Department of Agriculture, Fisheries and Forestry (DAFF). (2012). National Plan of Action for the Conservation and Management of Sharks 2012, Shark-plan 2. Department of Agriculture, Fisheries and Forestry, Canberra.

- Department of the Environment (DoE). (2014a). Non-detriment finding for the export of shark species listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and harvested from Australian waters: *Sphyrna lewini* – scalloped hammerhead shark, *Sphyrna mokarran* – great hammerhead shark, *Sphyrna zygaena* – smooth hammerhead shark, *Lamna nasus* – porbeagle shark, *Carcharhinus longimanus* – oceanic whitetip shark. Department of the Environment, Canberra.
- Department of the Environment (DoE). (2014b). Recovery plan for the Grey Nurse Shark (*Carcharias taurus*). Department of the Environment, Canberra.
- Department of the Environment (DoE). (2015). Sawfish and river sharks multispecies recovery plan. Department of the Environment, Canberra.
- Department of the Environment and Heritage (DEH). (2005). Whale Shark (*Rhincodon typus*) recovery plan 2005-2010. Department of the Environment and Heritage, Canberra.
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC). (2011). Non detriment finding for the Freshwater Sawfish *Pristis microdon*. Department of Sustainability, Environment, Water, Population and Communities, Canberra.
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC). (2013). Recovery plan for the White Shark (*Carcharodon carcharias*). Department of Sustainability, Environment, Water, Population and Communities, Canberra.
- Drew, M., White, W.T., Dharmadi, Harry, A.V., & Huvneers, C. (2015). Age, growth and maturity of the pelagic thresher *Alopias pelagicus* and the scalloped hammerhead *Sphyrna lewini*. *Journal of Fish Biology* 86, 333–354.
- Dulvy, N.K., Fowler, S.L., Musick, J.A., Cavanagh, R.D., Kyne, P.M., Harrison, L.R., Carlson, J.K., Davidson, L.N.K., Fordham, S.V., Francis, M.P., Pollock, C.M., Simpfendorfer, C.A., Burgess, G.H., Carpenter, K.E., Compagno, L.J.V., Ebert, D.A., Gibson, C., Heupel, M.R., Livingstone, S.R., Sanciangco, J.C., Stevens, J.D., Valenti, S., & White, W.T. (2014). Extinction risk and conservation of the world's sharks and rays. *eLife* 3, e00590.
- Dulvy, N.K., Davidson, L.N., Kyne, P.M., Simpfendorfer, C.A., Harrison, L.R., Carlson, J.K., & Fordham, S.V. (2016). Ghosts of the coast: global extinction risk and conservation of sawfishes. *Aquatic Conservation: Marine and Freshwater Ecosystems* 26, 134–153.
- Ebert, D.A., Dando, M., & Fowler, S. (2021a). *Sharks of the World. A Complete Guide*. Princeton University Press, Princeton.
- Ebert, D.A., Wintner, S.P., & Kyne, P.M. (2021b). An annotated checklist of the chondrichthyans of South Africa. *Zootaxa* 4947, 1–127.
- Ellis, J.R., McCully Phillips, S.R., & Poisson, F. (2017). A review of capture and post-release mortality of elasmobranchs. *Journal of Fish Biology* 90, 653–722.
- Fenton, G.E. (2001). Radiometric ageing of sharks. FRDC Final Report, 1994/021. Fisheries Research & Development Corporation, Canberra.
- Feutry, P., Kyne, P.M., Pillans, R.D., Chen, X., Naylor, G.J.P., & Grewe, P.M. (2014). Mitogenomics of the Spertooth Shark challenges ten years of D-loop sequencing. *BMC Evolutionary Biology* 14, 232.
- Feutry, P., Kyne, P.M., Pillans, R.D., Chen, X., Marthick, J.R., Morgan, D.L., & Grewe, P.M. (2015). Whole mitogenome sequencing refines population structure of the Critically Endangered sawfish *Pristis pristis*. *Marine Ecology Progress Series* 533, 237–244.
- Feutry, P., Berry, O., Kyne, P.M., Pillans, R.D., Hillary, R.M., Grewe, P.M., Marthick, J.R., Johnson, G., Gunasekera, R.M., Bax, N.J., & Bravington, M. (2017). Inferring contemporary and historical genetic connectivity from juveniles. *Molecular Ecology* 26, 444–456.
- Feutry, P., Devloo-Delva, F., Tran Lu Y, A., Mona, S., Gunasekera, R.M., Johnson, G., Pillans, R.D., Jaccoud, D., Kilian, A., Morgan, D.L., Saunders, T., Bax, N.J., & Kyne, P.M. (2020). One panel to rule them all: DArTcap genotyping for population structure, historical demography, and kinship analyses, and its application to a threatened shark. *Molecular Ecology Resources* 20, 1470–1485.
- Field, I.C., Charters, R., Buckworth, R.C., Meekan, M.G., & Bradshaw, C.J.A. (2008). Distribution and abundance of *Glyphis* and sawfishes in northern Australia and their potential interactions with commercial fisheries. Final report to the Department of the Environment, Water, Heritage, and the Arts.
- Field, I.C., Buckworth, R.C., Yang, G-Y., Meekan, M.G., Johnson, G., Stevens, J.D., Pillans, R.D., McMahon, C.R., & Bradshaw, C.J.A. (2012). Changes in size distributions of commercially exploited sharks over 25 years in northern Australia using a Bayesian approach. *Fisheries Research* 125–126, 262–271.
- Field, I.C., Tillett, B.J., Charters, R., Johnson, G.J., Buckworth, R.C., Meekan, M.G., & Bradshaw, C.J.A. (2013). Distribution, relative abundance and risks from fisheries to threatened *Glyphis* sharks and sawfishes in northern Australia. *Endangered Species Research* 21, 171–180.
- Finucci, B. & Kyne, P.M. (2018). *Oxynotus bruniensis*. *The IUCN Red List of Threatened Species* 2018, e.T41840A68639645.

- Finucci, B., Duffy, C.A.J., Francis, M.P., Gibson, C., & Kyne, P.M. (2019). The extinction risk of New Zealand chondrichthyans. *Aquatic Conservation: Marine and Freshwater Ecosystems* 29, 783–797.
- Francis, M.P., Ó Maolagáin, C., & Stevens, D. (2001). Age, growth, and sexual maturity of two New Zealand endemic skates, *Dipturus nasutus* and *D. innominatus*. *New Zealand Journal of Marine and Freshwater Research* 35, 831–842.
- Garnett, S.T., Szabo, J.K., & Dutson, G. (2011). *The Action Plan for Australian Birds 2010*. CSIRO Publishing, Collingwood.
- Gaughan, D.J. & Santoro, K. (eds). (2018). Status reports of the fisheries and aquatic resources of Western Australia 2016/17: The state of the fisheries. Department of Primary Industries and Regional Development, Western Australia.
- Gladstone, W., Lindfield, S., Coleman, M., & Kelaher, B. (2012). Optimisation of baited remote underwater video sampling designs for estuarine fish assemblages. *Journal of Experimental Marine Biology and Ecology* 429, 28–35.
- Goldman, K.J., Branstetter, S., & Musick, J.A. (2006). A re-examination of the age and growth of sand tiger sharks, *Carcharias taurus*, in the western North Atlantic: the importance of ageing protocols and use of multiple back-calculation techniques. *Environmental Biology of Fishes* 77, 241–252.
- Graham, K.J., Andrew, N.L., & Hodgson, K.E. (2001). Changes in the relative abundances of sharks and rays on Australian South East Fishery trawl grounds after twenty years of fishing. *Marine and Freshwater Research* 52, 549–561.
- Grant, M.I., Kyne, P.M., Simpfendorfer, C.A., White, W.T., & Chin, A. (2019). Categorising use patterns of non-marine environments by elasmobranchs and a review of their extinction risk. *Reviews in Fish Biology and Fisheries* 29, 689–710.
- Green, M.E., D'Anastasi, B.R.D., Hobbs, J-P.A., Feldheim, K., McAuley, R., Peverell, S., Stapley, J., Johnson, G., Appleyard, S.A., White, W.T., Simpfendorfer, C.A., & van Herwerden, L. (2018). Mixed-marker approach suggests maternal philopatry and sex-biased behaviours of narrow sawfish *Anoxypristis cuspidata*. *Endangered Species Research* 37, 45–54.
- Harry A.V., Macbeth W.G., Gutteridge A.N., & Simpfendorfer C.A. (2011a). The life histories of endangered hammerhead sharks (Carcharhiniformes, Sphyrnidae) from the east coast of Australia. *Journal of Fish Biology* 78, 2026–2051.
- Harry, A.V., Tobin, A.J., Simpfendorfer, C.A., Welch, D.J., Mapleston, A., White, J., Williams, A.J., & Stapley, J. (2011b). Evaluating catch and mitigating risk in a multispecies, tropical, inshore shark fishery within the Great Barrier Reef World Heritage Area. *Marine and Freshwater Research* 62, 710–721.
- Henry, G.W. & Lyle, J.M. (2003). The National recreational and Indigenous fishing survey July 2003. Department of Agriculture, Fisheries and Forestry, Canberra.
- Heupel, M.R., Williams, A.J., Welch, D.J., Ballagh, A., Mapstone, B.D., Carlos, G., Davies, C., & Simpfendorfer, C.A. (2009). Effects of fishing on tropical reef associated shark populations on the Great Barrier Reef. *Fisheries Research* 95, 350–361.
- Heupel, M.R., Kyne, P.M., White, W.T., & Simpfendorfer, C.A. (2018). Shark Action Plan policy report. Report to the National Environmental Science Program, Marine Biodiversity Hub. Australian Institute of Marine Science, Townsville.
- Heupel, M., Simpfendorfer, C., Chin, A., Appleyard, S., Barton, D., Green, M., Johnson, G., McAuley, R. & White, W. (2020). Examination of connectivity of hammerhead sharks in northern Australia. Report to the National Environmental Science Program, Marine Biodiversity Hub. Australian Institute of Marine Science, Townsville.
- Hillary, R.M., Bravington, M.V., Patterson, T.A., Grewe, P., Bradford, R., Feutry, P., Gunasekera, R., Peddemors, V., Werry, J., Francis, M.P., Duffy, C.A.J., & Bruce, B.D. (2018). Genetic relatedness reveals total population size of white sharks in eastern Australia and New Zealand. *Scientific Reports* 8, 2661.
- Holmes, B.J., Peddemors, C.M., Gutteridge, A.N., Geraghty, P.T., Chan, R.W.K., Tibbetts, I.R., & Bennett, M.B. (2015). Age and growth of the tiger shark *Galeocerdo cuvier* off the east coast of Australia. *Journal of Fish Biology* 87, 422–448.
- Huveneers, C., Ebert, D.A., & Dudley, S.F.J. (2015). The evolution of chondrichthyan research through a metadata analysis of dedicated international conferences between 1991 and 2014. *African Journal of Marine Science* 37, 129–139.
- Irvine, S.B. (2004). Age, growth and reproduction of deepwater dogfishes from southeastern Australia. PhD thesis, Deakin University, Australia.
- Irvine, S.B., Daley, R.K., Graham, K.J., & Stevens, J.D. (2012). Biological vulnerability of two exploited sharks of the genus *Deania* (Centrophoridae). *Journal of Fish Biology* 80, 1181–1206.
- IUCN. (2012a). IUCN Red List Categories and Criteria: Version 3.1. Second edition. IUCN, Gland, Switzerland and Cambridge, UK.
- IUCN. (2012b). Guidelines for application of IUCN Red List Criteria at regional and national levels: Version 4.0. IUCN, Gland, Switzerland and Cambridge, UK.
- IUCN. (2020). The IUCN Red List of Threatened Species. Version 2020-3. www.iucnredlist.org

- IUCN Standards and Petitions Committee. (2019). Guidelines for using the IUCN Red List Categories and Criteria. Version 14. Prepared by the Standards and Petitions Committee. IUCN, Gland, Switzerland and Cambridge, UK.
- Jacobsen, I.P. & Bennett, M.B. (2010). Age and growth of *Neotrygon picta*, *Neotrygon annotata* and *Neotrygon kuhlii* from north-east Australia, with notes on their reproductive biology. *Journal of Fish Biology* 77, 2405–2422.
- Jakobs, S. & Braccini, M. (2019). Acoustic and conventional tagging support the growth patterns of grey nurse sharks and reveal their large-scale displacements in the west coast of Australia. *Marine Biology* 166, 150.
- Kyne, P.M. & Feutry, P. (2017). Recreational fishing impacts on threatened river sharks: a potential conservation issue. *Ecological Management and Restoration* 18, 209–213.
- Kyne, P.M. & Sherman, C.S. (2016). *Dipturus confusus*. *The IUCN Red List of Threatened Species* 2016, e.T70688138A70688281.
- Kyne, P.M., Courtney, A.J., Campbell, M.J., Chilcott, K.E., Gaddes, S.W., Turnbull, C.T., van der Geest, C.C., & Bennett, M.B. (2002). An overview of the elasmobranch by-catch of the Queensland East Coast Trawl Fishery (Australia). *NAFO Scientific Research Council Document* 02/97.
- Kyne, P.M., Compagno, L.J.V., Stead, J., Jackson, M.V., & Bennett, M.B. (2011). Distribution, habitat and biology of a rare and threatened eastern Australian endemic shark: Colclough's shark, *Brachaelurus colcloughi* Ogilby, 1908. *Marine and Freshwater Research* 62, 540–547.
- Kyne, P.M., Carlson, J., & Smith, K. (2013a). *Pristis pristis* (errata version published in 2019). *The IUCN Red List of Threatened Species* 2013, e.T18584848A141788242.
- Kyne, P.M., Rigby, C., & Simpfendorfer, C. (2013b). *Pristis clavata* (errata version published in 2019). *The IUCN Red List of Threatened Species* 2013, e.T39390A141790455.
- Kyne, P.M., Compagno, L.J.V., Last, P.R., & Stevens, J.D. (2015). *Brachaelurus colcloughi*. *The IUCN Red List of Threatened Species* 2015, e.T39335A68610594.
- Kyne, P.M., Pollard, D.A., & Bennett, M.B. (2016). *Hemistrygon fluviarium*. *The IUCN Red List of Threatened Species* 2016, e.T41797A104116059.
- Kyne, P.M., Last, P.R., Marshall, L.J., & Trinnie, F. (2019a). *Urolophus bucculentus*. *The IUCN Red List of Threatened Species* 2019, e.T60088A68649040.
- Kyne, P.M., Last, P.R., & Marshall, L.J. (2019b). *Urolophus orarius*. *The IUCN Red List of Threatened Species* 2019, e.T60100A68649829.
- Kyne, P.M., Last, P.R., & Marshall, L.J. (2019c). *Urolophus sufflavus*. *The IUCN Red List of Threatened Species* 2019, e.T60104A68650134.
- Kyne, P.M., Last, P.R., & Marshall, L.J. (2019d). *Urolophus viridis*. *The IUCN Red List of Threatened Species* 2019, e.T60105A68650230.
- Kyne, P.M., Jabado, R.W., Rigby, C.L., Dharmadi, Gore, M.A., Pollock, C.M., Herman, K.B., Cheok, J., Ebert, D.A., Simpfendorfer, C.A., & Dulvy, N.K. (2020). The thin edge of the wedge: extremely high extinction risk in wedgefishes and giant guitarfishes. *Aquatic Conservation: Marine and Freshwater Ecosystems* 30, 1337–1361.
- Kyne, P.M., Davies, C.-L., Devloo-Delva, F., Johnson, G., Amepou, Y., Grant, M.I., Green, A., Gunasekara, R.M., Harry, A.V., Lemon, T., Lindsay, R., Maloney, T., Marthick, J., Pillans, R.D., Saunders, T., Shields, A., Shields, M., & Feutry, P. (2021a). Molecular analysis of newly-discovered geographic range of the threatened river shark *Glyphis glyphis* reveals distinct populations. Report to the National Environmental Science Program, Marine Biodiversity Hub. Charles Darwin University and CSIRO.
- Kyne, P.M., Oetinger, M., Grant, M.I., & Feutry, P. (2021b). Life history of the Critically Endangered largetooth sawfish: a compilation of data for population assessment and demographic modelling. *Endangered Species Research* 44, 79–88.
- Lack, M. & Sant, G. (2011). The future of sharks: A review of action and inaction. TRAFFIC International and the Pew Environment Group.
- Last, P., White, W., de Carvalho, M., Séret, B., Stehmann, M., & Naylor, G. (2016a). *Rays of the World*. CSIRO Publishing, Clayton.
- Last, P.R. (2004). *Rhinobatos sainsburyi* n.sp. and *Aptychotrema timorensis* n.sp. – Two new shovelnose rays (Batoidea: Rhinobatidae) from the Eastern Indian Ocean. *Records of the Australian Museum* 56, 201–208.
- Last, P.R. & Stevens, J.D. (2009). *Sharks and Rays of Australia. Second Edition*. CSIRO Publishing, Collingwood.
- Last, P.R., Kyne, P.M., & Sherman, C.S. (2015). *Aptychotrema timorensis*. *The IUCN Red List of Threatened Species* 2015, e.T60179A68609203.
- Last, P.R., Gledhill, D.C., & Sherman, C.S. (2016b). *Zearaja maugeana*. *The IUCN Red List of Threatened Species* 2016, e.T64442A68650404.
- Lawson, J.M. & Fordham, S.V. (2018). Sharks ahead: Realizing the potential of the Convention on Migratory Species to conserve elasmobranchs. CMS/Sharks/MOS3/Inf.21. Shark Advocates International, The Ocean Foundation, Washington, DC.
- Lear, K.O., Gleiss, A.C., Whitty, J.M., Fazeldean, T., Alber, J.R., Green, N., Ebner, B.C., Thorburn, D.C., Beatty, S.J., & Morgan, D.L. (2019). Recruitment of a critically endangered sawfish into a riverine nursery depends on natural flow regimes. *Scientific Reports* 9, 17071.

