



Australian Government
Department of Agriculture
and Water Resources
ABARES

Australian National Report

To the Scientific Committee of the Indian Ocean Tuna Commission for 2016

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Research by the Australian Bureau of Agricultural
and Resource Economics and Sciences

November 2016



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Cataloguing data

Hobsbawn, PI, Patterson, HM & Williams, A 2016, *Australian National Report to the Scientific Committee of the Indian Ocean Tuna Commission*, ABARES, November. CC BY 3.0.

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Acknowledgements

The authors thank Rupert Summerson and James Larcombe (ABARES); Trent Timmis (AFMA); Jonathon Barrington (AAD); Kimberley Layton (Department of the Environment and Energy) and Susie Howell (Department of Agriculture and Water Resources) for their comments and assistance in preparing this report. Work was funded by the Fisheries Resources Research Fund and ABARES.

In accordance with IOTC Resolution 10/02, final scientific data for the previous year was provided to the Secretariat by 30 June of the current year, for all fleets other than longline (e.g. for a National report submitted to the Secretariat in 2010, final data for the 2009 calendar year must be provided to the Secretariat by 30 June 2010).

YES

30/06/2016

In accordance with IOTC Resolution 10/02, provisional longline data for the previous year was provided to the Secretariat by 30 June of the current year (e.g. for a National report submitted to the Secretariat in 2010, preliminary data for the 2009 calendar year was provided to the Secretariat by 30 June 2010).

YES

30/06/2016

REMINDER: Final longline data for the previous year is due to the Secretariat by 30 Dec of the current year (e.g. for a National report submitted to the Secretariat in 2010, final data for the 2009 calendar year must be provided to the Secretariat by 30 December 2010).

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Summary

Pelagic longline and purse seine are the two main fishing methods used by Australian vessels to target tuna and billfish in the Indian Ocean Tuna Commission (IOTC) Area of Competence. In 2015, two Australian longliners from the Western Tuna and Billfish Fishery and five longliners from the Eastern Tuna and Billfish Fishery operated in the IOTC Area of Competence. They caught 19.3 t of albacore (*Thunnus alalunga*), 94.3 t of bigeye tuna (*Thunnus obesus*), 72.6 t of yellowfin tuna (*Thunnus albacares*), 200.6 t of swordfish (*Xiphius gladius*) and 1.5 t of striped marlin (*Tetrapturus audax*). These catches represent approximately 12 per cent of the peak catches taken by Australian vessels fishing in the IOTC Area of Competence in 2001, for these five species combined. In addition, Australian vessels using minor line methods took a small amount of catch. The number of active longliners and levels of fishing effort have declined substantially in recent years due to reduced profitability, primarily as a result of lower fish prices and higher operating costs. The catch of southern bluefin tuna (*Thunnus maccoyii*) in the purse seine fishery was 4789 t in 2015. There was no skipjack tuna (*Katsuwonus pelamis*) caught by purse seine fishing. In 2015, less than 1 t of shark was landed by the Australian longline fleet operating in the IOTC Area of Competence and 5553 sharks were discarded/released. In the 2015 calendar year, 7.1 per cent of hooks deployed in the WTBF were observed.

1 Background/general fishery information

Australian fisheries targeting tuna and billfish in the Indian Ocean Tuna Commission (IOTC) Area of Competence are the pelagic longline fisheries – Western Tuna and Billfish Fishery (WTBF) and Eastern Tuna and Billfish Fishery (ETBF) (Appendix A) and the purse seine fisheries – Southern Bluefin Tuna Fishery (SBTF) and the Eastern and Western Skipjack Fisheries (SJF). These five fisheries are managed by the Australian Government through the Australian Fisheries Management Authority (AFMA). Other methods such as handline, dropline, trolling and gillnetting capture small amounts of tuna and related species in multi-purpose fisheries, which are managed by the Australian Government and Australian State Governments (e.g. Western Australia). Catches from the SBTF are included in this report, although this information is reported separately to the Commission for the Conservation of Southern Bluefin Tuna.