- Lee, K.A., Roughan, M., Harcourt, R.G., & Peddemors, V.M. (2018). Environmental correlates of relative abundance of potentially dangerous sharks in nearshore areas, southeastern Australia. *Marine Ecology Progress Series* 599, 157–179.
- Liu, K.-M., Lin, C.-P., Joung, S.-J., & Wang, S.-B. (2011). Age and growth estimates of the Blacktip Sawtail Catshark *Galeus sauteri* in northeastern waters of Taiwan. *Zoological Studies* 50, 284–295.
- Lyle, J.M., Bell, J.D., Chuwen, B.M., Barrett, N., Tracey, S.R., & Buxton, C.D. (2014). Assessing the impacts of gillnetting in Tasmania: Implications for by-catch and biodiversity. Fisheries Research and Development Corporation Project No 2010/016. Institute for Marine and Antarctic Studies, University of Tasmania, Hobart.
- Lynch, T.P., Harcourt, R., Edgar, G., & Barrett, N. (2013). Conservation of the Critically Endangered eastern Australian population of the Grey Nurse Shark (*Carcharias taurus*) through cross-jurisdictional management of a network of marine-protected areas. *Environmental Management* 52, 1341–1354.
- Macbeth, W.G., Geraghty, P.T., Peddemors, V.M., & Gray, C.A. (2009). Observer-based study of targeted commercial fishing for large shark species in waters off northern New South Wales. Northern Rivers Catchment Management Authority Project No. IS8-9-M-2. Industry & Investment NSW – Fisheries Final Report Series No. 114.
- Mace, G.M., Collar, N.J., Gaston, K.J., Hilton-Taylor, C., Akçakaya, H.R., Leader-Williams, N., Milner-Gulland, E.J., & Stuart, S.N. (2008). Quantification of extinction risk: IUCN's system for classifying threatened species. *Conservation Biology* 22, 1424–1442.
- Marshall, A., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Derrick, D., Herman, K., Jabado, R.W., Liu, K.M., Rigby, C.L., & Romanov, E. (2020). *Mobula birostris*. *The IUCN Red List of Threatened Species* 2020, e.T198921A68632946.
- Martin, L.K. & Cailliet, G.M. (1988a). Aspects of the reproduction of the Bat Ray, *Myliobatis californica*, in central California. *Copeia* 1988(3), 754–762.
- Martin, L.K. & Cailliet, G.M. (1988b). Age and growth determination of the Bat Ray, *Myliobatis californica* Gill, in central California. *Copeia* 1988(3), 762–773.
- McAuley, R.B., Simpfendorfer, C.A., Hyndes, G.A., Allison, R.R., Chidlow, J.A., Newman, S.J., & Lenanton, R.C.J. (2006). Validated age and growth of the sandbar shark, *Carcharhinus plumbeus* (Nardo 1827) in the waters off Western Australia. *Environmental Biology of Fishes* 77, 385–400.
- McLean, D.L., Green, M., Harvey, E.S., Williams, A., Daley, R., & Graham, K.J. (2015). Comparison of baited longlines and baited underwater cameras for assessing the composition of continental slope deepwater fish assemblages off southeast Australia. *Deep Sea Research Part I: Oceanographic Research Papers* 98, 10–20.
- Momigliano, P. & Jaiteh, V.F. (2015). First records of the grey nurse shark *Carcharias taurus* (Lamniformes: Odontaspidae) from oceanic coral reefs in the Timor Sea. *Marine Biodiversity Records* 8, e56.
- Moreno, D., Lyle, J.M., Semmens, J.M., Morash, A., Stehfest, K., McAllister, J., Bowen, B., & Barrett, N. (2020). Vulnerability of the endangered Maugean Skate population to degraded environmental conditions in Macquarie Harbour. Fisheries Research and Development Corporation Project No. 2016-068. Institute for Marine and Antarctic Studies, University of Tasmania, Hobart.
- Moreno Iturria, D.A. (2012). Demography of the family Pristidae as an aid to conservation and management. Bachelor of Marine Science (Honours) thesis, James Cook University, Townsville.
- Nakano, H. (1994). Age, reproduction and migration of blue shark in the North Pacific Ocean. *Bulletin of National Research Institute of Far Seas Fisheries* 31, 141–256.
- New South Wales Fisheries Scientific Committee (NSW FSC). (2008). Final determination. *Pristis zijsron* – green sawfish. Ref. No. FD31. File No. FSC 99/19.
- Norén, Y.M. (2013). Reproductive biology and age determination of the blind shark, *Brachaelurus waddi*, in New South Wales. Masters thesis, University of Newcastle, Newcastle.
- Northern Territory Department of Primary Industry and Resources (NT DPIR). (2018). Management arrangements for the Northern Territory offshore net and line fishery. Northern Territory Department of Primary Industry and Resources, Darwin.
- Nowara, G.B., Burch, P., Gasco, N., Welsford, D.C., Lamb, T.D., Chazeau, C., Duhamel, G., Pruvost, P., Wotherspoon, S., & Candy, S.G. (2017). Distribution and abundance of skates (*Bathyraja* spp.) on the Kerguelen Plateau through the lens of the toothfish fisheries. *Fisheries Research* 186, 65–81.
- Pardo, S.A., Kindsvater, H.K., Cuevas-Zimbrón, E., Sosa-Nishizaki, O., Pérez-Jiménez, J.C., & Dulvy, N.K. (2016). Growth, productivity, and relative extinction risk of a data-sparse devil ray. *Scientific Reports* 6, 33745.

- Pardo, S.A., Dulvy, N.K., Barratt, P.J., & Kyne, P.M. (2019). *Cephaloscyllium albipinum*. *The IUCN Red List of Threatened Species* 2019, e.T42706A68615830.
- Patterson, H., Williams, A., Woodhams, J., & Curtotti, R. (2019). Fishery status reports 2019. Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.
- Peeverell, S.C. (2009). Sawfish (Pristidae) of the Gulf of Carpentaria, Queensland, Australia. Masters thesis, James Cook University, Townsville.
- Pierce, S.J. & Bennett, M.B. (2010a). Destined to decline? Intrinsic susceptibility of the threatened estuary stingray to anthropogenic impacts. *Marine and Freshwater Research* 61, 1468–1481.
- Pierce, S.J. & Bennett, M.B. (2010b). Distribution of the estuary stingray (*Dasyatis fluviorum*) in Australia. *Memoirs of the Queensland Museum – Nature* 55, 89–97.
- Pierce, S.J. & Norman, B. (2016). *Rhincodon typus*. *The IUCN Red List of Threatened Species* 2016, e.T19488A2365291.
- Phillips, N.M., Chaplin, J.A., Morgan, D.L., & Peeverell, S.C. (2011). Population genetic structure and genetic diversity of three critically endangered *Pristis* sawfishes in Australian waters. *Marine Biology* 158, 903–915.
- Phillips, N.M., Chaplin, J.A., Peeverell, S.C., & Morgan, D.L. (2017). Contrasting population structures of three *Pristis* sawfishes with different patterns of habitat use. *Marine and Freshwater Research* 68, 452–460.
- Pogonoski, J., Pollard, D.A., & Rigby, C.L. (2016). *Squatina albipunctata*. *The IUCN Red List of Threatened Species* 2016, e.T42729A68645549.
- Primary Industries and Regions South Australia (PIRSA). (2017). Management plan for the South Australian commercial Gulf St Vincent Prawn Fishery. Primary Industries and Regions South Australia, Adelaide. Paper Number 74.
- Queensland Government. (2019). Open data portal. www.data.qld.gov.au/
- Rayns, N. (2019). Review of recovery planning for threatened sharks: status, analysis & future directions. A report prepared for Australian Marine Conservation Society and Humane Society International. FutureCatch Consulting.
- Reid, D.D., Robbins, W.D., & Peddemors, V.M. (2011). Decadal trends in shark catches and effort from the New South Wales, Australia, Shark Meshing Program 1950–2010. *Marine and Freshwater Research* 62, 676–693.
- Rigby, C.L., Daley, R.K., & Simpfendorfer, C.A. (2016a). Comparison of life histories of two deepwater sharks from eastern Australia: the piked spurdog and the Philippine spurdog. *Marine and Freshwater Research* 67, 1546–1561.
- Rigby, C.L., White, W.T., Smart, J.J., & Simpfendorfer, C.A. (2016b). Life histories of two deep-water Australian endemic elasmobranchs: Argus skate *Dipturus polyommata* and eastern spotted gummy shark *Mustelus walkeri*. *Journal of Fish Biology* 88, 1149–1174.
- Rigby, C.L., White, W.T., & Simpfendorfer, C.A. (2016c). Deepwater chondrichthyan bycatch of the Eastern King Prawn Fishery in the southern Great Barrier Reef, Australia. *PLoS ONE* 11(5), e0156036.
- Rigby, C.L., Sherman, C.S., Chin, A., & Simpfendorfer, C. (2017). *Carcharhinus falciformis*. *The IUCN Red List of Threatened Species* 2017, e.T39370A117721799.
- Rigby, C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W., Liu, K.M., Lowe, C.G., Marshall, A., Pacoureaux, N., Romanov, E., Sherley, R.B., & Winker, H. (2019a). *Carcharodon carcharias*. *The IUCN Red List of Threatened Species* 2019, e.T3855A2878674.
- Rigby, C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W., Liu, K.M., Marshall, A., Pacoureaux, N., Romanov, E., Sherley, R.B., & Winker, H. (2019b). *Alopias pelagicus*. *The IUCN Red List of Threatened Species* 2019, e.T161597A68607857.
- Rigby, C.L., Barreto, R., Fernando, D., Carlson, J., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W., Liu, K.M., Marshall, A., Pacoureaux, N., Romanov, E., Sherley, R.B., & Winker, H. (2019c). *Alopias vulpinus*. *The IUCN Red List of Threatened Species* 2019, e.T39339A2900765.
- Rigby, C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W., Liu, K.M., Marshall, A., Pacoureaux, N., Romanov, E., Sherley, R.B., & Winker, H. (2019d). *Carcharhinus obscurus*. *The IUCN Red List of Threatened Species* 2019, e.T3852A2872747.
- Rigby, C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W., Liu, K.M., Marshall, A., Romanov, E., & Kyne, P.M. (2021). *Cetorhinus maximus* (amended version of 2019 assessment). *The IUCN Red List of Threatened Species* 2021, e.T4292A194720078.
- Robbins, W.D. (2006). Abundance, demography and population structure of the Grey Reef Shark (*Carcharhinus amblyrhynchos*) and the Whitetip Reef Shark (*Triaenodon obesus*). PhD thesis, James Cook University, Townsville.
- Rochowski, B.A. (2014). Life history traits of dogfish *Squalus chloroculus* and *Deania calcea* in southern Australia. PhD thesis, University of Melbourne, Melbourne.
- Rochowski, B.E.A., Graham, K.J., Day, R.W., & Walker, T.I. (2015). Reproductive biology of the greeneye spurdog *Squalus chloroculus* (Squaliformes, Squalidae). *Journal of Fish Biology* 86, 734–754.

- Roff, G., Brown, C.J., Priest, M.A., & Mumby, P.J. (2018). Decline of coastal apex shark populations over the past half century. *Communications Biology* 1(1), 223.
- Rosa, D., Coelho, R., Fernandez-Carvalho, J., & Santos, M.N. (2017). Age and growth of the smooth hammerhead, *Sphyrna zygaena*, in the Atlantic Ocean: comparison with other hammerhead species. *Marine Biology Research* 13, 300–313.
- Sherley, R.B., Winker, H., Rigby, C.L., Kyne, P.M., Pollom, R., Pacoureaux, N., Herman, K., Carlson, J.K., Yin, J.S., Kindsvater, H.K., & Dulvy, N.K. (2019). Estimating IUCN Red List population reduction: JARA – A decision-support tool applied to pelagic sharks. *Conservation Letters* 2019, e12688.
- Sherman, C.S. (2016). *Dipturus canutus*. *The IUCN Red List of Threatened Species* 2016, e.T14134315A14134317.
- Simpfendorfer, C. (2013). *Pristis zijsron* (errata version published in 2019). *The IUCN Red List of Threatened Species* 2013, e.T39393A141792003.
- Simpfendorfer, C., Chin, A., Kyne, P., Rigby, C., Sherman, S., & White, W. (2019). A report card for Australia's sharks. Fisheries Research and Development Corporation, Canberra.
- Simpfendorfer, C.A. & Kyne, P.M. (2009). Limited potential to recover from overfishing raises concern for deep-sea sharks and rays. *Environmental Conservation* 36, 97–103.
- Smart, J.J. & Simpfendorfer, C. (2016). *Eusphyra blochii*. *The IUCN Red List of Threatened Species* 2016, e.T41810A68623209.
- Smart, J.J., Harry, A.V., Tobin, A.J., & Simpfendorfer, C.A. (2013). Overcoming the constraints of low sample sizes to produce age and growth data for rare or threatened sharks. *Aquatic Conservation: Marine and Freshwater Ecosystems* 23, 124–134.
- Smith, S.E., Au, D.W., & Show, C. (1998). Intrinsic rebound potentials of 26 species of Pacific sharks. *Marine and Freshwater Research* 49, 663–678.
- Stevens, J.D. & Lyle, J.M. (1989). Biology of three hammerhead sharks (*Eusphyra blochii*, *Sphyrna mokarran* and *S. lewini*) from northern Australia. *Australian Journal of Marine and Freshwater Research* 40, 129–146.
- Stevens, J.D. & Valenti, S.V. (2009). *Dipturus australis*. *The IUCN Red List of Threatened Species* 2009, e.T161637A5470186.
- Stobutzki, I.C., Miller, M.J., Heales, D.S., & Brewer, D.T. (2002). Sustainability of elasmobranchs caught as bycatch in a tropical prawn (shrimp) trawl fishery. *Fishery Bulletin*, 100, 800–821.
- Stow, A., Zenger, K., Briscoe, D., Gillings, M., Peddemors, V., Otway, N., & Harcourt, R. (2006). Isolation and genetic diversity of endangered grey nurse shark (*Carcharias taurus*) populations. *Biology Letters* 2, 308–311.
- Taylor, S.M., Braccini, J.M., Bruce, B.D., & McAuley, R.B. (2018). Reconstructing Western Australian white shark (*Carcharodon carcharias*) catches based on interviews with fishers. *Marine and Freshwater Research* 69, 266–375.
- Treloar, M.A. (2008). Aspects of the life history of skates from southeastern Australia. PhD thesis, Deakin University, Geelong.
- Treloar, M.A. (2009). *Spiniraja whitleyi*. *The IUCN Red List of Threatened Species* 2009, e.T161496A5436892.
- Treloar, M.A., Barrett, N.S., & Edgar, G.J. (2017). Biology and ecology of *Zearaja maugeana*, an Endangered skate restricted to two south-western Tasmanian estuaries. *Marine and Freshwater Research* 68, 821–830.
- Trinnie, F.I., Walker, T.I., Jones, P.L., & Laurenson, L.J. (2012). Biennial reproductive cycle in an extensive matrotrophic viviparous batoid: the sandyback stingaree *Urolophus bucculentus* from south-eastern Australia. *Journal of Fish Biology* 80, 1267–1291.
- Trinnie, F.I., Walker, T.I., Jones, P.L., & Laurenson, L.J. (2015). Asynchrony and regional differences in the reproductive cycle of the greenback stingaree *Urolophus viridis* from south-eastern Australia. *Environmental Biology of Fishes* 98, 425–441.
- Walker, T.I. & Gason, A.S. (2007). Shark and other chondrichthyan byproduct and bycatch estimation in the Southern and Eastern Scalefish and Shark Fishery. Final report to Fisheries and Research Development Corporation Project No. 2001/007. Primary Industries Research Victoria, Queenscliff.
- Walker, T.I. & Rochowski, B.E.A. (2019). *Squalus chloroculus*. *The IUCN Red List of Threatened Species* 2019, e.T161360A68644464.
- Walker, T.I., Rigby, C.L., Pacoureaux, N., Ellis, J., Kulka, D.W., Chiaramonte, G.E., & Herman, K. (2020). *Galeorhinus galeus*. *The IUCN Red List of Threatened Species* 2020, e.T39352A2907336.
- Walmsley-Hart, S.A., Sauer, W.H.H., & Buxton, C.D. (1999). The biology of the skates *Raja wallacei* and *R. pullopunctata* (Batoidea: Rajidae) on the Agulhas Bank, South Africa. *South African Journal of Marine Science* 21, 165–179.
- Weigmann, S. (2016). Annotated checklist of the living sharks, batoids and chimaeras (Chondrichthyes) of the world, with a focus on biogeographical diversity. *Journal of Fish Biology* 88, 837–1037.

- Weltz, K., Lyle, J.M., Semmens, J.M., & Ovenden, J.R. (2018). Population genetic of the endangered Maugean skate (*Zearaja maugeana*) in Macquarie Harbour, Tasmania. *Conservation Genetics* 19, 1505–1512.
- Weltz, K., Lyle, J.M., Bell, J.D., & Semmens, J.M. (2019). Dietary analysis reveals the vulnerability of the endangered Maugean skate (*Zearaja maugeana*) to benthic changes in Macquarie Harbour. *Marine and Freshwater Research* 70, 745–753.
- White, J., Heupel, M.R., Simpfendorfer, C.A., & Tobin, A.J. (2013). Shark-like batoids in Pacific fisheries: prevalence and conservation concerns. *Endangered Species Research* 19, 277–284.
- White, J., Simpfendorfer, C.A., Tobin, A.J., & Heupel, M.R. (2014). Age and growth parameters of shark-like batoids. *Journal of Fish Biology* 84, 1340–1353.
- White, W.T. & Dharmadi (2007). Species and size compositions and reproductive biology of rays (Chondrichthyes, Batoidea) caught in target and non-target fisheries in eastern Indonesia. *Journal of Fish Biology* 70, 1809–1837.
- White, W.T. & Kyne, P.M. (2010). The status of chondrichthyan conservation in the Indo-Australasian region. *Journal of Fish Biology* 76, 2090–2117.
- White, W.T., Platell, M.E., & Potter, I.C. (2001). Relationship between reproductive biology and age composition and growth in *Urolophus lobatus* (Batoidea: Urolophidae). *Marine Biology* 138, 135–147.
- White, W.T., Hall, N.G., & Potter, I.C. (2002). Reproductive biology and growth during pre- and postnatal life of *Trygonoptera personata* and *T. mucosa* (Batoidea: Urolophidae). *Marine Biology* 140, 699–712.
- White, W.T., Kyne, P.M., & Last, P.R. (2016). *Myliobatis hamlyni*. *The IUCN Red List of Threatened Species* 2016, e.T60124A68634957.
- White W.T., Baje, L., Sabub, B., Appleyard, S.A., Pogonoski, J.J., & Mana, R.R. (2017). Sharks and rays of Papua New Guinea. ACIAR Monograph No. 189. Australian Centre for International Agricultural Research, Canberra.
- Whitely, R. (2004). Using dorsal spines to age the Australian dogfish *Centrophorus harrissoni* and *Centrophorus uyato*. Masters thesis, University of Bangor, Bangor.
- Woinarski, J.C.Z., Burbidge, A.A., & Harrison, P.L. (2014). *The Action Plan for Australian Mammals 2012*. CSIRO Publishing, Collingwood.
- Woodhams, J. & Harte, C. (2018). Shark assessment report 2018. Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.
- Wueringer, B.E. (2017). Sawfish captures in the Queensland Shark Control Program, 1962 to 2016. *Endangered Species Research* 34, 293–300.
- Yan, H.F., Kyne, P.M., Jabado, R.W., Leeney, R.H., Davidson, L.N.K., Derrick, D.H., Finucci, B., Freckleton, R.P., Fordham, S.V., & Dulvy, N.K. (2021). Overfishing and habitat loss drives range contraction of iconic marine fishes to near extinction. *Science Advances* 7, eabb6026.
- Zhou, S.J. & Griffiths, S.P. (2008). Sustainability Assessment for Fishing Effects (SAFE): A new quantitative ecological risk assessment method and its application to elasmobranch bycatch in an Australian trawl fishery. *Fisheries Research* 91, 56–68.