2 Fleet structure

Longline fleet

The number of Australian longline vessels operating in the IOTC Area of Competence has declined substantially since 2000 (61 vessels) with only seven vessels operating in 2015 (Table 1). The main factor influencing the decline in fishing effort is reduced profitability, caused by lower export prices and higher operating costs, particularly fuel costs.

Historically, most of these vessels have operated in the WTBF (Appendix A) with very little longline effort taking place in the area of the ETBF between 141°E and 150°E. In 2015, two vessels from the WTBF and five from the ETBF fished in the IOTC Area of Competence. In recent years, the Australian longline fleet has fished mainly within Australia's Exclusive Economic Zone (EEZ) between 20°S and 35°S; 94.5 per cent of total effort in 2015.

Most Australian longline vessels range in length from 20 to 35 m and are less than 230 gross registered tonnes. Ice, ice slurry or brine spray systems are used to chill the catch. The majority of the fishing trips undertaken by Australian longline operators are less than 15 days in length (52 trips undertaken in the WTBF in 2015). Vessels fishing in the high seas undertake longer voyages of up to 62 days.

Purse seine fleet

The purse seine fleet has fluctuated from 5–14 vessels since 1998 (Table 1). The purse seine vessels vary in length from 20 to 45 m and target southern bluefin tuna (SBT; *Thunnus maccoyii*) for farm cage grow-out. There were six active SBT vessels in 2015.

Table 1 Number of Commonwealth and Western Australian longline and purse seine vessels reporting one or more fishing trips in the IOTC Area of Competence from 1998 to 2015. For the purse seine fleet, the numbers in brackets represent the number of active SBT purse seine vessels from the total number of purse seiners. The number of vessels >24 metres in length (all methods combined) for each year is also indicated.

Calendar Year	Number of vessels		
	Longline	Purse seine	> 24 m
1998	37	5 (5)	n/a
1999	49	7 (7)	n/a
2000	61	8 (8)	n/a
2001	45	13 (8)	n/a
2002	44	9 (7)	25
2003	36	7 (7)	21
2004	22	7 (6)	17
2005	6	8 (8)	11
2006	4	14 (7)	10
2007	3	11 (6)	9
2008	5	10 (7)	8
2009	4	10 (8)	13
2010	4	9 (7)	13
2011	2	5 (5)	7
2012	4	5 (5)	8
2013	4	5 (5)	11
2014	4	6 (6)	9
2015	7	6 (6)	9

n/a = data not available

3 Catch and effort by species and gear

Longline fleet

Australian longline fishing activity and associated catches of tunas and billfishes in the eastern Indian Ocean increased rapidly between 1998 and 2001, especially off Australia's western coast, south of latitude 20°S. Catch and effort for all species then declined and have remained relatively low since 2005, with some annual variation (Figure 1). Swordfish (*Xiphius gladius*) has been the main target species since 1999 (peak catch of 2136 t in 2001) with smaller amounts of albacore (*Thunnus alalunga*; peak catch of 94 t in 2001), bigeye tuna (*Thunnus obesus*; peak catch of 436 t in 2000), yellowfin tuna (*Thunnus albacares*; peak catch of 558 t in 2001) and striped marlin (*Tetrapturus audax*; peak catch of 23 t in 1999) landed each year.

Catch in the fishery generally increased in 2015 compared to 2014, although effort decreased from 449 387 hooks in 2014 to 430 015 hooks in 2015. The swordfish catch decreased from 211.6 t in 2014 to 200.6 t in 2015 (Table 2a). Bigeye catch increased from 75.3 t to 94.3 t in 2015. Yellowfin tuna catch increased from 19.0 t to 72.6 t in 2015 (Table 2a). Figure 2a and Figure 2b map the footprint of Australian tuna fishing effort in the IOTC area of competence for 2015 and for 2011–15. Due to confidentiality restrictions that prevent the disclosure of fishing activity by fewer than five vessels, fine-scale effort distribution cannot be reported in the WTBF or ETBF. Figures 3a and 3b indicate the distribution of the catch in the IOTC Area of Competence. However, the longline catch from the WTBF and ETBF could not be mapped for 2015 due to confidentiality.

Figure 1 Australian annual catch of primary species in the longline sector of the WTBF, 1986 to 2015

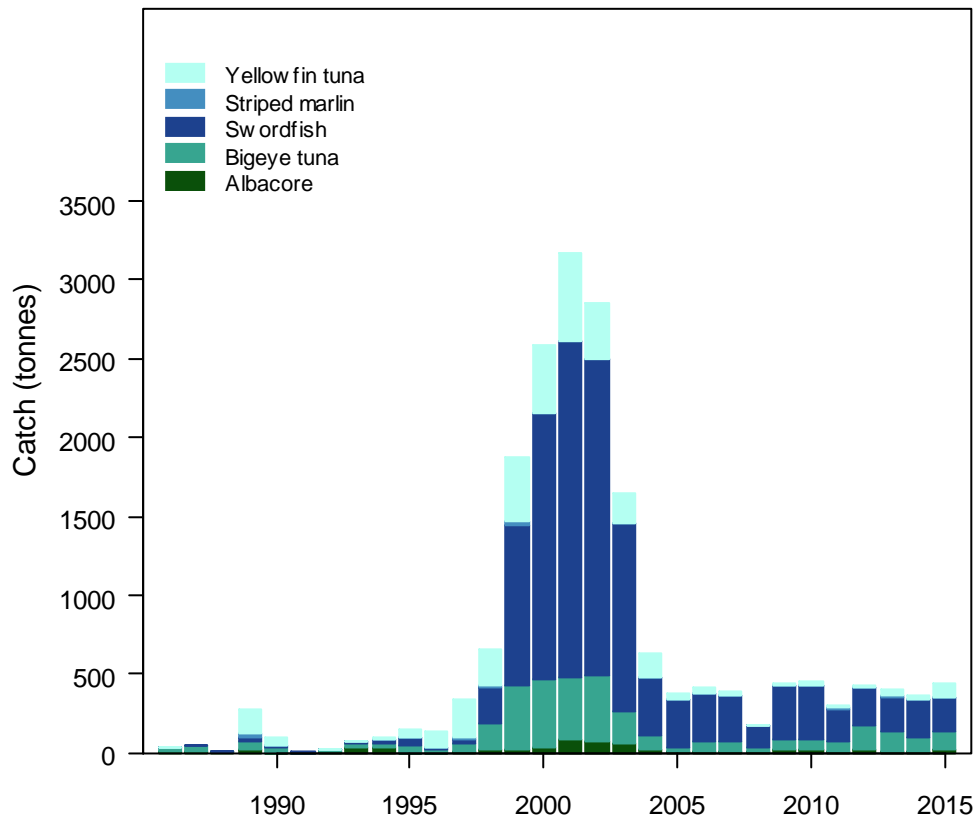


Figure 2a Fishing footprint (shown as 1 degree cells) in the Western Tuna and Billfish Fishery and Eastern Tuna and Billfish Fishery (longline) and in the Southern Bluefin Tuna Fishery (purse seine) for 2015