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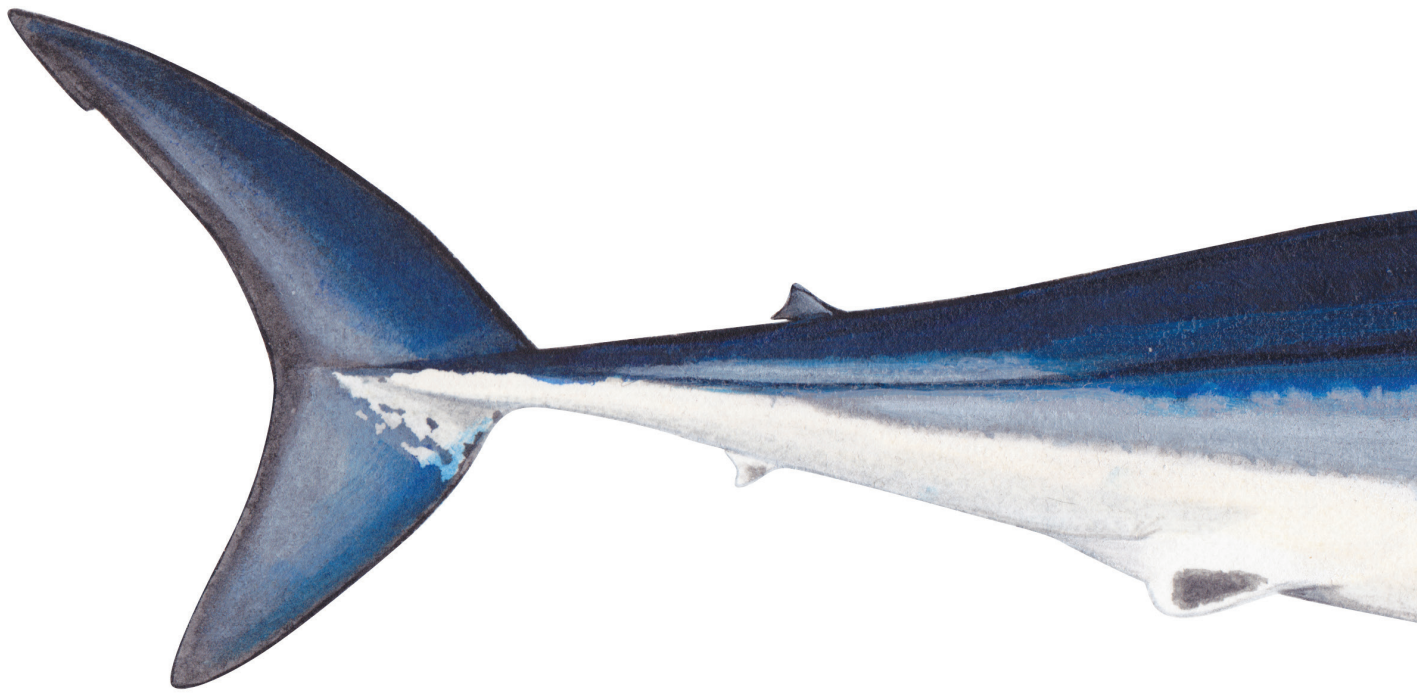
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The Action Plan for Australian Sharks and Rays 2021 is the first action plan for Australia's chondrichthyan fishes (sharks, rays, and chimaeras). This book presents the IUCN Red List status of all 328 species occurring in Australian waters including Sub-Antarctic and Antarctic waters. The majority of the fauna is secure, although roughly one in eight species is threatened with extinction. The Action Plan presents specific actions required to address vast knowledge gaps, and outlines conservation actions for each species. This book is a call to secure all of Australia's sharks, rays, and chimaeras.





Australian Government
**Department of Agriculture
and Water Resources**

National Plan of Action for Minimising Incidental Catch of Seabirds in Australian Capture Fisheries



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Contact

Department of Agriculture and Water Resources
Postal address GPO Box 858 Canberra ACT 2601
Telephone 1800 900 090
Web agriculture.gov.au

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Foreword

Australian fisheries are among the best managed in the world. The Australian Government is working hard to keep them this way. An important part of this is ensuring that our fisheries resources continue to be managed sustainably and to minimise impacts of fishing activities on the marine environment.

I am pleased to release Australia's *National Plan of Action for Minimising Incidental Catch of Seabirds in Australian Capture Fisheries* (NPOA–Seabirds) which provides a national approach to mitigating the impact of fishing on seabirds.

Australia recognises the need to address the impact of fishing on seabirds. This action plan provides guidance on best-practice mitigation, monitoring and reporting of seabird interactions for all fishing activities. It will reduce duplication, target responses to areas that need it most and result in more uniform, efficient and cost-effective seabird bycatch management. Establishing minimum reporting standards will enable us to better understand the extent of seabird interactions across all Australia's capture fisheries.

NPOA–Seabirds demonstrates Australia's commitment to sustainable fishing practices internationally. It also fulfils our obligation to Food and Agriculture Organization (FAO) of the United Nations by aligning our national efforts with those of the FAO's [International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries](#) (IPOA–Seabirds).

NPOA-seabirds will enhance the reputation of Australia's sustainable seafood industry, particularly in high-value export markets, and help strengthen our international seafood brand.

Most importantly, it will build trust among Australians and international consumers that our fisheries are managed under a sustainable and environmentally responsible fisheries management regime.



A handwritten signature in blue ink that reads "Richard Colbeck". The signature is fluid and cursive, with a horizontal line underneath the name.

Senator the Hon. Richard Colbeck
Assistant Minister for Agriculture and Water Resources

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Introduction

Fishing represents a substantial threat to some seabird populations. Most seabirds are primarily surface feeders, taking their prey from the top few metres of the water column (Harper, Croxall & Cooper 1985). Many species are at-sea scavengers, preying on dead fish, squid and other marine life found floating on the surface. The negative effects of fishing practices occur most often when fishing and seabird foraging behaviour overlap (Alexander, Robertson & Gales 1997; Baker et al. 2002; Birdlife International 1995; Croxall 1998; Croxall et al. 2012; Gales 1998). Scavenging seabirds supplement their diet by feeding on discards from vessels and baited hooks, and from fisheries catch as it is being hauled (Baker et al. 2002).

The incidental catch of seabirds in capture fisheries has been of international concern since the 1980s (Brothers 1991; Gales 1998). Studies highlighting the number of seabirds killed annually by fishing operations include Anderson et al. 2011; Brothers 1991; Brothers, Gales & Reid 1998; Gales 1998; Gales, Brothers and Reid 1998, Zydulis, Small & French 2013.

Each Australian jurisdiction has its own regulatory approach to addressing seabird interactions. Australia's 200-plus seabird species are protected under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In accordance with the legislation, it is illegal to kill, injure, take, trade, keep or move these species in Commonwealth waters without a permit. Some species, such as albatrosses, petrels and shearwaters, are granted greater protection under the EPBC Act due to their 'threatened' species status. The [Commonwealth Fisheries Bycatch Policy](#) sets out a framework for minimising bycatch of species including seabirds that may be killed or injured as a result of interacting with fishing equipment. Protection of seabirds in state and Northern Territory waters is subject to the legislation and policies of those jurisdictions.

In 1999 the Food and Agriculture Organization of the United Nations (FAO) adopted the [International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries](#) (IPOA–Seabirds) (FAO 1999). IPOA–Seabirds is a voluntary instrument within the framework of the FAO Code of Conduct for Responsible Fisheries. It sets out principles and international standards of behaviour for responsible fishing practices. In 2009 the FAO expanded the plan to cover interactions between seabirds and all types of fishing gear used by industrial, recreational and customary fishers.

Development and implementation of this *National Plan of Action for Minimising Incidental Catch of Seabirds in Australian Capture Fisheries* (NPOA–Seabirds) fulfils Australia’s voluntary commitment to the FAO. NPOA–Seabirds has been developed in line with the FAO’s best-practice guidelines for reducing incidental catch of seabirds in capture fisheries (Box 1). It also incorporates findings of a 2013 national assessment (Baker & Finley 2013). The assessment recommended that the plan focus on collecting and analysing data to improve knowledge of seabird–fishery interactions and assess mitigation performance. This process would be a precursor to implementation of further mitigation measures. NPOA–Seabirds promotes national coordination to better understand and mitigate impacts of fishing activities on seabirds across jurisdictions, recognising that the state, Northern Territory and Australian governments have separate regulatory authority in their own jurisdictions and are best placed to determine what mitigation measures are needed.

Box 1 FAO best-practice guidelines for reducing incidental catch of seabirds in capture fisheries

1. Address incidental catch of seabirds in all capture fisheries.
2. Advocate seabird bycatch mitigation in regional fisheries and conservation bodies.
3. Identify extent of seabird bycatch in capture fisheries.
4. Implement mitigation measures.
5. Conduct mitigation research and development.
6. Provide education, training and outreach.
7. Conduct independent monitoring.
8. Establish objectives to avoid and minimise incidental catch of seabirds.
9. Implement monitoring and reporting arrangements.

Source: FAO 2009

Chapter 1

Impact of fishing on Australian seabird populations

The impact of fishing on Australian seabird species differs depending on the method of fishing and the foraging behaviour of each bird species. Seabirds are known to follow fishing vessels in search of discarded fish scraps, unused baits (offal) and bait that is accessible when fishing gear is set, hauled or in the water. As a result, many seabirds are injured or die after becoming entangled or hooked in fishing gear.

Our understanding of the extent of fishing impacts on seabird populations in Australian capture fisheries is limited by a lack of reliable data on interactions and species behaviour. Baker & Finley (2010) found that risks to seabirds are evident from fishing activities, particularly south of 30° latitude.

Longline, trawl and net fishing methods are likely to have an impact on seabird populations. Incidental catch of seabirds primarily occurs during setting and hauling, when baits or nets are close to the surface.

Recreational and Indigenous fishing can result in the incidental injury or death of seabirds (Campbell 2013; McPhee, Leadbitter & Skilleter 2002). Recreational fishing activities are widespread along Australia's east coast and may become more prevalent as coastal communities continue to expand.

Commercial longline fisheries

The incidental catch of seabirds during longline fishing and its impact on populations internationally is well documented (Anderson et al. 2011). Australia already has measures in place to reduce the incidental catch of seabirds during longline fishing. In 1992 incidental catch of seabirds during oceanic longline fishing operations was nominated and subsequently listed under the EPBC Act as a key threat to seabirds. As a result the *Threat Abatement Plan for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations* (TAP–Seabirds) was developed in 1998. TAP–Seabirds sets out mandatory mitigation requirements for longline fishing operations in Commonwealth waters (Commonwealth of Australia 2014). The plan has been reviewed three times since its release (2006, 2014 and 2017). The reviews have found that the TAP has been successful in significantly reducing the impact of longline fishing on seabird species in Commonwealth-managed fisheries (Commonwealth of Australia 2014).

In addition to requirements under TAP–Seabirds, best-practice measures have been adopted by Commonwealth commercial fishers to prevent interactions with seabirds. These include not discharging offal while setting and bringing in lines, the use of tori line devices when setting gear, only setting lines at night and using sinkers to ensure baited hooks sink quickly.

In 2008 a national assessment of the extent of seabird bycatch in longline fisheries highlighted a lack of reliable data on seabird interactions with fishers outside Commonwealth jurisdiction, who aren't subject to the requirements of TAP–Seabirds (Baker & Finley 2010). Improved national data collection would provide a better understanding of the impacts of longline fishing on seabirds across all Australian fisheries, and help ensure national consistency in management and reporting.

Commercial trawl fisheries

The impact of trawl fishing on seabird populations internationally is well documented (Bartle 1991; González-Zevallos & Yorio 2006; Sullivan, Reid & Bugoni 2006; Weimerskirch, Capdeville & Duhamel 2000).

The impact of trawl fishing on seabird populations in Australia is difficult to gauge. Until recently, limited research was available and fishers were not required to keep extensive records of interactions. This was partly due to the difficulty of observing and recording interactions and related mortalities. The collection of seabird interaction data is now recognised as a priority for the management of bycatch in Commonwealth trawl fisheries. These fisheries are required to report all seabird interactions and are subject to electronic monitoring and/or observer coverage. This has significantly improved availability of bycatch data for these fisheries. Since 1 May 2017 Commonwealth trawl fishers have also been required to have one of three approved mitigation techniques in place:

- Warp deflectors (pinkie buoys)—these must sit alongside the trawl gear as a visual deterrent and physical barrier between birds and fishing gear, and may be used in combination with zero offal discharge while fishing; recent research shows that pinkie buoys reduce seabird interactions with warp wires by 75 per cent.
- Bird bafflers—a form of modified tori line .
- Seabird sprayers—the two booms, which extend beyond the stern and over the warps, pump water through nozzles to create a curtain of water around each warp.

Operators in some Commonwealth fisheries also continue to trial new mitigation devices to further reduce interactions. A better understanding of national seabird impacts from trawl fishing would help fisheries managers design tailored mitigation actions.

Commercial gillnet and entanglement net fisheries

International evidence suggests that gillnet fisheries contribute to high levels of seabird incidental mortality (Anderson et al. 2011; Zydelski, Small & French 2013). Diving seabird species, such as penguins, shearwaters, cormorants and gannets, are particularly susceptible to entanglement in net fisheries.

Limited information is available on seabird bycatch levels in Australian net fisheries. This is because many net fisheries do not require or enforce logbook recordings of seabird interactions. Without data on specific fisheries, it is difficult to determine the level of interaction or the impact net fisheries may have on seabirds. Data limitations have also restricted the validity of research on developing best-practice seabird mitigation measures for net fisheries. However, since 2014 the Commonwealth gillnet fishing fleet has been subject to electronic monitoring, allowing collection of crucial data on seabird interactions.

Improving reporting requirements and setting minimum data standards across Australian net fisheries will have several benefits. It will increase understanding of the impacts of seabird interactions and drive fishery managers and industry to implement actions to mitigate interactions.

Recreational and customary fishing

Recreational (including commercial game and charter) and customary fishing can result in the injury or death of seabirds that ingest baited hooks and fishing line or get entangled in crab pots (McPhee, Leadbitter & Skilleter 2002). Most seabird interactions with recreational and customary fishers are unrecorded because fishers are not required to formally report incidents in the coastal waters where most recreational fishing occurs. Estimates of interactions are based on data collected from seabird rescue groups.

The Australian Government has supported the development of the National Recreational Fishing Code of Practice, which was most recently revised by the Australian Recreational Fishing Foundation in 2016. The code sets standards that seek to improve recreational fisher stewardship of the marine environment, including through sustainable fishing practices and responsible use of aquatic resources.

Case study 1 Understanding the impact of recreational fishing on seabirds

According to a southern Queensland rescue group, in 2012 more than 1,000 seabirds were rescued in the waters between the Sunshine Coast and Redcliffe Peninsula (Campbell 2013).

The majority of birds rescued were Australian pelicans and white ibises that had been injured in interactions with discarded fishing tackle. Significant numbers of white-faced herons, pied cormorants, wood ducks and silver gulls were also rescued. Over 60 per cent of birds rescued had wing or foot injuries. Most were released after less than two weeks. However, around 6 per cent died or had to be euthanased and 30 per cent required long-term treatment for beak or internal injuries.

Chapter 2

Rationale

Internationally, fishing has been identified as a threat to seabird populations. Following the release of IPOA–Seabirds in 1999, the Australian Government prepared an assessment report on the extent and nature of incidental seabird catch in longline fisheries (Commonwealth of Australia 2003). The report concluded that TAP–Seabirds was largely fulfilling the role of a national plan for longline fisheries.

Past national assessments of seabird bycatch across Australian fisheries have found that little information is available on the impact of other fishing methods on seabird populations (Baker & Finley 2010; Commonwealth of Australia 2003). The assessments identified a need to improve reporting standards nationally to better understand the extent of seabird interactions. NPOA–Seabirds addresses the need for national coordination and consistency to better understand and mitigate the impacts of fishing activities on seabirds.

Chapter 3

Scope

Implementation of NPOA–Seabirds will contribute towards achieving and maintaining a favourable conservation status for seabirds (Box 2) by providing a comprehensive and consistent approach to reducing the impact of fishing on these species. The scope of this plan covers:

- all species of birds that occur naturally in Australian marine areas, including migratory and threatened seabird species listed under the EPBC Act
- all commercial, recreational, customary and other relevant capture fisheries
- all waters under the jurisdiction of Commonwealth, state and Northern Territory fisheries
- all fishing undertaken by Australian-flagged fishing vessels on the high seas, including areas governed by regional fisheries and conservation bodies.

NPOA–Seabirds does not include those general actions for reducing threats to the conservation status of a species that are not directly related to fishing activity, such as threats to seabird breeding sites or from marine debris. These issues are addressed through other environmental actions and measures, including recovery plans established under the EPBC Act.

Box 2 Favourable conservation status

‘Conservation status’ means the sum of the influences acting on seabird species that may affect their long-term distribution and abundance. Conservation status is considered favourable when any of these conditions are met:

- distribution and abundance of the species approach historic coverage and levels to the extent that potentially suitable ecosystems exist and are consistent with wise wildlife management
- population dynamics data indicate that the species is maintaining itself long term
- the range of the species is neither currently being reduced nor likely to be reduced long term
- sufficient habitat exists and will continue to exist in the foreseeable future to maintain the population of the species long term.
- Conservation status is considered unfavourable when any of these conditions are not met.

Source: FAO 2009

Chapter 4

Objectives

NPOA–Seabirds is a voluntary measure. It is not a regulatory instrument. It provides guidance for regulators on best-practice mitigation and reporting of seabird interactions across all fishing operations in Australian waters.

NPOA–Seabirds aims to establish a nationally coordinated approach to avoiding or minimising seabird deaths or injuries resulting from capture fishing activities. Implementation of the plan by jurisdictions is voluntary. Jurisdictions are encouraged to implement consistent measures to address data limitations. This will ensure that sufficient information is available to undertake a comprehensive national assessment of the impact of fishing activities on seabirds.

The goal of Australia’s NPOA–Seabirds is to minimise and, where practicable, eliminate the incidental catch of seabirds in capture fisheries. To achieve this, NPOA–Seabirds has five objectives:

- **Objective 1** Understand the extent of the incidental catch of seabirds.
- **Objective 2** Implement best-practice seabird bycatch mitigation in capture fisheries to
 - minimise or, where practicable, eliminate the incidental catch of seabirds
 - contribute towards achieving and maintaining a favourable conservation status for seabirds.
- **Objective 3** Promote development of innovative mitigation procedures and technologies that are feasible, effective and efficient.
- **Objective 4** Increase awareness and understanding of the incidental catch of seabirds and best-practice mitigation.
- **Objective 5** Promote adoption of effective mitigation measures in regional fisheries and conservation bodies.

Chapter 5

Framework for achieving NPOA–Seabirds objectives

Objective 1 Understand the extent of the incidental catch of seabirds

Australia has a well-developed understanding of the extent of the incidental catch of seabirds in longline fisheries. However, many other fisheries in Australia are small-scale, low-value enterprises with limited capacity to support expensive monitoring programs. As a result, data on seabird interaction in these fisheries is limited. Action is needed to increase our understanding of the effects of different fishing gear types on seabirds in Australian fisheries.

To understand and manage the incidental catch of seabirds in capture fisheries across jurisdictions, fisheries managers need to:

- review available data about the incidental catch of seabirds
- validate data sources and, where appropriate, conduct more detailed investigations
- determine whether a problem exists based on
 - magnitude of seabird bycatch (rate or number)
 - species that are incidentally caught and their conservation status
 - spatial and temporal overlap of fishing effort
 - existing mitigation measures and their effectiveness
 - existing seabird monitoring programs and their effectiveness
- adopt a precautionary approach when information is lacking or unclear.

Fisheries managers should undertake risk assessments to determine the risk to seabirds from fishing operations. Where the risk is identified as high, managers should ensure appropriate management measures are in place. Managers can use a range of input, output and educational measures to reduce fishing-related mortalities. Measures can be targeted based on the identified risk.

Data collection and reporting programs, such as logbook reporting, e-monitoring and observer programs, should be designed to provide representative data on the incidental catch of seabirds, and be regularly reviewed. The size of the fishery and likelihood of interactions with seabirds should be considered when developing programs. Where possible, logbooks should be standardised to ensure information is collected and recorded consistently across jurisdictions and time. See Appendix A for a list of data categories that regulators should consider requiring fishers to collect. Suggested data fields for each category are provided at Appendix B.

If evidence indicates an incidental seabird catch problem, regulators should consider developing and implementing targeted programs to better understand or mitigate the impacts. Some government environmental agencies obtain data on seabird mortalities in coastal waters from seabird rescue groups.

Day-to-day monitoring will not always capture the information required to understand the extent of seabird incidental catch in a fishery. Jurisdictions may choose to undertake research or monitoring programs that focus on high risk and provide transparent and statistically robust estimates of seabird injury and mortality.