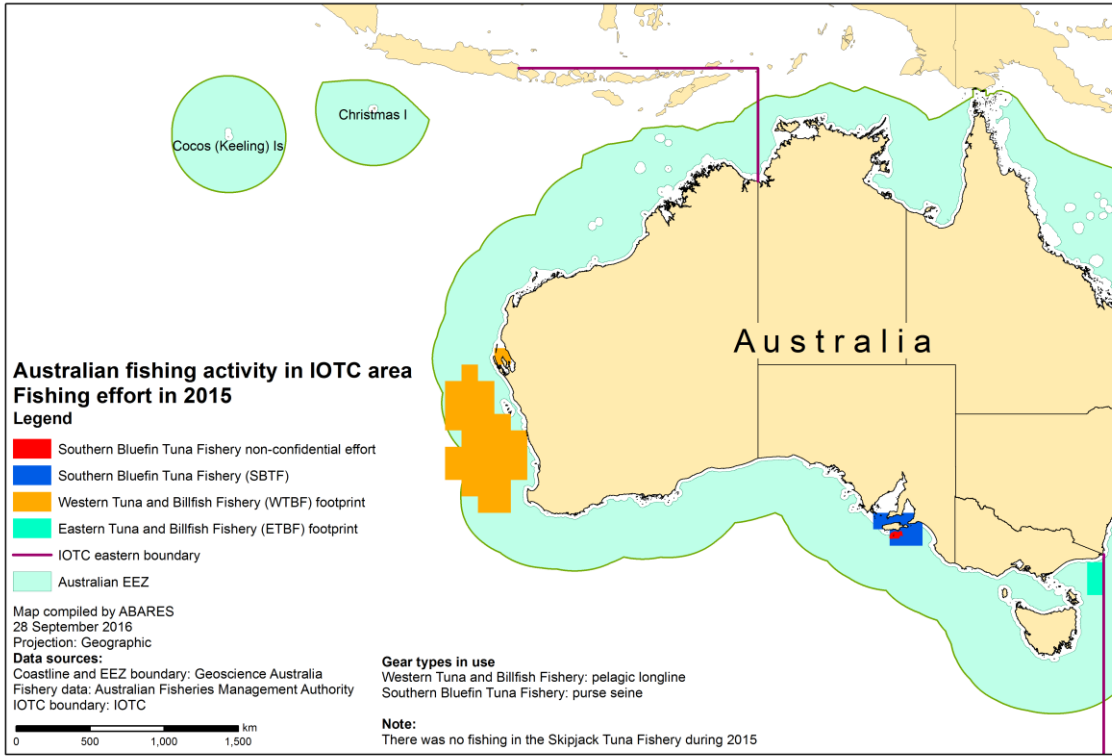


Figure 2b Aggregate fishing footprint (shown as 1 degree cells) in the Western Tuna and Billfish Fishery and Eastern Tuna and Billfish Fishery (longline) and in the Southern Bluefin Tuna Fishery (purse seine) for 2011–2015