Under the EPBC Act, it is an offence to kill, take, trade, keep or move a listed species in a Commonwealth area, including Commonwealth waters, without a permit. Sometimes interactions with listed species are unavoidable. Under the EPBC Act, fishers must report such interactions to the Australian Government Department of the Environment and Energy within seven days of the incident occurring or face a fine. Fishers who promptly report interactions are meeting their legal obligations and helping the Australian Government protect marine species.

Objective 2 Implement best-practice seabird bycatch mitigation in capture fisheries

Feasible, effective and efficient seabird bycatch mitigation measures should be implemented in all capture fisheries where there is a risk of incidental catch of seabirds.

Seabird bycatch mitigation measures are ‘a modification to fishing practices and/or equipment that reduces the likelihood of seabird incidental catch’ (Brothers, Cooper & Løkkeborg 1999; Løkkeborg 2008, 2011). Measures can take many forms, including the use of bird-scaring devices, fishing gear modifications (for example, line weighting), temporal and seasonal restrictions and alignment with international best practice fisheries management (such as cleaning of nets or offal management).

Australia is a signatory to the international [Agreement on the Conservation of Albatrosses and Petrels](#) (ACAP), which coordinates international activity to mitigate known threats to these bird populations. ACAP develops best-practice advice for longline and trawl fisheries that jurisdictions can consider when regulating these types of fisheries (see summary in Appendix C). ACAP criteria for developing advice are summarised in Box 3.

Australia’s current TAP–Seabirds prescribes actions that fisheries managers and longline fishing operators must take in Commonwealth waters to reduce incidental seabird catch. Requirements under the plan are consistent with ACAP best-practice advice. TAP–Seabirds was implemented in 1998. Since implementation, incidental bycatch rates for several Commonwealth longline fisheries have dropped well below the maximum permissible levels of 0.01 or 0.05 birds per 1,000 hooks. For fisheries that score above this rate, an investigation into their operators occurs which can lead to fisheries managers imposing additional measures on the fishing operators to ensure the rate does not rise. TAP–Seabirds will remain in place, independent of NPOA–Seabirds.

International best-practice advice for gillnet fisheries is still being developed. In the interim, ACAP has pointed to research demonstrating that increasing the visibility of the net can reduce seabird bycatch (Bull 2007), as a particle measure fisheries managers could regulate.

Wherever possible, fisheries managers and operators should adopt data-driven solutions—supported by in-fishery trials—that effectively manage seabird bycatch by meeting or exceeding international standards. However, guidance on international best practice should not override tailored approaches that accommodate the unique features of particular fisheries. Similarly, international best-practice guidelines should not constrain the pursuit of continuous improvement in the mitigation of seabird interactions.

Several Australian fisheries have introduced measures that extend beyond international best practice. These initiatives provide a model of adaptive management for other fisheries.

Box 3 Agreement on the Conservation of Albatrosses and Petrels—best-practice seabird bycatch mitigation criteria

1. Individual fishing technologies and techniques should be selected from those shown by experimental research to significantly reduce [statistically] the rate of seabird incidental mortality to the lowest achievable levels.
2. Fishing technologies and techniques, or a combination of the two, should have clear and proven specifications and minimum performance standards for their deployment and use.
3. Fishing technologies and techniques should be demonstrated to be practical, cost-effective and widely available.
4. Fishing technologies and techniques should, to the extent practicable, maintain catch rates of target species.
5. Fishing technologies and techniques should, to the extent practicable, not increase the bycatch of other taxa.
6. Minimum performance standards and methods of ensuring compliance should be provided for fisheries technologies and techniques, and should be clearly specified in fishery regulations.

A significant reduction in incidental seabird mortality can be determined by either a direct reduction in mortality or a reduction in seabird attack rates.

Source: [Agreement on the Conservation of Albatrosses and Petrels](#)

NPOA–Seabirds seeks to ensure that affected capture fisheries employ proven technical and operational seabird mitigation measures to prevent interactions. Measures adopted should be tailored for the type of fishery and individual fishing operations.

Regulators of recreational, customary and small-scale fisheries should consider lower-cost management measures. These could include education and extension programs such as implementing a code of practice. Appendix D lists principles for developing recreational fishing codes of practice. To ensure the application of best practice in seabird bycatch mitigation, jurisdictions should maintain a focus on strong stakeholder engagement throughout implementation. Jurisdictions should share information and provide opportunities for support and technical assistance, particularly for fishers at a regional level.

Case study 2 Sliding lead-weight technology—new seabird bycatch mitigation device for longline fisheries

Correct use of line-weighting in longline fisheries is an effective method of minimising seabird bycatch because it sinks fishing gear rapidly. However, many fishers are reluctant to adopt the method, partly because of safety concerns. If a line breaks during hauling, traditional leaded swivels can cause serious injury or fatality if they fly back towards the crew.

Sliding lead weights may be a solution to this problem. The device was developed in consultation with the Australian Fisheries Management Authority, the Australian Antarctic Division and the East Coast Tuna and Billfish Fishery. The device places a sliding lead at or near the hook. The lead slides down the line when fish bite. When a hook is pulled from the fish's mouth, on or near the surface, the lead slides down the line and dampens the energy of the recoiling line and hook, reducing the likelihood of fly-back.

Findings indicate that sliding lead-weighting configurations increase hook sink rates and result in a reduction in seabird mortalities, without reducing the target catch. Members of the Queensland tuna industry have voluntarily adopted sliding lead weights.

Objective 3 Promote development of innovative mitigation procedures and technologies that are feasible, effective and efficient

New or improved technical measures for seabird mitigation can significantly reduce seabird bycatch. International best-practice guidelines provide a benchmark, but this should not preclude development of better approaches for local situations.

Incentives to trial new and improved technical measures will help ensure that new procedures and technologies are feasible, effective and efficient. Jurisdictions have a role in supporting and encouraging stakeholder and industry-led research and testing. This includes working with stakeholders to mitigate risks and providing advice on experimental design. Jurisdictions also have a role in effectively converting the results of studies into fleet-based uptake of measures.

Case study 3 Industry–science collaboration reduces seabird interactions with trawl fisheries

As a condition of their fishing permit all trawlers in the South East Trawl Fishery must follow the directions of an approved seabird management plan at all times. This plan directs each vessel to manage offal in a particular way and deploy an approved physical mitigation device when fishing in daylight hours.

With Australian Government support, the South East Trawl Fishing Industry Association and the Great Australian Bight Fishing Industry Association have developed and trialled two effective seabird bycatch mitigation devices for trawl fisheries: the sprayer and the bird baffler.

The sprayer device sprays seawater at high pressure where the warp enters the water, deterring seabirds from the area. Trials recorded a 92 per cent reduction in warp–seabird interactions.

The bird baffler device prevents birds from accessing the area between the stern of the vessel and where the warp enters the water. It comprises two booms that extend perpendicular to the side of the vessel. The booms have droppers that hang down to the water line and act as a curtain. Trials indicate that bird bafflers reduce bird and warp interactions by 96 per cent.

Objective 4 Increase awareness and understanding of the incidental catch of seabirds and best-practice mitigation

Education, training, incentives and outreach programs can reduce seabird bycatch by driving changes in behaviour and practices. The commercial fishing industry and recreational and customary fishing sectors should be encouraged to share experiences and exchange skills through existing networks and jurisdictions.

All jurisdictions and fishing sectors should consider the use of training and extension programs for fishers, and the production of best-practice seabird identification and seabird handling guides. Education and extension activities are particularly important for recreational fisheries where regulatory oversight of fishing practices is limited.

Case study 4 Education and outreach programs to reduce seabird bycatch: OceanWatch TAngler bins

The OceanWatch TAngler bins project encourages recreational fishers to dispose of fishing line and tackle responsibly. Associated education programs help recreational fishers understand that keeping their fishing spots tidy and free of lost and littered fishing line will help preserve their fishing spots and local wildlife.

More than 300 TAngler bins have been installed across Victoria, New South Wales and Queensland, resulting in the collection of more than 10 tons of discarded fishing line.

This project is a partnership between OceanWatch, local and state governments, land managers and volunteer groups who join the TAngler Bin Network.

Objective 5 Promote adoption of effective mitigation measures in regional fisheries and conservation bodies

NPOA–Seabirds applies to Australian-flagged fishing vessels operating on the high seas and in areas managed by a Regional Fisheries Management Organisation.

Seabirds cross national boundaries and can spend most of their lives migrating and foraging in waters distant from their breeding grounds. As a result, mitigating risk to seabird populations requires regional and international cooperation driven by action undertaken by regional fisheries management organisations and regional conservation bodies.

Australia will continue to pursue stringent and effective seabird bycatch mitigation measures through engagement in regional fisheries management organisations, regional conservation bodies and ACAP.

Chapter 6

Implementation

NPOA–Seabirds seeks to ensure a nationally coordinated approach to addressing the incidental catch of seabirds in all Australian capture fisheries. Actions to implement NPOA–Seabirds are detailed in Appendix E. These actions are not intended to be prescriptive, as it is recognised that the level of incidental catch of seabirds is likely to vary significantly across jurisdictions due to geographic location and extent of fishing operations. When prioritising the actions, jurisdictions will take into account factors including the nature and size of their fisheries and the seabird interaction risks. Implementation of these actions is subject to available funding and resources.

Implementation is expected to take four years and should recognise existing practices and management arrangements for Australian capture fisheries.

Government subcommittee

Implementation of NPOA–Seabirds will be overseen by the existing fisheries management subcommittee of the Australian Fisheries Management Forum (AFMF). The committee will review the progress of implementation and consider current and emerging issues related to the impact of fishing activities on seabirds.

Fisheries management agencies will prepare reports for the subcommittee annually. Content of the reports will be stipulated by the subcommittee and should identify what implementation actions have been undertaken. Where agencies have not implemented actions proposed under NPOA–Seabirds, reports should provide relevant justification. The subcommittee can request further information from agencies where warranted. The Department of Agriculture and Water Resources will be responsible for collating annual reporting and making it available on the NPOA–Seabirds page of the department’s website.

The subcommittee will also consider the benefits of holding periodic or ad hoc workshops to enable stakeholders to share experiences and exchange skills and knowledge.

Roles and responsibilities

Australian Government

The Australian Government will provide national policy leadership and help implement NPOA–Seabirds by providing impetus for whole-of-government approaches, coordinating the AFMF subcommittee, facilitating and encouraging research activities, and overseeing implementation of actions for fisheries managed by the Australian Government.

The Department of Agriculture and Water Resources will report to the FAO on the progress of developing and implementing NPOA–Seabirds as part of its biennial reporting on the FAO Code of Conduct for Responsible Fisheries. The Department of the Environment and Energy will report to ACAP.

State and Northern Territory governments

State and Northern Territory fisheries and government environment agencies will be responsible for overseeing implementation of actions in capture fisheries under their respective jurisdictions. Each jurisdiction will determine how best to do this. In some cases, current practices may already be consistent with the objectives of NPOA–Seabirds. Jurisdictions will provide input to the Department of Agriculture and Water Resources for annual reporting to the AFMF subcommittee.

Commercial, recreational and customary fishing sectors

The commercial, recreational and customary fishing sectors have a significant role to play in achieving and ensuring that the fishing practices of their stakeholders are ecologically sustainable and the objectives of NPOA–Seabirds are realised. Where possible, these sectors are encouraged to facilitate development and trialling of innovative mitigation measures and drive educational and outreach activities that promote best practice approaches to the mitigation of seabird interaction. Successful pursuit of ecologically sustainable practices by these sectors, in partnership with government agencies, will ensure that community support for fishing activities continues into the future.

Non-government sectors

Conservation groups, researchers, other interested organisations and members of the public can contribute to implementation of NPOA–Seabirds through on-ground activities and engagement with research, education and awareness programs.

Resourcing

Implementation of NPOA–Seabirds will require resourcing from all jurisdictions and fishing sectors, including financial in-kind commitments. Voluntary commitments from relevant stakeholders will help minimise the incidental catch of seabirds. However, resourcing remains the responsibility of anyone accessing or managing community-owned fisheries. Implementation of the plan recognises existing practices and management arrangements for Australian capture fisheries. This will help minimise resourcing pressures on stakeholders identified as delivering actions under the plan.

Issues and actions outlined in this plan will help responsible agencies guide and prioritise their own actions to minimise the incidental catch of seabirds in Australian capture fisheries.

Chapter 7

Evaluation and review

NPOA–Seabirds will be reviewed four years after its release. The Department of Agriculture and Water Resources will coordinate the review and communicate the outcomes.

The review will consider the effectiveness of the plan and any positive and negative effects of implementation. It will assess the extent to which NPOA–Seabirds objectives have been met and whether they have contributed to reducing seabird mortalities in capture fisheries. When evaluating the plan, the department will consider the effectiveness of other measures put in place to mitigate seabird bycatch, including TAP–Seabirds and state-specific measures. The review may make recommendations about developing and implementing a revised NPOA–Seabirds.

Ongoing evaluation and the four-year review will provide recommendations for improvements and future work, including any necessary changes to the plan. Consultation with key stakeholders will be central to the review.

Appendix A

Data collection categories

ABARES recommends using these data categories for recording interactions in fisheries logbooks and during observer programs.

TABLE A1 Minimum data categories and fields

Data category	Minimum data fields	Data use
Vessel specification	Vessel length, vessel type, gross registered tonnes, fishing master/skipper, number of crew, gear types	For covariates for standardising interaction rates and analyses of the implementation and effectiveness of mitigation measures
Fishing effort	Fishing time, spatial location and fishing method, number of hooks set, hours trawled, fishing conditions (weather), offal discharged	For analyses to determine frequency of interactions by gear, location and time of day
Mitigation measures	Mitigation technique, time of deployment, where on vessel deployed, whether mitigation operated according to specifications or was deployed unsuccessfully (including partially)	To standardise description of which and how mitigation measures were deployed to analyse implementation and effectiveness of mitigation measures
Interaction details	Number of interactions, how birds interact with the gear and on which part of the gear/vessel the interactions occur	For analyses of general and specific interactions
Fate details	Condition of the seabird (alive, dead or injured)	For partitioning analyses to estimate mortalities and encounters
Seabird identification	Species identification or evidence for its identification	For species-specific analyses
Seabird biologicals	Seabird size, evidence of maturity, counts, behaviour, tissue samples, handling methods	For covariate inclusion in analyses (for example, maturity status or bird density)

Source: ABARES (forthcoming)

Appendix B

Minimum standards for collecting seabird interaction data

ABARES recommends that managers implement minimum data standards for recording interactions in fisheries logbooks and during observer programs.

TABLE B1 Minimum data standards

Data field and instructions	Observations to be recorded
Gear	Gear used [insert details]
Date and UTC time	Fishing started on [insert DD/MM/YYYY] and ended on [insert DD/MM/YYYY] Setting started on [insert DD/MM/YYYY, HH:MM UTC] and ended [insert DD/MM/YYYY, HH:MM UTC] Hauling started on [insert DD/MM/YYYY, HH:MM UTC] and ended on [insert DD/MM/YYYY, HH:MM UTC]
Latitude and longitude	Fishing started at latitude [insert DD, N for north and S for south], latitude [insert MM], longitude [insert DD, E for east and W for west], longitude [insert MM] Fishing ended at latitude [insert DD, N for north and S for south], latitude [insert MM], longitude [insert DD, E for east and W for west], longitude [insert MM]
Marine seabirds caught	Marine seabirds caught [select Yes/No] For each species: <ul style="list-style-type: none"> • Species name [insert name and species code] • Alive, unharmed [insert number] • Alive, harmed [insert number] • Dead [insert number]
Mitigation method	Mitigation method used [insert details]

TABLE B2 Recommended data standards for independent observer programs

Data field and instructions	Observations recorded
Trawl fishing activities	
Observer details	Observer name [insert family name first] Observation period start date[insert DD/MM/YYYY], end date [insert DD/MM/YYYY]
Gear details	Net ID [insert number] Net type [insert ISSFCV] Head rope length [insert metres] Ground rope length [insert metres] Bobbin diameter [insert centimetres] Otter board to wing length [insert metres] Horizontal opening [insert metres] Vertical opening [insert metres]
Codend mesh	Mesh size [insert centimetres] Codend circumference [insert centimetres] Orientation [select Diamond/Square]
Otter board	Board type [insert type], weight [insert kilograms]
Net design	Make [insert details] Model [insert number] Other features [insert details]
Trawl details	Trawl ID [insert number] Trawl type [select Research/Commercial] Observed [select Yes/No] Gear [insert type] Target species [insert FAO species code]
Start and end fishing	Trawl started [insert DD/MM/YYYY] at latitude [insert DD, N for north and S for south], longitude [insert MM], longitude [insert DD, E for east and W for west], longitude [insert MM] Trawl ended [insert DD/MM/YYYY] at latitude [insert DD, N for north and S for south], longitude [insert MM], longitude [insert DD, E for east and W for west], longitude [insert MM] Trawl depth [insert metres] Bottom depth [insert metres]

continued ...

TABLE B2 Recommended data standards for independent observer programs continued

Data field and instructions	Observations recorded
Seabird interactions	Marine seabirds caught [select Yes/No] For each species: <ul style="list-style-type: none"> • Species name [insert name and species code] • Alive, unharmed [insert number] • Alive, harmed [insert number] • Dead [insert number] Bycatch mitigation measures employed [insert details] Bird-scaring (tori) lines in use [select Yes/No] Aerial extent of bird-scarer lines consistently extended at least 10 metres beyond point of entry of warps into the sea [select Yes/No] Bird bafflers in use [select Yes/No]
Trawl warp strike (monitored for 15 minutes immediately after net is deployed)	Mandatory 15 min monitoring started at [insert HH:MM UTC] and ended at [insert HH:MM UTC] Marine seabirds caught [select Yes/No] Heavy warp strikes for each species: <ul style="list-style-type: none"> • Species name [insert name and species code] • Alive, unharmed [insert number and select strike type Air/Water/Sinker] • Alive, harmed [insert number and select strike type Air/Water/Sinker] • Dead [insert number] Albatross [insert number and select strike type]
Offal management	Offal dumping position [select Port/Starboard/Stern] Offal dumping during shooting [select Never/Occasionally/Always] Offal dumping during hauling [select Never/Occasionally/Always]
Seabird abundance observation	Seabirds present in observation area [select Yes/No, insert name and species code] Estimated numbers [insert number]
Other	Trawl speed [insert knots] Horizontal opening [insert metres] Total catch [insert kilograms]

continued ...

TABLE B2 Recommended data standards for independent observer programs continued

Data field and instructions	Observations recorded
Longline fishing activities	
Observer details	Observer name [insert family name first] Observation period start date[insert DD/MM/YYYY], end date [insert DD/MM/YYYY]
Longline description	Longline type [insert FFSCV], Period when gear was used start date[insert DD/MM/YYYY], end date [insert DD/MM/YYYY] Target species [insert FAO species code] Main line: Material diameter [insert millimetres] Integrated weight [insert grams] Branch lines: material [insert type] Length [insert metres] Spacing [insert metres] Hooks: Type [insert details], make [insert details], total length [insert millimetres], shank[insert millimetres], gape [insert millimetres], throat[insert millimetres], front length [insert millimetres], usual setting position [insert position], line off bottom [insert metres], hooks off bottom [insert millimetres], baiting method [select Manual/Automatic], automatic baiting equipment [insert make and model]
Hook sinkers	Size [insert grams], position from hook [insert millimetres], longline setting position [select Port/Starboard/Stern], propeller rotation direction [select Clockwise/Anti-clockwise] Longline system: [select system single/double/trotline] <ul style="list-style-type: none"> • if single (auto) line [insert kilograms per metre] • if double (Spanish) line [insert kilograms per metre] • if trotline (vertical droppers/trots attached to a mainline) [insert kilograms per metre]
General streamer line description	Vessel equipped with streamer line [select Yes/No], Streamer line regularly set [insert number], Streamer line position [select Port/Starboard/Stern], Streamer line length [insert metres], Streamer length min/max [insert metres], Attached height above water [insert metres], Distance between streamers [insert metres] Streamers [insert number], Streamer design [select Single/Paired], Aerial extent of line [insert metres], Method used to assess aerial extent [insert details] Streamer material [insert details], Streamer line diameter [insert millimetres], Streamer colours [insert details] Streamer line over bait entry position? [select Yes/No], Distance from stern to bait entry point [insert metres], towed object [select Yes/No], Horizontal distance from bait entry point to streamer line [insert metres]
Daily setting observations	Sets (as per catch and effort log entries) [insert number], Set type [select Research/Commercial], Longline type code [insert FFSCV], Trotline cetacean exclusion device used [select Yes/No]

continued ...

TABLE B2 Recommended data standards for independent observer programs continued

Data field and instructions	Observations recorded
Setting information	<p>Must be collected the same day as hauling information is.</p> <p>Observation started on [insert DD/MM/YYYY], at [insert HH:MM UTC] and ended on [insert DD/MM/YYYY], at [insert HH:MM UTC] Vessel setting speed [insert knots], Sets unobserved since last set [insert number]</p> <p>Setting started at [insert HH:MM UTC], at latitude degrees [insert DD, N for north and S for south], latitude minutes [insert MM], longitude degrees [insert DD, E for east and W for west], longitude minutes [insert MM]</p> <p>Setting ended at [insert HH:MM UTC], at latitude degrees [insert DD, N for north and S for south], latitude minutes [insert MM], longitude degrees [insert DD, E for east and W for west], longitude minutes [insert MM]</p> <p>Setting information, Bottom depth [insert metres], total length of longline set [insert kilometres], hooks set [insert number]</p>
Details of longline setting	<p>Main line length [insert metres], Hooks set [insert number], Baskets/magazines set [insert number], Hooks per basket/magazine [insert number], Hooks baited [insert percentage], Distance between branches [insert millimetres], Distance of hooks off bottom [insert millimetres], Bait species [insert FAO species code], Deck lights during setting [select On/Off], Streamer lines used [select Yes/No], Number of streamer lines used [insert number], Aerial extent of bird scarer lines consistently achieved at least 100 metres? [select Yes/No], Bait entry position [select Port/Starboard/Stern]</p>
Daily hauling observations	Sets [insert number]
Hauling information	<p>Must be collected the same day as setting information is.</p> <p>Observation date [insert DD/MM/YYYY], Hooks observed (tally period) [insert number], Gear lost [insert number], Sections lost [insert number], Hooks lost that were attached to lost sections of the longline [insert number], Other hooks lost (excluding hooks attached to lost sections) [insert number]</p>
Observed catch composition	Haul was observed for fish/invertebrate bycatch [select Yes/No], If yes, estimated percentage of haul observed for bycatch [insert percentage]
Offal management	Offal dumping position [select Port/Starboard/Stern], Offal dumping during setting [select Never/Occasionally/Always], Offal dumping during hauling [select Never/Occasionally/Always]
Seabird interactions	<p>Marine seabirds caught [select Yes/No]</p> <p>For each species: Species name [insert name and species code], Alive, unharmed [insert number], Alive, harmed [insert number], Dead [insert number]</p>

continued ...

TABLE B2 Recommended data standards for independent observer programs continued

Data field and instructions	Observations recorded
Trapping/potting fishing activities	
Observer details	Observer name [insert family name first], Observation period start date [insert DD/MM/YYYY], end date [insert DD/MM/YYYY]
Gear type	Pot type [insert type], Mesh size [insert millimetres]
Funnel position	Orientation [insert details], Aperture [insert centimetres], Chambers [insert number], Escape port present [select Yes/No], Dimensions of escape port [insert centimetres]
Processing details and conversion factors	Haul number [insert number], Observer name [insert family name first], Target species code [insert FAO species code], Processing code [insert number], Length range individuals [insert min and max length], Live weight [insert kilograms] Processed weight [insert kilograms], Grade [insert details], Conversion factor [insert details]
Set and haul details	<p>Observation date [insert DD/MM/YYYY], Set number [insert number], Set type [select Research/Commercial], Target species [insert FAO species code]</p> <p>Set start time [insert HH:MM UTC], latitude [insert DD; N for north and S for South], longitude [insert MM.mm], longitude [insert DD; E for east and W for west], longitude [insert MM.mm], bottom depth [insert metres]</p> <p>Set end time [insert HH:MM UTC], latitude [insert DD; N for north and S for South], longitude [insert MM.mm], longitude [insert DD; E for east and W for west], longitude [insert MM.mm], bottom depth [insert metres]</p> <p>Haul Start time [insert HH:MM UTC], latitude [insert DD; N for north and S for South], longitude [insert MM.mm], longitude [insert DD; E for east and W for west], longitude [insert MM.mm], bottom depth [insert metres]</p> <p>Haul end time [insert HH:MM UTC], latitude [insert DD; N for north and S for South], longitude [insert MM.mm], longitude [insert DD; E for east and W for west], longitude [insert MM.mm], bottom depth [insert metres]</p>
Gear details	<p>Length of line [insert metres], type of line [insert line description], Pot spacing [insert metres], bait [insert type]</p> <p>Setting : Pots set [insert number], pots observed [insert number]</p> <p>Hauling: Pots hauled [insert number], pots observed [insert number]</p>
Observed interactions with birds or marine mammals	<p>Marine species observed [list FAO species code]</p> <p>Setting: Species abundance (within 500 metre radius) [insert number for each observed species], gear interaction [select Yes/No]</p> <p>Hauling: Species abundance (500 metre radius) [insert number for each observed species], gear interaction [select Yes/No]</p>
Offal management	<p>Offal dumping position [select Port/Starboard/Stern]</p> <p>Offal dumping during setting [select Never/Occasionally/Always]</p> <p>Offal dumping during hauling [select Never/Occasionally/Always]</p>
Seabird interactions	<p>Marine seabirds caught [select Yes/No]</p> <p>For each species: Species name [insert name and species code], Alive, unharmed [insert number], Alive, harmed [insert number], Dead [insert number]</p>
Seabird abundance observation	<p>Seabirds present in observation area [select Yes/No]</p> <p>Estimated numbers of abundance [insert number by species]</p>

continued ...

TABLE B2 Recommended data standards for independent observer programs continued

Data field and instructions	Observations recorded
Dahn/dropline fishing activity	
Observer details	Observer name [insert family name first], Observation period start date [insert DD/MM/YYYY], end date [insert DD/MM/YYYY]
Dahn/dropline description	Line type [insert description], Period when gear was used, start date [insert DD/MM/YYYY], end date [insert DD/MM/YYYY], Target species [insert FAO species code]
Main line	Line material [insert description] Line diameter [insert mm], Integrated line weight [insert gm]
Hooks	Hook type [insert description], Hook make [insert description], Total length [insert millimetres], shank [insert millimetres], gape [insert millimetres] throat [insert millimetres], Front length [insert millimetres]
Setting position	Line off bottom [insert metres], Hooks off bottom [insert metres], Baiting method [select Manual/Automatic], Automatic baiting equipment [insert make and model]
Offal management	Offal dumping position [select Port/Starboard/Stern], Offal dumping during hauling [select Never/Occasionally/Always], Propeller rotation direction [select Clockwise/Anti-clockwise]
General streamer line description	Vessel equipped with streamer line [select Yes/No], Streamer lines regularly set [insert number], Streamer line position [select Port/Starboard/Stern], Streamer line length [insert metres] Streamer length min/max [insert metres], Attached height above water [insert metres] Distance between streamers [insert metres], Number of streamers [insert number], Streamer design [select Single/Paired], Ariel extent of line [insert metres], Method used to assess aerial extent [insert details] Streamer material [insert details], Streamer line diameter [insert millimetres], Streamer colours [insert details] Streamer line over bait entry position [select Yes/No], Distance from stern to bait entry point [insert metres], Horizontal distance from bait entry point to streamer line [insert metres]

continued ...

TABLE B2 Recommended data standards for independent observer programs continued

Data field and instructions	Observations recorded
Details of dahn/dropline setting	<p>Main line length [insert metres], Hooks set [insert number], Hooks baited [insert percentage]</p> <p>Distance between branches/snoods [insert metres], Distance of hooks off bottom [insert metres]</p> <p>Bait species [insert species], Bait size [insert size mm], Bait proportion [insert details], Deck lights during setting [select On/Off]</p> <p>Streamer lines used [select Yes/No], streamer lines used [insert number], Daylight period – Moonlight, bait entry position [select Port/Starboard/Stern], Vessel setting speed [insert knots]</p> <p>Set start time [insert HH:MM UTC], latitude [insert DD; N for north and S for South], latitude [insert MM.mm], longitude [insert DD; E for east and W for west], longitude [insert MM.mm], bottom depth [insert metres]</p> <p>Set end time [insert HH:MM UTC], latitude [insert DD; N for north and S for South], latitude [insert MM.mm], longitude [insert DD; E for east and W for west], longitude [insert MM.mm], bottom depth [insert metres]</p> <p>Haul Start time [insert HH:MM UTC], latitude [insert DD; N for north and S for South], latitude [insert MM.mm], longitude [insert DD; E for east and W for west], longitude [insert MM.mm], bottom depth [insert metres]</p> <p>Haul end time [insert HH:MM UTC], latitude [insert DD; N for north and S for South], latitude [insert MM.mm], longitude [insert DD; E for east and W for west], longitude [insert MM.mm], bottom depth [insert metres]</p>
Gear lost	<p>Sections lost [insert number]</p> <p>Hooks lost that were attached to lost sections of the dahn/dropline [insert number]</p> <p>Other hooks lost (excluding hooks attached to lost sections) [insert number]</p>
Seabird interactions	<p>Marine seabirds caught [select Yes/No]</p> <p>For each species: Species name [insert name and species code], Alive, unharmed [insert number], Alive, harmed [insert number], Dead [insert number]</p>
Seabird abundance observation	<p>Seabirds present in observation area [select Yes/No], Estimated numbers of abundance [insert number by species]</p>

Appendix C

ACAP recommended best-practice approaches for longline and trawl fisheries

Summarised from the International Agreement on the Conservation of Albatrosses and Petrels.

TABLE C1 Trawl fisheries

Mitigation	Description	Objective of mitigation action
Nets		
Net binding	Net binding is when 3-ply sisal string is applied to the net on the deck, at intervals of around 5 metres.	Reduce seabird entanglements by preventing the net from lofting and mesh from opening.
Net weights	Adding weight on or near the codend to increase the angle of ascent of the net during hauling operations.	Reduce the time the net is on the water's surface, reducing seabird entanglements.
Net cleaning	Net cleaning involves removing all fish stickers and other material from nets.	Reduce net entanglement during shooting.
Cables		
Bird-scaring lines for warp cables	Attachment of a bird-scaring line to both the port and starboard sides of a vessel, above and outside the warp blocks.	Reduce seabird access to the danger zone, where warps enter the water.
Avoid use of net monitoring cables or employ bird-scaring lines	Net-monitoring cables should not be used. Where this is impracticable: <ul style="list-style-type: none"> • deploy bird-scaring lines positioned to deter birds from net-monitoring cables during fishing operations, and • install a snatch block at the stern of the vessel to draw the net-monitoring cable close to the water to reduce its aerial extent. 	Avoid or minimise risk of bird strikes.

continued ...

TABLE C1 Trawl fisheries continued

Mitigation	Description	Objective of mitigation action
Offal		
Full retention—recommended as best option	All waste material is converted into fish meal and fully retained.	Reduce the number of seabirds attracted to vessel.
Mealing—recommended when full retention is not possible	Mealing converts fish waste into fish meal, reducing the quantity of fish waste discharge. Discharging of meal should not occur during shooting and hauling.	Reduce the number of seabirds attracted to vessels.
Batching—recommended (when full retention or mealing not possible)	Where meal production from offal and full retention are impracticable, batching of waste (preferably for two hours or longer) should occur.	Reduce the number of seabirds attached to vessels.
General measures		
Area closures	Avoiding fishing at during periods of intense bird foraging activity.	Reduce seabird bycatch.

TABLE C2 Pelagic longline fisheries

Mitigation	Description	Objective of mitigation action
Branch line weighting—recommended for simultaneous use with night setting and bird scanning	<p>Branch lines should be weighted to sink the baited hooks rapidly out of the diving range of feeding seabirds. Recommended minimum standards for branch line weighting configurations are either:</p> <ul style="list-style-type: none"> • 40 grams or greater attached within 0.5 metres of the hook • 60 grams or greater attached within 1 metre of the hook, or • 80 grams or greater attached within 2 metres of the hook. 	Reduce seabird attacks on baited hooks.
Night setting—recommended for simultaneous use with branch line weighting and bird scanning	Most vulnerable seabirds are inactive at night. Setting longlines at night, between nautical twilight and nautical dawn, avoids contact with seabirds.	Reduce seabird bycatch.
Bird-scaring lines for vessels >35 metres long—recommended for simultaneous use with branch line weighting and night setting	<p>Bird-scaring lines run from a high point at the stern (minimum of 8 metres above the water at the stern) to a device or mechanism that creates drag at its terminus, and consistently achieve an aerial extent of 100 metres.</p> <p>Vessels >35 metres long should use two bird-scaring lines, one on each side of the sinking longline.</p> <p>Streamers for vessels >35 metres long should be brightly coloured and a mix of long and short, placed at intervals of no more than 5 metres.</p>	Reduce seabird attacks on baited hooks.
Hook-shielding devices—recommended for use in addition to the other mitigation measures listed in Table C2 (where required)	<p>Hook-shielding devices to be deployed before setting to deter birds from accessing baited hooks.</p> <p>Hook-shields should be positioned at the hook and encapsulate the barb and point of the hook during setting.</p> <p>Hook shields should remain attached till they reach a minimum depth of 10 metres or a minimum immersion time of 10 minutes.</p> <p>Hook shields should meet minimum standards for branch line weighting.</p>	Reduce risk of seabird bycatch on baited hooks.
Cables		
Time-area fishery closures	Temporary closure to fishing of important seabird foraging areas (for example, areas adjacent to important seabird colonies during the breeding season or highly productive waters when large numbers of aggressively feeding seabirds are present).	Avoid seabird bycatch.

TABLE C3 Demersal longline fisheries

Mitigation	Description	Objective of mitigation action
General		
Area and seasonal closures	Temporary closure to fishing of important seabird foraging areas (for example, near seabird colonies during the breeding season, when large numbers of aggressively feeding seabirds are present).	Reduce seabird bycatch.
Line setting		
Line weighting	Lines should be weighted to get the baited hooks rapidly out of the range of feeding seabirds. Weights should be deployed before line tension occurs to ensure that the line sinks rapidly out of reach of seabirds.	Reduce seabird attacks on baited hooks.
External weighted line: Spanish system	In the Spanish system the buoyant longlines are deployed with steel weights (minimum 5 kilograms) attached at intervals of 4 metres to make them sink.	Reduce seabird attacks on baited hooks.
External weighted line: Chilean method	This variant of the traditional Spanish double-line method uses a net sleeve or cachalotera, which envelops captured fish during hauling. Hooks are clustered on secondary lines that have steel weights (minimum of 5 kilograms) attached at intervals of 40 metres. Weights are deployed directly below the hooks. Hook-bearing lines sink in a vertical profile, resulting in very fast hook sink rates.	Reduce seabird attacks on baited hooks.
External weighted line: autoline	Autoline gear consists of a single line with steel weights (minimum of 5 kilograms) at intervals of 40 metres. These lines sink fast and consistently, with a near-linear profile from the surface.	Reduce seabird attacks on baited hooks.
Night setting	Most vulnerable seabirds are inactive at night. Setting longlines at night, between nautical twilight and nautical dawn, avoids contact with seabirds.	Reduce seabird bycatch.
Bird-scaring lines for vessels >35 metres long	Bird-scaring lines run from a high point at the stern to a device or mechanism that creates drag at its terminus. Vessels >35 metres long should use two bird-scaring lines, one on each side of the sinking longline. Streamers for vessels >35 metres long should be brightly coloured and a mix of long and short, placed at intervals of no more than 5 metres.	Reduce seabird attacks on baited hooks.

continued ...

TABLE C3 Demersal longline fisheries continued

Mitigation	Description	Objective of mitigation action
Bird-scaring lines for vessels <35 metres long	<p>Bird-scaring lines run from a high point at the stern to a device or mechanism that creates drag at its terminus.</p> <p>Small vessels should use a single bird-scaring line—either long and short streamers or short streamers only. Streamers for vessels <35 metres long should be brightly coloured. Short streamers (>1 metre long) should be placed at intervals of 1 metre along the length of the aerial extent.</p>	Reduce seabird attacks on baited hooks.
Offal and discard management	Offal and discards should be retained on board. If this is not possible, these should be either retained on board during hauling (preferable) or released on the opposite side of the vessel to the hauling bay.	Reduce seabird bycatch.
Line hauling		
Bird exclusion device (BED/brickle curtain)	A BED or brickle curtain is a horizontal support several metres above the water that encircles the entire line-hauling bay. Vertical streamers are positioned between the support and water surface.	Deter birds from flying into the area where the line is being hauled and prevent birds that on the surface from swimming into the hauling bay area.
Offal and discard management	Offal and discards should be retained on board. If this is not possible, these should be either retained on board during hauling (preferable) or released on the opposite side of the vessel to the hauling bay.	Reduce seabird bycatch.

Appendix D

Principles for recreational fishing codes of practice

Principle 1 Reduce seabird attraction to fishing activity

- Avoid bird feeding and nesting areas.
- Look out for diving birds, which may take bait when lines are cast.
- Avoid discarding fish waste in areas where you are actively fishing.
- Avoid fishing near fish-cleaning tables because seabirds are attracted to these areas.

Principle 2 Use responsible fishing practices

- Do not leave your fishing equipment unattended at any time.
- Avoid using alloy or stainless steel hooks; these remain intact indefinitely and can cause serious or fatal infections in seabirds.
- Use single hooks, barbless hooks and circle hooks to minimise harm.
- Don't leave anything behind—take all your tackle home and dispose of discarded fishing line, other gear or rubbish responsibly.

Principle 3 Promote best-practice hook removal

- If you accidentally hook a bird, carefully pull the bird in and if possible carefully de-hook it.
- If the hook is too deep to remove, contain the bird and call for help, or take it to the nearest vet so the hook can be surgically removed. Most vets will treat native wildlife for free.
- If the bird breaks free of the line, call for help immediately and keep the creature in sight so that a rescuer can find it.

Principle 4 Promote best-practice seabird handling

- Keep handling to a minimum to avoid causing stress to an injured seabird. Remain calm, speak quietly and refrain from sudden movements.
- Immobilise the beak and feet with a firm hold and gently restrain the rest of the bird.
- Do not hold birds around the neck. This restricts breathing and can cause muscle damage.
- When handling birds with long legs, hold the legs of the bird at the top of the femur where the legs and body meet. Hold the bird at waist height, away from your face.
- Protect your eyes and other body parts from birds with sharp beaks and claws.
- To minimise stress, attempt to create a quiet, dark, ventilated and temperature-controlled environment when holding and transporting birds.

Appendix E

Voluntary implementation actions

Objective 1

Understand the extent of the incidental catch of seabirds.