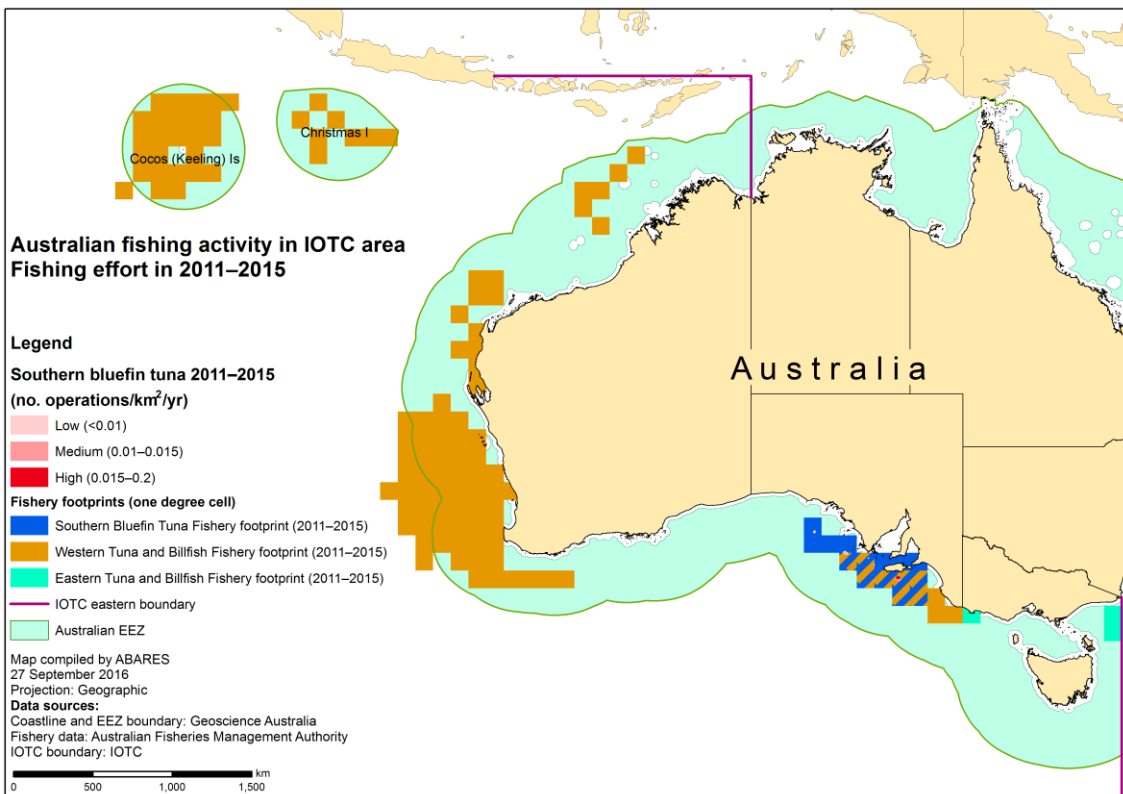


Figure 3a Distribution of catch in the Southern Bluefin Tuna Fishery (purse seine) for 2015. Note that due to the low effort in the longline fisheries, confidentiality rules prohibit the depiction of the 2015 WTBF and ETBF data

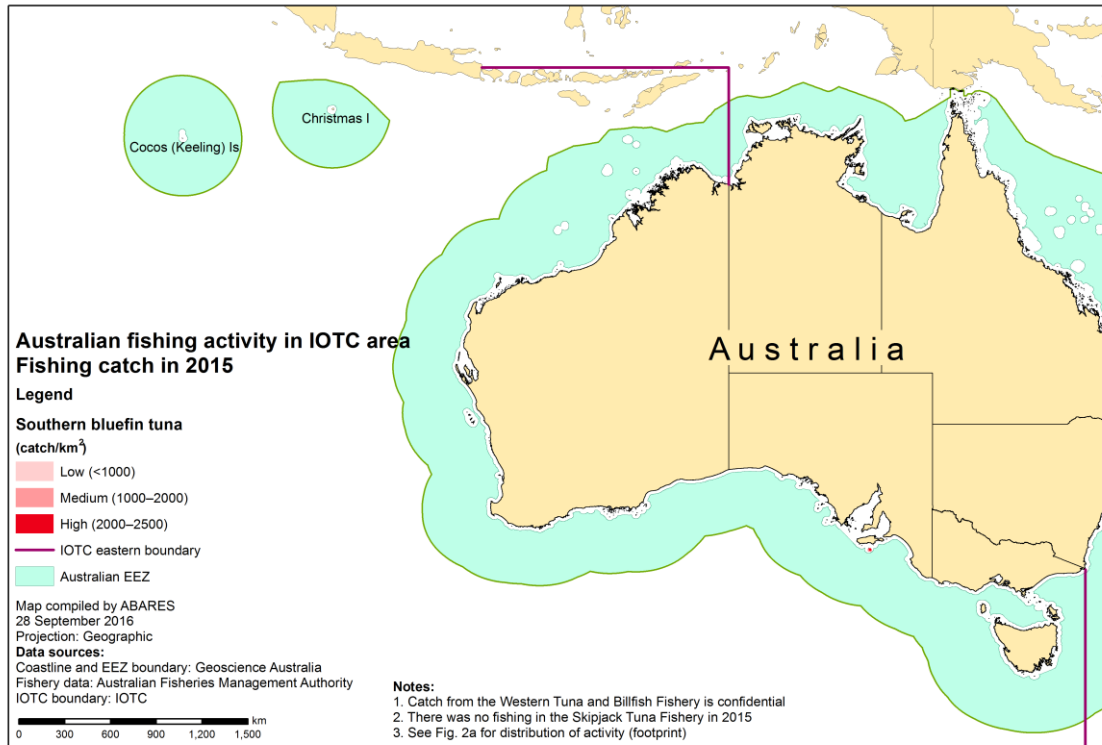
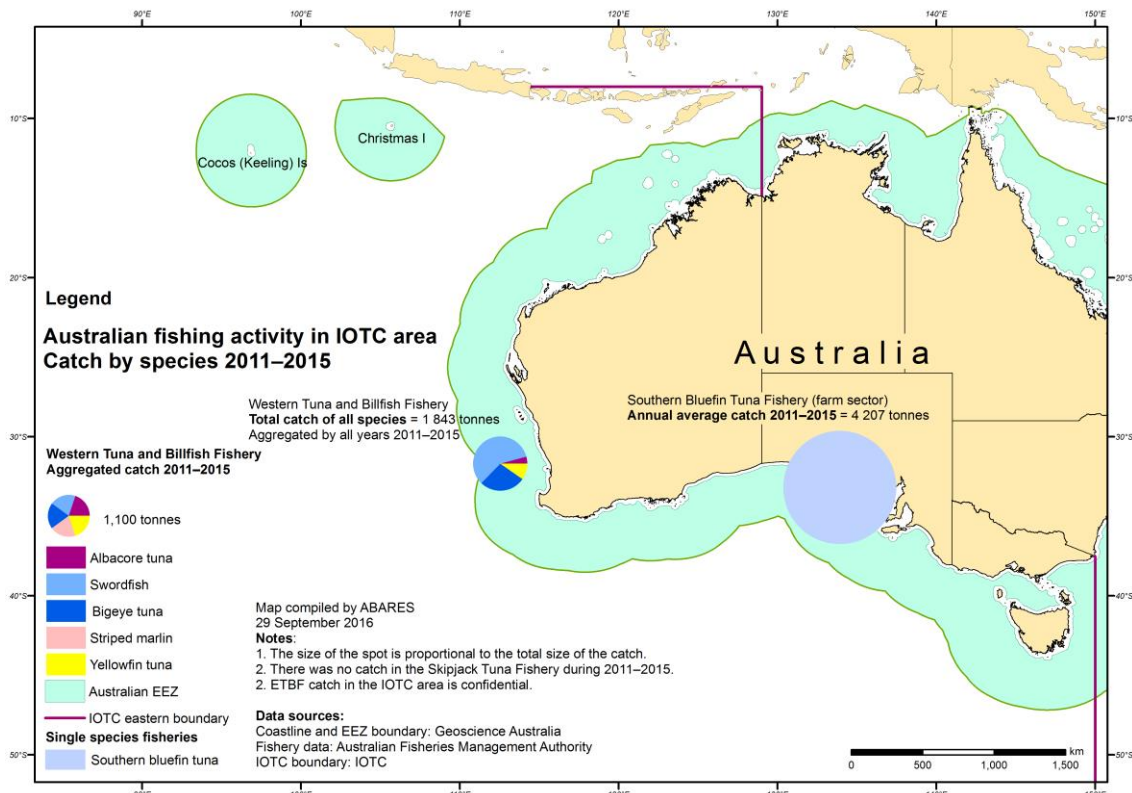