TABLE E1 Actions to achieve Objective 1, NPOA–Seabirds

Action	Responsible	Time frames
1.1 Conduct a qualitative or quantitative assessment of the level of incidental catch of seabirds and current use of mitigation measures in all relevant fisheries (Appendix A).	<ul style="list-style-type: none"> Fisheries management agencies 	By 2019
1.2 Develop a national data standard for logbook reporting of incidental catch of seabirds and the use of mitigation measures in commercial fisheries (Appendix B).	<ul style="list-style-type: none"> Department of Agriculture and Water Resources ABARES 	By 2019
1.3 Implement national data standard for logbook reporting, ensuring comparable, representative and verifiable time-series information.	<ul style="list-style-type: none"> Fisheries management agencies 	By 2020
1.4 Identify gaps in existing monitoring and data collection programs for recreational fishing to understand the incidental catch of seabirds.	<ul style="list-style-type: none"> Fisheries management agencies Department of the Environment and Energy 	By 2021
1.5 In capture fisheries with uncertain seabird catch levels, conduct independent monitoring to provide impartial and representative data.	<ul style="list-style-type: none"> Fisheries management agencies Commercial fisheries 	By 2021
1.6 Investigate potential for additional tools for seabird identification, such as morphological diagnostic tools or DNA identification kits.	<ul style="list-style-type: none"> Fisheries management agencies Industry bodies Research and development institutions 	By 2020
1.7 Analyse collected information to determine the extent of incidental catch of seabirds in capture fisheries.	<ul style="list-style-type: none"> Department of Agriculture and Water Resources (lead) ABARES Australian Fisheries Management Forum subcommittee 	By 2020

Source: ABARES (forthcoming)

Objective 2

Have best-practice seabird bycatch mitigation in capture fisheries to:

- minimise or, where practicable, eliminate the incidental catch of seabirds
- contribute towards achieving and maintaining a favourable conservation status for seabirds.

TABLE E2 Actions to achieve Objective 2, NPOA–Seabirds

Action	Responsible	Time frames
2.1 Identify and review use of existing mitigation measures in all relevant capture fisheries against best practice (using ACAP advice where appropriate).	<ul style="list-style-type: none"> • Fisheries management agencies • Department of the Environment and Energy 	By 2020
2.2 Assess the need for mitigation practices in all capture fisheries and implement best-practice mitigation where identified.	<ul style="list-style-type: none"> • Fisheries management agencies 	By 2021

ACAP Agreement on the Conservation of Albatrosses and Petrels.

Objective 3

Promote development of innovative mitigation procedures and technologies that are feasible, effective and efficient.

TABLE E3 Actions to achieve Objective 3, NPOA–Seabirds

Action	Responsible	Time frames
3.1 Encourage and support innovation in mitigation, including through research, development and extension.	<ul style="list-style-type: none"> • Fisheries management agencies • Department of Agriculture and Water Resources • Department of the Environment and Energy • Commercial fisheries • Recreational fishing representative organisations 	Ongoing
3.2 Assess the need for changed mitigation practices in all capture fisheries and implement best-practice mitigation where identified.	<ul style="list-style-type: none"> • Fisheries management agencies 	By 2019
3.3 Develop national guidelines for conducting research on seabird bycatch mitigation.	<ul style="list-style-type: none"> • Department of Agriculture and Water Resources • Department of the Environment and Energy 	By 2019
3.4 Develop a set of effective technologies that can be applied to different fisheries.	<ul style="list-style-type: none"> • Fisheries management agencies 	By 2019
3.5 Develop management arrangements that complement best-practice mitigation measures.	<ul style="list-style-type: none"> • Fisheries management agencies 	By 2019

Objective 4

Increase awareness and understanding of the incidental catch of seabirds and best-practice mitigation.

TABLE E4 Actions to achieve Objective 4, NPOA–Seabirds

Action	Responsible	Time frames
4.1 Incorporate within commercial and recreational education programs information about the incidental catch of seabirds and effective mitigation techniques.	<ul style="list-style-type: none"> • Fisheries management agencies • Commercial fisheries • Non-government environmental groups 	By 2019
4.2 Promote methods for recognising and reporting interactions with seabirds.	<ul style="list-style-type: none"> • Fisheries management agencies • Commercial fisheries • Non-government environmental groups 	Ongoing
4.3 Develop and promote duty of care and seabird handling techniques, especially for hooked and entangled seabirds.	<ul style="list-style-type: none"> • Fisheries management agencies • Commercial fisheries • Non-government environmental groups 	Ongoing
4.4 Provide guidance and raise awareness on best practice for minimising interactions with fishing gear and discarded gear.	<ul style="list-style-type: none"> • Fisheries management agencies 	Ongoing
4.5 Promote best-practice mitigation of seabird interactions in codes of conduct.	<ul style="list-style-type: none"> • Fisheries management agencies • Commercial fisheries • Non-government environmental groups 	Ongoing

Objective 5

Promote adoption of effective mitigation measures in regional fisheries and conservation bodies.

TABLE E5 Actions to achieve Objective 5, NPOA–Seabirds

Action	Responsible	Time frames
5.1 Advocate for effective mitigation measures in regional fisheries and conservation bodies.	<ul style="list-style-type: none"> Australian Government agencies on behalf of the government 	Ongoing
5.2 Encourage collaborative research between countries.	<ul style="list-style-type: none"> Australian Government agencies on behalf of the government 	Ongoing

Glossary

Term	Definition
ACAP	International Agreement on the Conservation of Albatrosses and Petrels.
AFMF	Australian Fisheries Management Forum, an informal network for sharing information between Australian, state and territory government agencies involved in managing fisheries and aquaculture in Australia.
bycatch	A species that is incidentally taken in a fishery and returned to the sea or killed or injured (but not taken) as a result of interacting with fishing equipment in the fishery.
capture fishery	Refers to all kinds of harvesting of naturally occurring living fish resources, including industrial, small-scale and recreational fishing.
ecologically sustainable development	under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> this is defined as using, conserving and enhancing community resources to maintain ecological processes and ensure quality of life into the future.
incidental catch	See 'bycatch'.
interaction	Any physical contact with a species and all catches (for example, hooked, netted, entangled), discards, releases and collisions with these species.
IPOA–Seabirds	The FAO's International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries.
NPOA–Seabirds	National Plan of Action for Minimising the Incidental Catch of Seabirds in Australian Capture Fisheries.
offal (marine)	Discarded waste from processing fish (such as discarded fish and other organisms and unused baits), discarded food and food scraps.
seabird	A species of the class Aves that frequents coastal waters and the open ocean, such as albatrosses, cormorants, gannets, gulls, pelicans, petrels and shearwaters.
TAP–Seabirds	Australia's Threat Abatement Plan 2014 for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations.

References

Draft National Plan of Action for Minimising the Incidental Catch of Seabirds in Australian Capture Fisheries

ABARES forthcoming, *Supporting information for the preparation of a national plan of action for seabirds in Australia*, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

Alexander, K, Robertson, G & Gales, R 1997, *The incidental mortality of albatrosses in longline fisheries*, Australian Antarctic Division, Tasmania.

Anderson, A, Small, C, Croxall, J, Dunn, E, Sullivan, B, Yates, O & Black, A 2011, [Global seabird bycatch in longline fisheries](#), *Endangered Species Research*, vol. 14, pp. 91–106.

Baker, GB & Finley, LA 2010, *2008 National assessment report for reducing the incidental catch of seabirds in longline fisheries*, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

——— 2013, *National assessment of the incidental catch of seabirds in trawl, gillnet and purse-seine fisheries*, Fisheries Research and Development Corporation, Canberra.

Baker, GB, Gales, R, Hamilton, S & Wilkinson, V 2002, 'Albatrosses and petrels in Australia: a review of their conservation and management', *Emu-Austral Ornithology*, vol. 102, pp. 7–97.

Bartle, JA 1991, 'Incidental capture of seabirds in the New Zealand sub-Antarctic squid trawl fishery, 1990', *Bird Conservation International*, vol. 1, pp. 351–9.

Birdlife International 1995, 'Global impacts of fisheries on seabirds', paper presented at the London workshop on environmental science: comprehensive and consistency in global decisions on ocean issues, London, 30 November to 2 December.

Brothers, N 1991, 'Albatross mortality and associated bail loss in the Japanese longline fishery in the Southern Ocean', *Biological Conservation*, vol. 55, pp. 255–68.

Brothers, NP, Cooper, J, & Løkkeborg, S 1999, *The incidental catch of seabirds by longline fisheries: worldwide review and technical guidelines for mitigation*, FAO Fisheries circular no. 937, Food and Agriculture Organization of the United Nation, Rome.

Brothers, N, Gales, R, & Reid, T 1998, *Seabird interactions with longline fishing in the AFZ: 1996 seabird mortality estimates and 1988–1996 trends*, Wildlife report 98/1, Parks and Wildlife Service, Tasmania.

Bull, LS 2007, 'Reducing seabird bycatch in longline, trawl and gillnet fisheries', *Fish*, vol. 8, pp. 31–56.

- Campbell, M 2013, *Tactical Research Fund: reducing the impact of discarded recreational fishing tackle on coastal seabirds, 2011/057*, Queensland Department of Agriculture, Fisheries and Forestry, Brisbane.
- Commonwealth of Australia 2003, *Seabird interactions with longline fisheries in the Australian Fishing Zone: assessment report for the National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries*, Department of Agriculture, Fisheries and Forestry, Canberra.
- 2014, [Threat Abatement Plan 2014 for the incidental catch \(or bycatch\) of seabirds during oceanic longline fishing operations](#), Department of the Environment, Canberra.
- Croxall, JP 1998, 'Research and conservation: a future for albatrosses?' in G Robertson & R Gales (eds), *Albatross biology and conservation*, Surrey Beatty & Sons, Chipping Norton, New South Wales.
- Croxall, JP, Butchart, SHM, Lascelles, B, Stattersfield, AJ, Sullivan, B, Symes, A & Taylor P 2012, 'Seabird conservation status, threats and priority actions: a global assessment', *Bird Conservation International*, vol. 22, pp. 1–34.
- FAO 1999, [International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries](#), Food and Agriculture Organization of the United Nations, Rome.
- 2009, *FAO technical guidelines for responsible fisheries. No. 1, Suppl. 2. Fishing operations 2. Best practices to reduce incidental catch of seabirds in capture fisheries*, Food and Agriculture Organization of the United Nations, Rome.
- Gales, R 1998, 'Albatross populations: status and threats', in G Robertson & R Gales (eds), *Albatross biology and conservation*, Surrey Beatty & Sons, Chipping Norton, New South Wales, pp. 20–45.
- Gales, R, Brothers, N & Reid, T 1998, 'Seabird mortality in the Japanese tuna longline fishery around Australia, 1988–1995', *Biological Conservation*, vol. 86, pp. 37–56.
- González-Zevallos, D & Yorio, P 2006, *Seabird use of discards and incidental captures at the Argentine hake trawl fishery in the Golfo San Jorge, Argentina*, Marine Ecology Progress Series, vol. 316, pp. 175–83.
- Harper, PC, Croxall, JP & Cooper, J 1985, *A guide to foraging methods used by marine birds in Antarctic and sub-Antarctic seas*, BIOMASS handbook, no. 24, University of California, Davis, pp. 1–22.
- Løkkeborg, S 2008, *Review and assessment of mitigation measures to reduce incidental catch of seabirds in longline, trawl and gillnet fisheries*, Food and Agriculture Organization of the United Nations, Rome.
- 2011, 'Best practices to mitigate seabird bycatch in longline, trawl and gillnet fisheries—efficiency and practical applicability', *Marine Ecology Progress*, vol. 435, pp. 285–303.
- McPhee, DP, Leadbitter D & Skilleter, GA 2002, 'Swallowing the bait: is recreational fishing in Australia ecologically sustainable?', *Pacific Conservation Biology*, vol. 8, no. 1, pp. 40–51.
- Sullivan, BJ, Reid, TA & Bugoni, L 2006, 'Seabird mortality on factory trawlers in the Falkland Islands and beyond', *Biological Conservation*, vol. 131, pp. 495–504.
- Weimerskirch, H, Capdeville, D & Duhamel, G 2000, 'Factors affecting the number and mortality of seabirds attending trawlers and long-liners in the Kerguelen area', *Polar Biology*, vol. 23, pp. 236–49.
- Zydels, R, Small, C & French, G 2013, 'The incidental catch of seabirds in gillnet fisheries: a global review', *Biological Conservation*, vol. 162, pp. 76–88.



Department of Agriculture and Water Resources
General inquiry 1800 900 090
National office +61 2 6272 3933



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Australian Government

Department of the Environment and Energy

Australian Antarctic Division

THREAT ABATEMENT PLAN

for the incidental catch (or bycatch) of
seabirds during oceanic longline fishing
operations (2018)



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Glossary

ACAP	<i>Agreement on the Conservation of Albatrosses and Petrels</i> , done 19 June 2001, 2258 UNTS 257 (entered into force 1 February 2004).
AFMA	Australian Fisheries Management Authority.
Antarctic Fishery	An existing, new and exploratory fishery operating under the framework of the <i>Convention on the Conservation of Antarctic Marine Living Resources</i> , done 20 May 1980, 1329 UNTS 47 (entered into force 7 April 1982).
Australian Fishing Zone	Area of waters between three nautical miles and 200 nautical miles seaward of the baselines.
Branch line	Secondary line with an individual baited hook and attached to the mainline of a longline by a clip.
Bycatch	Unintentional catch of a seabird during longline fishing.
Bycatch rate	Number of seabirds observed caught per 1000 hooks set during longline fishing (see also definition of <i>interaction</i>).
Caught	Where a seabird is either hooked or entangled in fishing gear, regardless of whether the seabird is landed on board the fishing vessel.
CMS	<i>Convention on the Conservation of Migratory Species of Wild Animals</i> , done 23 June 1979, 1651 UNTS 333 (entered into force 1 November 1983).
Coral Sea Fishery	A fishery defined under the <i>Fisheries Management Regulations 1992</i> and managed under the <i>Fisheries Management Act 1991</i> .
Criteria	Maximum permissible bycatch rate at or above which a management response is required.
Dead seabird	A seabird caught by a longline shall be considered to be dead if: <ol style="list-style-type: none"> 1. it is obviously dead (i.e. shows no muscle movement or corneal reflex); or 2. it is landed alive, but displays any of the following pathologies that may lead to death on its release: <ol style="list-style-type: none"> a. fracture of a wing bone, a leg bone or beak; b. broken feather shafts on more than two primary feathers on either wing; c. substantial damage to the patagial tendon (indicated by a drooping wing or the inability to fly upon release); d. an open wound (other than superficial injuries in which there is no subcutaneous muscle damage); e. waterlogged or hydrocarbon-soiled plumage; or f. any bird released with a hook in situ.

Demersal fish	Fish that live close to or in contact with the seabed.
Electronic monitoring system	Video recording system involving cameras positioned on a fishing vessel enabling fishing operations (including setting and hauling) to be recorded, and where the recordings are subject to independent auditing. Auditing is conducted for fishery management purposes including to ensure accurate reporting by fishing concession holders of hooks set, seabird interactions and the effectiveness of mitigation measures.
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999.</i>
Eastern Tuna and Billfish Fishery	A fishery defined in the <i>Eastern Tuna and Billfish Fishery Management Plan 2010</i> (AFMA 2016a).
Fishing areas	Areas within the Eastern Tuna and Billfish Fishery or Western Tuna and Billfish Fishery south of the parallel of 25 degrees South divided for the purposes of the criteria into five degree latitudinal bands.
Fishing gear	Any longline fishing gear deployed by a fishing vessel including seabird mitigation devices.
Fishing operator	Legal or natural person who holds a fishing concession, as defined under the <i>Fisheries Management Act 1991</i> .
Fishing seasons	Seasons defined, for the purposes of the criteria, into two: summer 1 September–30 April, and winter 1 May–31 August.
Heard Island and McDonald Islands Fishery	A fishery defined in the <i>Heard Island and McDonald Islands Fishery Management Plan 2002</i> (AFMA 2016b).
Independent monitoring	Using an AFMA scientific observer or other independent observer approved by AFMA and/or an electronic monitoring system approved by AFMA to independently monitor and record fishing activities including seabird bycatch.
Interaction	In the context of this threat abatement plan an interaction with a seabird occurs where a seabird is observed as caught under one of the following situations: <ol style="list-style-type: none"> 1. dead not landed on board – birds observed to be killed by direct interaction with fishing gear, but not landed on the fishing vessel; 2. dead landed on board – birds killed by direct interaction with fishing gear and landed on the fishing vessel; 3. alive landed on board the fishing vessel following direct interaction with fishing gear: <ol style="list-style-type: none"> a. injured; or b. released uninjured; or

	<p>4. alive and released while not on board the fishing vessel following direct interaction with fishing gear:</p> <ol style="list-style-type: none"> a. injured; or b. released uninjured.
IUCN	International Union for Conservation of Nature.
Longline fishing	Setting and hauling of one or more single lines (mainline) that contains many individual hooks on branch lines. The mainline can either be anchored or drifting. It can be oriented vertically or horizontally, and vary considerably in length and number of hooks. Longline fishing includes using any configuration of a pelagic or drifting longline, demersal longline, trotline, or dropline (AAD 2005).
Macquarie Island Toothfish Fishery	A fishery defined in the <i>Macquarie Island Toothfish Fishery Management Plan 2006</i> (AFMA 2016c).
Night	Period after nautical dusk and before nautical dawn. Nautical dusk and nautical dawn are defined as set out in the Nautical Almanacs for relevant latitude, local time and date.
Night setting	Setting of all hooks deployed by a fishing vessel during night.
Observed caught	Number of seabirds observed as caught by an AFMA scientific observer or other independent observer approved by AFMA, and/or reported as caught by the fishing operator in compliance with arrangements for the fishery where longline fishing is subject to independent monitoring using an electronic monitoring system approved by AFMA.
Observed hooks set and hauled	Number of hooks observed as set and hauled by an AFMA scientific observer or other independent observer approved by AFMA, and/or reported as set and hauled by the fishing operator in the logbook records in compliance with arrangements for the fishery, where longline fishing is subject to independent monitoring using an electronic monitoring system approved by AFMA.
Offal	Discarded waste from the processing of fish (including, among other things, discarded fish and other organisms, and used baits). The discharge of offal from fishing vessels is regulated by Part 12 of the <i>Fisheries Management Regulations 1992</i> .
Pelagic finfish	Fish that live in the upper layers of the sea.
Seabird	A bird that frequents the sea or coast. For the purposes of the criteria established by this plan, a seabird includes all species in the Class Aves that are caught by any part of the fishing gear and observed to be either dead or alive.

Southern and Eastern Scalefish and Shark Fishery	A fishery defined in the <i>Southern and Eastern Scalefish and Shark Fishery Management Plan 2003</i> (AFMA 2016d).
Stakeholder group	Forum established by the Department of the Environment and Energy to discuss implementation and effectiveness of provisions of this threat abatement plan. Participation includes representatives from government, the fishing industry, and environmental non-governmental organisations and experts closely involved with alleviating the impact of longline fishing on Australian seabirds.
Western Tuna and Billfish Fishery	A fishery defined in the <i>Western Tuna and Billfish Fishery Management Plan 2005</i> (AFMA 2016e).

Summary

Oceanic longlining is a fishing method used to target pelagic and demersal fish species. Longlining occurs in almost all Australian waters.

The adverse impact of longline fishing activities on seabirds was not fully realised until the 1980s. The incidental catch (or bycatch) of seabirds during oceanic longline fishing operations was listed by the then Minister as a key threatening process on 24 July 1995. Threat abatement plans for this key threatening process have been in place since 1998 with the current plan, *Threat Abatement Plan the incidental catch (or bycatch) of seabirds during longline fishing operations (2018)*, made in 2018. The ultimate aim of this plan is to achieve zero bycatch of seabirds from longline fishing in Commonwealth fisheries.

Considerable progress has been made under successive threat abatement plans to reduce the impact of longlining on seabirds. This has been achieved through the combined efforts of the fishing industry, researchers and non-governmental stakeholders working with government to reduce seabird bycatch in longline fisheries in a feasible, effective and efficient way. The prescriptions in this plan recognise this success and seek to further reduce the incidental capture of seabirds.

Threat abatement plans provide a national strategy to guide the activities of government, industry and research organisations in abating the impact of key threatening processes. The content of a plan must provide for the research, management and other actions necessary to reduce the key threatening process to an acceptable level. Content requirements and matters to be taken into consideration are outlined in s 271 of the *Environment Protection and Biodiversity Conservation Act 1999*. Accordingly, this plan, among other things, states the objective to be achieved; specifies the actions to achieve the objective; states the criteria to measure performance of the plan; identifies the organisations and persons involved in evaluating the performance of the plan; and identifies albatross and other seabird species affected by the key threatening process. The plan is subject to review within five years.

Introduction

This *Threat Abatement Plan for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations (2018)* replaces the *Threat Abatement Plan 2006 for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations* (Department of the Environment and Heritage 2006) that was varied by the *Threat Abatement Plan 2014 for the incidental catch (or bycatch) of seabirds during longline fishing operations* (Department of the Environment 2014). It has been developed by the Department of the Environment and Energy to continue to implement existing, as well as new actions needed to abate the listed key threatening process of incidental catch (or bycatch) of seabirds during oceanic longline fishing operations in a feasible, effective and efficient way. The plan binds the Commonwealth and its agencies in responding to the impact of longline fishing activities on seabirds, and identifies the research, management and other actions needed to reduce the impacts of this key threatening process on affected seabird species. The plan will be reviewed within five years.

Threat abatement plans

Under s 270A of the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) the Commonwealth Government develops threat abatement plans; implements the actions under these plans that are its direct responsibility; and facilitates the implementation of actions where other groups share the implementation responsibilities (e.g. fishers, states and territories). Part 13 of the EPBC Act describes the process, content and consultation required when making or varying a threat abatement plan. The legislation requires the Government to implement the plans to the extent to which they apply in areas under Commonwealth control and responsibility. In addition, government agencies must not take any actions that contravene a threat abatement plan. Where a plan applies outside Commonwealth areas in states or territories, the Commonwealth must seek the cooperation of the affected jurisdiction, with a view to jointly implementing the threat abatement plan.

Background

Oceanic longline fishing is a method used to target pelagic and demersal fish species. This method involves setting one or more single mainlines containing many individual hooks on branch lines. The mainline can either be anchored or drifting. It can be oriented vertically or horizontally in the water column, and can vary considerably in length and number of hooks. Longline fishing includes using any configuration of a pelagic or drifting longline, demersal longline, trotline, or dropline (AAD 2005). Longline fishing occurs in almost all Australian waters today. The adverse impact of longline fishing activities on seabirds was not fully realised until the 1980s when seabird bycatch was first reported and then documented (e.g. Brothers 1991; Morant et al, 1983; Tomkins 1985; Weimerskirch & Jouventin 1987).

The incidental catch (or bycatch) of seabirds during oceanic longline fishing operations was listed by the then Minister as a key threatening process on 24 July 1995. Under Commonwealth legislation, now the EPBC Act, an initial threat abatement plan was prepared and approved by the then Minister in 1998. Following review after five years a second plan was approved by the then Minister in 2006. A review of that plan was undertaken in 2011 with a variation released in 2014. This *Threat Abatement Plan for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations (2018)* replaces the plan made in 2006 (as varied).

This threat abatement plan meets the requirements of the EPBC Act and coordinates national action to alleviate the impact of longline fishing activities on seabirds in Australian waters. Its content reflects changes and improvements which have occurred during the life of the previous plan and highlights the expectation of best and improving practice in all longline fisheries in achieving the ultimate goal and interim objective of this plan. It applies to all longline fisheries under Commonwealth jurisdiction.

Historically, seven longline fisheries operating in the Australian Fishing Zone have been identified as having significant and potential seabird bycatch problems: Antarctic Fishery, Coral Sea Fishery, Eastern Tuna and Billfish Fishery, Heard Island and McDonald Islands Fishery, Macquarie Island Toothfish Fishery, Southern and Eastern Scalefish and Shark Fishery (scalefish hook, shark hook and automatic longline sectors), and Western Tuna and Billfish Fishery (AAD 2005). These fisheries are managed by the Australian Fisheries Management Authority (AFMA). Over the life of the previous threat abatement plans, substantial progress has been achieved towards reducing the key threatening process in each fishery. The incidental bycatch rates in several fisheries are now generally well below 0.01 or 0.05 birds per 1000 hooks in each fishing season and fishing area, the maximum permissible levels set as a performance indicator under the previous plan. The prescriptions in this plan recognise this success and seek to further reduce the incidental capture of seabirds.

Information on the level and nature of interactions between seabirds and fishing gear has increased significantly since 1995, and there is now extensive information available upon which to base decision-making. Considerable research and development activities have been undertaken into seabird bycatch mitigation measures including at-sea trials. This work could not have been achieved without the continued engagement and support of industry.

The prescriptions in this threat abatement plan also draw on best and improving practices in seabird bycatch mitigation for longline fishing developed under the *Agreement on the Conservation of Albatrosses and Petrels* (ACAP) (ACAP 2016a; 2016b). This international agreement, to which Australia is a Party, aims to achieve and maintain a favourable conservation status for albatrosses and petrels. ACAP has been developed under the auspices of another international agreement, the *Convention on the Conservation of Migratory Species of Wild Animals* (CMS).

There is now increased confidence concerning the effectiveness of several mitigation measures, particularly line weighting strategies, use of bird-scaring lines, retention of offal during line setting and hauling, night setting (in certain instances), spatial and temporal closures, and use of hook-shielding devices (ACAP 2016a; 2016b). These mitigation measures form the basis of the prescriptions set out in this threat abatement plan.

This threat abatement plan is closely linked to other plans and policies concerning seabird species, particularly the *Threat Abatement Plan for the impacts of marine debris on vertebrate marine life* (Department of the Environment and Energy 2017); Australia's *National Plan of Action for minimising the incidental catch of seabirds in Australian capture fisheries* (DAWR 2017b) that has been prepared to meet Australia's commitment to the *International Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries* (FAO 1999) and associated technical guidelines (FAO 2009); and the *Commonwealth Fisheries Bycatch Policy* (DAWR 2017a) that is near finalisation. This threat abatement plan relies on recovery plans to collect specific data on population trends of those threatened seabird species found breeding in Australia. Of particular relevance is the *National recovery plan for threatened albatrosses and giant petrels* (DSWEPC 2011), which updates the first recovery plan for albatrosses and giant petrels that was released in 2001. The recovery plan sets out a coordinated conservation strategy for albatrosses and giant petrels listed as threatened under the EPBC Act. It considers threats to albatrosses and giant petrels both at terrestrial breeding sites and at sea in their foraging habitat.

This threat abatement plan represents an important component of Australia's domestic contribution to the global conservation of seabirds by managing the threat of incidental catch (or bycatch) of seabirds during longline fishing operations. However, conservation of migratory seabird species relies on more than Australian action. Mitigation strategies, such as those outlined in this plan, should also be applied during oceanic longline fishing operations in international waters and waters under the jurisdiction of other nations, particularly those in the southern hemisphere. Australia is actively pursuing such action through, among other things, those regional fisheries management organisations to which it is a Party, the Commission for the Conservation of Antarctic Marine Living Resources, ACAP and CMS.

The following sets out the threat abatement plan for the listed key threatening process of *incidental catch (or bycatch) of seabirds during oceanic longline fishing operations*.

Objective

Threat abatement plans must state the objective to be achieved (EPBC Act s 271(2)(a)). The ultimate aim of this threat abatement plan is to achieve a zero bycatch of seabirds, especially threatened albatross and petrel species, in all longline fisheries. However, using currently available mitigation methods, this aim may not be realistic in the short-term, although it is expected that improved and emerging mitigation measures will mean near-zero bycatch is feasible within the life of this plan. Therefore, the objective of this threat abatement plan is to seek to further reduce the seabird bycatch and bycatch rate during oceanic longline fishing operations in the Australian Fishing Zone.

As many seabird species have large distributional ranges, actions by Australia alone are unlikely to be sufficient to prevent any decline in some populations. Accordingly, Commonwealth Government agencies will pursue, in addition to domestic actions under this threat abatement plan, the global adoption of bycatch and other threat mitigation strategies through international conservation and fisheries management forums.

The objective of this threat abatement plan is to be achieved through six key actions:

1. **Mitigation** – effective measures will continue to be applied, both through legislative frameworks and fishing practices, to avoid seabird bycatch or minimise seabird bycatch and bycatch rates, recognising the importance of other factors such as safety, practicality and the characteristics of the fishery.
2. **Education** – results from data analysis will continue to be communicated throughout the community, stakeholder groups and international forums, and programs will continue or be established to provide information and education to longline operators.
3. **International initiatives** – advocacy in international conservation and fisheries management forums in support of global adoption of seabird bycatch mitigation measures across the range of affected seabird species including trigger and other limits, and effective bycatch and other threat mitigation methods that are complementary with those outlined in this threat abatement plan.
4. **Research and Development and Uptake** – continued support of research into developing and reviewing the efficiency, effectiveness and uptake of new and improved mitigation measures.
5. **Innovation** – innovation in ‘bird friendly’ fishing measures and devices will continue to be encouraged.
6. **Data collection and analysis** – data will be collected and analysed to assess the performance of this threat abatement plan including mitigation measures and to improve knowledge of seabird-longline interactions and the conservation status of seabirds.

Actions to achieve the objective

Threat abatement plans must specify actions needed to achieve the objective(s) (EPBC Act s 271(2)(c)). This threat abatement plan requires that government agencies identified below implement the following actions. The EPBC Act also requires that all government agencies act in a manner that is consistent with and does not undermine the provisions of this plan.

Mitigation actions

1. AFMA will require all pelagic longline tuna fishers operating within either the Eastern Tuna and Billfish Fishery or the Western Tuna and Billfish Fishery, or both fisheries, southwards of the parallel of 25 degrees South to:
 - a. employ a line-weighting strategy approved by AFMA that enables the bait to be rapidly taken below the reach of most seabirds;
 - b. employ either of the following:
 - i. at least one bird-scaring line constructed to a specified standard approved by AFMA, or use another proven mitigation measure approved by AFMA for use without such a line; or
 - ii. only set longlines at night;
 - c. not discharge offal during line setting; and
 - d. employ, as part of an adaptive management approach to seabird bycatch mitigation, such other mitigation measures as AFMA may stipulate following consultation with the Department of the Environment and Energy

(including, but not limited to, use of bird scaring lines, bird exclusion devices and/or managing offal discharge during line hauling, night setting, and area closures).
2. AFMA will continue to require domestic and foreign vessels in all longline fisheries operating within Australian jurisdiction to adopt proven mitigation measures that ensure the performance criteria for each fishery are achieved in all areas and seasons. The relevant requirements for each fishery are summarised in Table 1 below.

Table 1 Summary of seabird bycatch mitigation measures in longline fisheries (the following provides information about seabird bycatch mitigation measures for longline fisheries affected by this threat abatement plan, as at 1 February 2018).

Mitigation	Antarctic Fishery	Coral Sea Fishery		Eastern Tuna and Billfish	Heard Island and McDonald Islands Fishery
		Autolongline	Other line		
Bird scaring line (tori line)	√	√		√ (or night setting)	√ (2 tori lines)
Line weighting	√			√ (or hook-shields)	√
Night setting	√ (if limit exceeded)			√ (or tori line)	Undertaken
Offal management	√	√	√	√ (setting only)	√
Bird exclusion devices	Encouraged				√
Hook-shields				√ (or line weighting)	
Deck lighting	√				√
Observers	√	√ (upon request)	√ (upon request)	√ (upon request)	√
Electronic monitoring				√	
Season closures*	√				√
Area closures*	√			√	√
Performance criteria	√	√	√	√	√
Absolute number limits	√				√

* Where closure of an area or season is for seabird conservation purposes, as opposed to fishery management purposes.

Mitigation	Macquarie Island Toothfish Fishery	Southern and Eastern Scalefish and Shark Fishery		Western Tuna and Billfish Fishery
		Autolongline	Set demersal longline**	
Bird scaring line (tori line)	√ (2 tori lines)	√		√ (or night setting)
Line weighting	√	√		√ (or hook-shields)
Night setting	√	√ (if criterion exceeded)		√ (or tori line)
Offal management	√	√	√	√ (setting only)
Bird exclusion devices	√	√		
Hook-shields				√ (or line weighting)
Deck lighting	√			
Observers	√	√ (upon request)	√ (upon request)	√ (upon request)
Electronic monitoring		√	√	√
Season closures*	√			
Area closures*	√			
Performance criteria	√	√	√	√
Absolute number limits	√			

* Where closure of an area or season is for seabird conservation purposes, as opposed to fishery management purposes.

** Scalefish hook, and shark hook sectors.

3. AFMA will implement an appropriate management response in a longline fishery (described in Table 2 below) if the circumstances described in the table below occur, or data analysis indicates that the performance criteria, defined in this threat abatement plan, have not been met in any fishing area, season or fishery, or that independent monitoring has dropped below acceptable levels. Consistent with an adaptive management approach, the management response will be implemented as soon as practical, but no later than within three months of identification of a problem.

Table 2. Management responses in longline fisheries to bycatch incidents, when performance criteria are exceeded, and when independent monitoring does not meet coverage levels

Problem	Management response
<p>1. Bycatch incidents where more than one seabird is observed caught on a single trip by an individual longline fishing vessel</p>	<p>AFMA will investigate and determine if the cause was as a result of inadequate or non-compliant implementation of mitigation measures and/or a lack of effectiveness of mitigation measures.</p> <p>In the event of non-compliance, AFMA will take appropriate corrective action, including monitoring of future compliance.</p> <p>Any information of possible ineffectiveness of mitigation measures will be reviewed in consultation with the Department of the Environment and Energy and agreement reached on what corrective and monitoring actions, if any, are required.</p>
<p>2. Criterion for a longline fishery exceeded in a fishing area or fishery during one season</p>	<p>AFMA will:</p> <ol style="list-style-type: none"> a. review the mitigation measures currently deployed in the fishing area or fishery and the relevant circumstances — environmental conditions and fishing practices including compliance — this review will include examination of all relevant seabird interaction data, independent monitoring reports and other information; b. assess, in consultation with the Department of the Environment and Energy, whether it is feasible and desirable to further improve existing mitigation measures; and c. if identified, implement improved mitigation measures designed to enable the criterion to be achieved in future.
<p>3. Criterion for a longline fishery exceeded in a fishing area or fishery in the next corresponding season</p>	<p>AFMA will implement additional mitigation measures, if identified, for individual vessels that have exceeded the criterion. AFMA must consider suspension from fishing using longline fishing methods until AFMA and the Department of the Environment and Energy are satisfied with mitigation measures implemented on affected vessels.</p> <p>AFMA may also close the fishing area or fishery to fishing using longline fishing methods until AFMA and the Department of the Environment and Energy are satisfied that mitigation measures are available for deployment to enable the criterion to be achieved.</p>

Problem	Management response
4. Independent monitoring of a fishing area, fishery and/or season does not meet coverage levels in the criteria	AFMA will take such actions as are necessary to promptly increase independent monitoring levels to meet specified levels.

4. AFMA will consider the different demersal longline sectors in the Southern and Eastern Scalefish and Shark Fishery (scalefish hook, shark hook and scalefish automatic longline) when applying a management response.
5. AFMA will take into account the conservation status of seabirds caught during longline fishing operations in determining whether a more rigorous management response is required, in addition to that required in Table 2 (see above).
6. AFMA and the Department of the Environment and Energy will report annually to the stakeholder group on progress towards achieving the objective of this threat abatement plan, implementation of actions under the plan, and changes to the conservation status of threatened seabird species.
7. AFMA will implement extension and training programs for longline fishers, where appropriate.
8. AFMA will implement a risk based compliance strategy to ensure that all requirements of this threat abatement plan relevant to the mitigation of seabird bycatch are complied with. AFMA will provide to the stakeholder group annual summary compliance reports. These reports will include an assessment of the effectiveness of implementation of all mitigation measures, and will describe any incidents of non-reporting of interactions or mortalities in Australia's domestic and high seas oceanic longline fisheries.
9. AFMA and the Department of Agriculture and Water Resources will communicate the results of implementing this threat abatement plan, and will promote seabird bycatch mitigation and the need to use effective mitigation measures to foreign fishers through international fisheries forums. This advocacy will focus on ensuring that seabird bycatch mitigation measures across the range of affected seabird species are complementary with those outlined in this threat abatement plan. The Department of Agriculture and Water Resources will report annually to the stakeholder group on progress made on this action.
10. The Department of the Environment and Energy will communicate the results of implementing this threat abatement plan. It will promote seabird bycatch mitigation and the need to use effective mitigation measures in relevant international conservation forums, including ACAP and CMS. This advocacy will focus on ensuring that seabird bycatch mitigation measures across the range of affected seabird species are complementary with those outlined in this threat abatement plan. The Department of the Environment and Energy will report annually to the stakeholder group on progress made on this action.

Research and development, and innovation

11. AFMA, the Department of Agriculture and Water Resources and the Department of the Environment and Energy will promote and support research and development of new and existing mitigation measures, including by facilitating access to and awareness among stakeholders of fisheries research funding programs, particularly those conducting research and development on measures to mitigate seabird bycatch mortalities.
12. AFMA will support trials of seabird bycatch mitigation measures and devices under operational conditions by granting individual scientific permits to operators. The Department of the Environment and Energy will provide advice to help in ensuring the experimental design of trials is scientifically robust. Measures will be tested for a sufficient amount of fishing effort and in a manner that takes proper account of differences across seasons and between boats, and gives confidence in the results. Once a new seabird bycatch mitigation measure or device has been demonstrated to consistently and effectively meet the threat abatement plan criteria, it may be included in the management arrangements for fisheries.
13. AFMA will encourage innovation in the research, development, adoption and review of effective seabird bycatch mitigation measures and devices including international research.

Other actions

Data collection and analysis

14. AFMA will collect data on the bycatch of seabirds, and effectiveness of mitigation measures. In addition to collecting these data from fishing operator logbook reports AFMA will independently monitor fishing activities through the use of AFMA scientific observers or other independent observers approved by AFMA and/or electronic monitoring systems approved by AFMA. Independent monitoring occurs for a range of fishery management purposes including monitoring seabird bycatch. For the purposes of this threat abatement plan the level of independent monitoring shall be commensurate with the nature and level of seabird bycatch in each fishing area, season and fishery, and will comply with the requirements set out below.
15. The minimum level of on-board observer coverage by AFMA scientific observers or other independent observers is set out in Table 3 below.

Table 3. Minimum on board observer coverage levels for longline fisheries

Fishery	Minimum level of on board observer coverage
Antarctic Fishery	20% of all hooks set, and 40% of all hooks hauled
Coral Sea Fishery	10% of all hooks set and hauled
Eastern Tuna and Billfish Fishery	5% of all hooks set and hauled in each fishing area
Heard Island and McDonald Islands Fishery	20% of all hooks set, and 40% of all hooks hauled
Macquarie Island Toothfish Fishery	20% of all hooks set, and 40% of all hooks hauled
Southern and Eastern Scalefish and Shark Fishery: scalefish hook, shark hook and scalefish automatic longline sectors	10% of all hooks set and hauled in each of the demersal longline sectors
Western Tuna and Billfish Fishery	5% of all hooks set and hauled in each fishing area
All other longline fisheries (including new and developing fisheries)	10% of all hooks set and hauled

16. Video footage collected as part of independent monitoring using an electronic monitoring system will be subject to independent auditing. AFMA will ensure auditing results in accurate reporting by fishing operators of hooks set, seabird interactions and the effectiveness of mitigation measures.

17. AFMA will continue to require that all seabirds killed on longlines deployed by Commonwealth fishing vessels in the Australian Fishing Zone are:
- a. if feasible, brought aboard the vessel;
 - b. reported to AFMA;
 - c. reported to the Australian Bird and Bat Banding Scheme, if banded;
 - d. if feasible, collected whole or tissue sampled for analysis, and stored on board the vessel in a manner that limits decay, while meeting any vessel food safety requirements established by the Department of Agriculture and Water Resources; and
 - e. if feasible, either transported, as a whole seabird specimen or tissue sample, to a storage and analysis facility nominated by the Department of the Environment and Energy, or undergo other analysis, as required by the Department with these costs met by the Department.

The Department of the Environment and Energy will analyse collected seabird specimens or tissue samples to determine, as appropriate, species, subspecies, provenance (where possible), age, sex and breeding status and other relevant circumstances of the bycatch incident.

18. AFMA and the Department of the Environment and Energy will analyse and review seabird-fisheries interactions data to assess seabird bycatch levels by fishing area, season, fishery and fishing method to monitor compliance with the criteria. These analyses will be prepared annually and take into account possible biases in independent monitoring. The analyses will be provided to the stakeholder group and will show, for each fishing area, season and fishery, the observed and overall bycatch rates, together with the species composition of any seabird bycatch, if available.
19. AFMA will ensure that information collection procedures in longline fisheries enable accurate records about the following to be collected by fishing operators and reported through the logbook system, and collected and reported through independent monitoring:
- a. number of seabirds caught;
 - b. species of seabirds caught;
 - c. life status of seabirds caught;
 - d. type of bait used;
 - e. fishing gear and mitigation measures used and stage of operation when the seabird bycatch occurred;
 - f. time of day/night of line setting and haul;
 - g. date and location of the catch; and
 - h. external factors (such as weather conditions and moon phase) that may influence seabird bycatch.

20. AFMA will use independent monitoring to validate seabird bycatch data collected by fishing operators and reported through the logbook system, and to identify potential benefits and/or deficiencies in existing programs, and will disseminate any findings among domestic longline fishers, and in relevant international forums, as appropriate.
21. AFMA, the Department of Agriculture and Water Resources and the Department of the Environment and Energy, together with representatives of key stakeholders and relevant experts, will collaborate to consider the impact of actions under this threat abatement plan on other marine species.

Criteria to measure performance of threat abatement plan

Threat abatement plans must state criteria against which achievement of the objective(s) is to be measured (EPBC Act s 271(2)(b)). This threat abatement plan requires that seabird bycatch in all fishing areas, seasons and fisheries is less than the bycatch rates set out in Table 4 below.

Table 4. *Bycatch rate performance criteria in longline fisheries*

Fishery	Bycatch rate
Antarctic Fishery	0.01 birds per 1000 hooks
Coral Sea Fishery	0.01 birds per 1000 hooks
Eastern Tuna and Billfish Fishery	0.05 birds per 1000 hooks in each fishing area
Heard Island and McDonald Islands Fishery	0.01 birds per 1000 hooks
Macquarie Island Toothfish Fishery	0.01 birds per 1000 hooks
Southern and Eastern Scalefish and Shark Fishery: scalefish hook, shark hook and scalefish automatic longline sectors	0.01 birds per 1000 hooks in each of the demersal longline sectors
Western Tuna and Billfish Fishery	0.05 birds per 1000 hooks in each fishing area
All other longline fisheries (including new and developing fisheries)	0.01 birds per 1000 hooks

Seabird bycatch occurs where a seabird is observed caught during longline fishing (see also the definition of *interaction*). This is the number of seabirds reported caught: (a) by an AFMA scientific observer or other independent observer approved by AFMA on board the fishing vessel, and/or (b) by the fishing operator in the logbook records in compliance with arrangements for the fishery where longline fishing is subject to independent monitoring using an electronic monitoring system approved by AFMA.

AFMA will monitor performance against these criteria at a fishery level and/or for individual vessels. AFMA may, as appropriate, hold individual vessels responsible for meeting the criteria and apply a management response to vessels that breach the criteria.

These criteria have been set on the basis of annual fishing levels at the time this threat abatement plan was approved. Trends in fishing effort will be reviewed annually and, if fishing levels increase or decrease significantly (by more than 20 per cent), AFMA and the Department of the Environment and Energy may review the maximum permissible bycatch rates identified above, taking into account spatial and temporal trends, and the vulnerability of seabird species encountered. AFMA, the Department of Agriculture and Water Resources and the Department of the Environment and Energy, may arrange more sophisticated analyses in any instances where bycatch rates are close to the maximum permissible levels and are uncertain.

Duration and cost of threat abatement process

Threat abatement plans may identify the duration and cost of the threat abatement process (EPBC Act s 271(4)(a)). This threat abatement plan will be reviewed within five years of its coming into force. The cost of this plan will be covered under the core business expenditure of the affected agencies. There are costs to industry in meeting the requirements set out in this plan. The overall costs should be similar to those incurred in implementing the previous plan, and are not expected to significantly increase, and may decrease in some instances as a result of this plan. These costs are an unavoidable consequence of the need to abate the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations in a feasible, effective and efficient manner.

Organisations and persons involved in evaluating the performance of threat abatement plan

Threat abatement plans may identify the organisations and persons involved in evaluating performance of the plan (EPBC Act s 271(4)(b)). The Department of the Environment and Energy will evaluate performance of this threat abatement plan in consultation with key stakeholders and relevant seabird experts. It will report the results of the review to the Minister for the Environment, through the Threatened Species Scientific Committee.

Major ecological matters that may be affected by threat abatement plan

Threat abatement plans may specify any major ecological matters that will be affected by the plan (EPBC Act s 271(4)(c)). This threat abatement plan is unlikely to affect other ecological matters, but all actions undertaken will take into account any impacts on the conservation status of non-seabird species including threatened sharks, marine mammals and marine reptiles.

References

- AAD (Australian Antarctic Division) (2005) *Background to the Threat Abatement Plan for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations*, Kingston, Tasmania, 35p.
Available on the internet at: http://www.antarctica.gov.au/_data/assets/pdf_file/0009/21510/ml_38623723599537_tap-2-backgroundpaper-sept-2005.pdf.
- ACAP (Agreement on the Conservation of Albatrosses and Petrels) (2016a) *ACAP review and best practice advice for reducing the impact of pelagic longlines on seabirds*.
Available on the internet at: <http://www.acap.aq/en/bycatch-mitigation/mitigation-advice>.
- ACAP (2016b) *ACAP Summary advice for reducing impact of demersal longlines on seabirds*.
Available on the internet at: <http://www.acap.aq/en/bycatch-mitigation/mitigation-advice>.
- AFMA (Australian Fisheries Management Authority) (2016a) *Eastern Tuna and Billfish Fishery Management Plan 2010*.
Available on the internet at: <https://www.legislation.gov.au/Details/F2016C00636>.
- AFMA (2016b) *Heard Island and McDonald Islands Fishery Management Plan 2002*.
Available on the internet at: <https://www.legislation.gov.au/Details/F2016C00640>.
- AFMA (2016c) *Macquarie Island Toothfish Fishery Management Plan 2006*.
Available on the internet at: <https://www.legislation.gov.au/Details/F2016C00637>.
- AFMA (2016d) *Southern and Eastern Scalefish and Shark Fishery Management Plan 2003*.
Available on the internet at: <https://www.legislation.gov.au/Details/F2016C00638>.
- AFMA (2016e) *Western Tuna and Billfish Fishery Management Plan 2005*.
Available on the internet at: <https://www.legislation.gov.au/Details/F2016C00639>.
- Brothers N (1991) Albatross mortality and associated bait loss in the Japanese longline fishery in the Southern Ocean. *Biological Conservation* 55: 255-268.
- Commonwealth of Australia (2014) *Threat Abatement Plan 2014 for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations*, Department of the Environment. Canberra.
Available on the internet at: <https://www.legislation.gov.au/Details/F2014L01196>.
- DAWR (Department of Agriculture and Water Resources) (2017a) *Commonwealth Fisheries Bycatch Policy: Draft for Consultation*, Department of Agriculture and Water Resources, Canberra, 19p.
Available on the internet at: <http://www.agriculture.gov.au/SiteCollectionDocuments/fisheries/environment/bycatch/draft-bycatch-policy.pdf>.

- DAWR (2017b) *National Plan of Action for minimising the incidental catch of seabirds in Australian capture fisheries*, Canberra, 42p.
Available on the internet at:
<http://www.agriculture.gov.au/SiteCollectionDocuments/fisheries/environment/bycatch/consultation-draft-npoa-seabirds.pdf>.
- DAFF (Department of Agriculture, Fisheries and Forestry) (2009) *National Policy on Fisheries Bycatch*.
Available on the internet at:
http://www.agriculture.gov.au/fisheries/environment/bycatch/nat_by_policy_1999.
- Department of the Environment and Energy (2017) *Draft Threat Abatement Plan for the impacts of marine debris on vertebrate marine life (2017)*.
Available on the internet at:
<http://www.environment.gov.au/biodiversity/threatened/threat-abatement-plans/draft-marine-debris-2017>.
- Department of the Environment and Heritage (2006) *Threat Abatement Plan 2006 for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations*.
Available on the internet at: <https://www.legislation.gov.au/Details/F2006L02855>.
- DSEWPC (Department of Sustainability, Environment, Water, Population and Communities) (2011) *National recovery plan for threatened albatrosses and giant petrels: 2011-2016*.
Available on the internet at:
<http://www.environment.gov.au/biodiversity/threatened/publications/recovery/albatrosses-and-giant-petrels.html>.
- FAO (Food and Agriculture Organization of the United Nations) (1999) *International Plan of Action for reducing incidental catch of seabirds in longline fisheries*.
Available on the internet at: <http://www.fao.org/fishery/publications/ipoa/en>.
- FAO (2009) *Fishing operations. 2. Best practices to reduce incidental catch of seabirds in capture fisheries*, FAO Technical Guidelines for Responsible Fisheries, No 1, Suppl. 2, Rome, FAO, 49p.
- IUCN (International Union for Conservation of Nature) (2018) *IUCN Red List of Threatened Species, Version 2017-3*.
Viewed: 1 February 2018.
Available on the internet at: www.iucnredlist.org.
- Morant PD, Brooke RK & Abrams RW (1983) Recoveries in southern Africa of birds breeding elsewhere. *Ringing and Migration* 4: 257-268.
- Tomkins RJ (1985) Reproduction and mortality of wandering albatrosses on Macquarie Island. *Emu* 85: 40-42.
- Weimerskirch H & Jouventin P (1987) Population dynamics of the Wandering Albatross (*Diomedea exulans*) of the Crozet Islands: causes and consequences of the population decline. *Oikos* 49: 315-322.

Annex A: Summary of the seabird species affected by longline fishing in the Australian Fishing Zone

The following reflects current information on the taxonomy and conservation status of each seabird species, including information from the IUCN Red List of Threatened Species Version 2017-3 (IUCN, 2018) and ACAP. A distinction is drawn between species that breed and forage in areas under Australian jurisdiction (Table 5 below) and species foraging, but not breeding in areas under Australian jurisdiction (Table 6 below). The likely incidence in longline bycatch is assessed in the absence of seabird mitigation measures.

Table 5. Species breeding and foraging in Australian jurisdiction that are affected by longline fishing

Species name	International conservation status	EPBC Act listing	Likely incidence in longline bycatch	Jurisdiction and location of breeding areas
Wandering albatross <i>Diomedea exulans</i>	Vulnerable	Vulnerable	Moderate	Australia: Heard Island, Macquarie Island France: Iles Crozet, Iles Kerguelen South Africa: Prince Edward Islands United Kingdom/Argentina: South Georgia (Islas Georgias del Sur)
Black-browed albatross <i>Thalassarche melanophris</i>	Least Concern	Vulnerable	High	Australia: Heard Island and McDonald Islands, Macquarie Island Chile: island groups of Diego de Almagro, Diego Ramirez, Evangelistas, and Ildefonso; islets in the Magallanes region, and Tierra del Fuego France: Iles Crozet, Iles Kerguelen New Zealand: Antipodes Island, Campbell Island United Kingdom/Argentina: Falklands Islands (Islas Malvinas), South Georgia (Islas Georgias del Sur)
Shy albatross <i>Thalassarche cauta</i>	Near Threatened	Vulnerable	Moderate	Australia: Tasmanian islands of Albatross, Mewstone, and Pedra Branca
Grey-headed albatross <i>Thalassarche chrysostoma</i>	Endangered	Endangered	Moderate	Australia: Macquarie Island Chile: island groups of Diego Ramirez, and Ildefonso France: Iles Crozet, Iles Kerguelen

Species name	International conservation status	EPBC Act listing	Likely incidence in longline bycatch	Jurisdiction and location of breeding areas
				<p>South Africa: Prince Edward Islands</p> <p>New Zealand: Campbell Island</p> <p>United Kingdom/Argentina: South Georgia (Islas Georgias del Sur)</p>
<p>Light-mantled albatross</p> <p><i>Phoebastria palpebrata</i></p>	Near Threatened	Not listed	Low	<p>Australia: Heard Island, Macquarie Island</p> <p>France: Iles Crozet, Iles Kerguelen</p> <p>New Zealand: Antipodes Island, Auckland Islands, Campbell Island</p> <p>South Africa: Prince Edward Islands</p> <p>United Kingdom/Argentina: South Georgia (Islas Georgias del Sur)</p>
<p>Northern Giant Petrel</p> <p><i>Macronectes halli</i></p>	Least concern	Vulnerable	Low	<p>Australia: Macquarie Island</p> <p>France: Iles Crozet, Iles Kerguelen</p> <p>New Zealand: Antipodes Island, Auckland Islands, Campbell Island, Chatham Island</p> <p>South Africa: Prince Edward Islands</p> <p>United Kingdom/Argentina: South Georgia (Islas Georgias del Sur)</p>
<p>Southern Giant Petrel</p> <p><i>Macronectes giganteus</i></p>	Least concern	Endangered	Low	<p>Antarctica: Australian Antarctic Territory (Frazier, Hawker and Giganteus Islands), Antarctic Peninsula, South Orkney Islands, South Shetland Islands, Terre Adélie</p> <p>Argentina: Isla Arce, Isla de los Estados, Isla Gran Robredo, Isla Observatorio</p> <p>Australia: Heard Island and McDonald Islands, Macquarie Island</p> <p>Chile: Isla Noir, Islas Diego Ramirez</p> <p>France: Iles Crozet, Iles Kerguelen</p> <p>Norway: Bouvet Island</p> <p>South Africa: Prince Edward Islands</p> <p>United Kingdom/Argentina: Falklands Islands (Islas Malvinas), South Georgia (Islas Georgias del Sur), South Sandwich Islands (Islas Sandwich del Sur)</p> <p>United Kingdom: Gough Island</p>

Species name	International conservation status	EPBC Act listing	Likely incidence in longline bycatch	Jurisdiction and location of breeding areas
Great-winged Petrel <i>Pterodroma macroptera</i>	Least Concern	Not listed	Moderate	Australia: southern and southwestern Australia France: Iles Crozet, Iles Kerguelen New Zealand: North Island South Africa: Prince Edward Island United Kingdom: Tristan da Cunha Group
Grey Petrel <i>Procellaria cinerea</i>	Near Threatened	Not listed	Moderate	Australia: Macquarie Island France: Iles Amsterdam, Iles Crozet, Iles Kerguelen New Zealand: Antipodes Islands, Campbell Islands South Africa: Prince Edward Islands United Kingdom: Tristan da Cunha Group
Wedge-tailed shearwater <i>Ardenna pacifica</i>	Least Concern	Not listed	Moderate	Australia: numerous island and coastal locations Other: extensive distribution
Flesh-footed shearwater <i>Ardenna carneipes</i>	Near Threatened	Not listed	High	Australia: southern Australia France: Ile St Paul New Zealand: North Island
Sooty shearwater <i>Ardenna griseus</i>	Near Threatened	Not listed	Low	Australia: southeastern Australia (including Macquarie Island) Chile: southern New Zealand: islands off New Zealand United Kingdom/Argentina: Falkland Islands (Islas Malvinas)
Short-tailed shearwater <i>Ardenna tenuirostris</i>	Least Concern	Not listed	Low	Australia: southern Australia
Southern skua <i>Catharacta antarcticus</i>	Least Concern	Not listed	Low	Australia: Heard Island and McDonald Islands, Macquarie Island Other: extensive distribution across sub-Antarctic

Table 6. Species foraging in Australian jurisdiction that are affected by longline fishing

Species name	International conservation status	EPBC Act listing	Likely incidence in longline bycatch	Jurisdiction and location of breeding areas
Tristan albatross <i>Diomedea dabbenena</i>	Critically endangered	Endangered	Low	United Kingdom: Tristan da Cunha Group
Antipodean albatross <i>Diomedea antipodensis</i>	Endangered	Vulnerable	Low	New Zealand: Antipodes Island, Auckland Islands, Campbell Island
Northern royal albatross <i>Diomedea sanfordi</i>	Endangered	Endangered	Low	New Zealand: Chatham Islands (Big Sister Island, Little Sister Island, Forty-fours Island), South Island (Otago Peninsula, Taiaroa Head)
Southern royal albatross <i>Diomedea epomophora</i>	Vulnerable	Vulnerable	Low	New Zealand: Auckland Islands, Campbell Island, South Island (Taiaroa Head)
Amsterdam albatross <i>Diomedea amsterdamensis</i>	Critically Endangered	Endangered	Low	France: Iles Amsterdam
Campbell albatross <i>Thalassarche impavida</i>	Vulnerable	Vulnerable	High	New Zealand: Campbell Island
Buller's albatross <i>Thalassarche bulleri</i>	Near Threatened	Vulnerable	Low	New Zealand: Chatham Islands, Snares Islands, Solander Islands, Three Kings Islands
White-capped albatross <i>Thalassarche steadi</i>	Near Threatened	Vulnerable	Moderate	New Zealand: Antipodes Islands, Auckland Islands, Chatham Islands
Salvin's albatross <i>Thalassarche salvini</i>	Vulnerable	Vulnerable	Low	New Zealand: Bounty Islands, Snares Islands
Chatham albatross <i>Thalassarche eremita</i>	Vulnerable	Endangered	Low	New Zealand: Chatham Island

Species name	International conservation status	EPBC Act listing	Likely incidence in longline bycatch	Jurisdiction and location of breeding areas
Atlantic yellow-nosed albatross <i>Thalassarche chlororhynchos</i>	Endangered	Not listed	Low	United Kingdom: Tristan da Cunha Group
Indian yellow-nosed albatross <i>Thalassarche carteri</i>	Endangered	Vulnerable	Moderate	France: Iles Amsterdam, Iles Crozet, Iles Kerguelen, Iles St Paul South Africa: Prince Edward Islands
Sooty albatross <i>Phoebastria fusca</i>	Endangered	Vulnerable	Low	France: Iles Amsterdam, Iles Crozet, Iles Kerguelen, Iles St Paul South Africa: Marion Island, Prince Edward Island United Kingdom: Tristan da Cunha Group
White-chinned Petrel <i>Procellaria aequinoctialis</i>	Vulnerable	Not listed	Moderate	France: Iles Crozet, Iles Kerguelen New Zealand: Antipodes Islands, Auckland Islands, Campbell Islands South Africa: Prince Edward Island United Kingdom/Argentina: Falklands Islands (Islas Malvinas), South Georgia (Islas Georgias del Sur)
Westland Petrel <i>Procellaria westlandica</i>	Endangered	Not listed	Low	New Zealand: South Island (Punakaiki)
Black Petrel <i>Procellaria parkinsoni</i>	Vulnerable	Not listed	Low	New Zealand: Great Barrier Island, Little Barrier Island

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