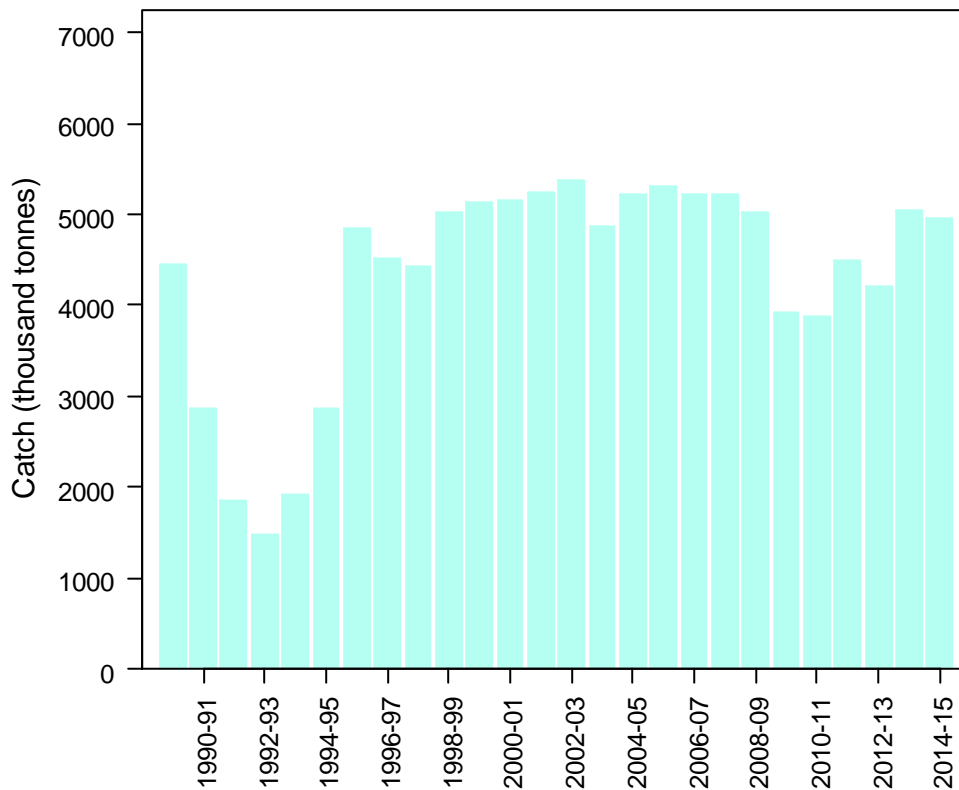
Figure 3b Distribution of catch in the Western Tuna and Billfish Fishery (WTBF; longline), Eastern Tuna and Billfish Fishery (ETBF; longline) and in the Southern Bluefin Tuna Fishery (purse seine) for 2011–2015



Purse seine fleet

Purse seine fishing operations by Australian vessels in the IOTC Area of Competence are dominated by targeting of SBT in the Great Australian Bight for grow-out in farm cages at Port Lincoln, South Australia. Effort in the purse-seine sector decreased from 154 sets in 2014–15 to 124 sets in the 2015–16 season (Table 2b). The actual catch of SBT taken in the purse seine fishery (derived from catch disposal data) in 2015 was 5252 t, while the actual catch for the 2014–15 fishing season (1 December 2014 to 30 November 2015) was 4947 t (Table 2b; Figure 4). In the 2015–16 fishing season (1 December 2015 to 30 November 2016), the actual catch taken was 4896 t (pending any further catch in November 2016; Table 2b). Distribution of the catch in the SBTf is shown for 2015 in Figure 3a and for 2011–15 in Figure 3b. In some fishing seasons, purse seine vessels also target skipjack tuna (*Katsuwonus pelamis*) late in the SBT season. There was no skipjack catch in 2015.

Figure 4 Fishing season catches of southern bluefin tuna in the purse seine sector of the SBTf, 1989–90 to 2014–15



Multi-purpose fleets

The multi-purpose fisheries (dropline, gillnet, minor line, trawl and troll) typically target different species (e.g. Spanish mackerel) compared to the longline fishery. In 2015, total tuna catch for gillnet, troll and line (mainly handline) from state-managed Western Australian fisheries decreased from 2014 (Tables 2c, 2d). In the Commonwealth-managed WTBF, three vessels (one trolling vessel and two vessels using handline) operated in the IOTC Area of Competence in 2015. These vessels caught 7.7 t of longtail tuna, less than 0.1 t of bigeye tuna, 1.0 t southern bluefin tuna and no albacore or skipjack tuna.

Table 2a Total numbers of Australian longline vessels, hooks set and total catch (tonnes live weight) of the five main tuna and billfish species taken by those vessels operating in the IOTC Area of Competence from 1998 to 2015

Calendar year	Vessel number	Hooks set (thousands)	Albacore	Bigeye tuna	Yellowfin tuna	Swordfish	Striped marlin	NEI^a	Total catch
1998	37	1807	25.1	161.1	231.3	238.3	8.8	196.7	1031.4
1999	49	4031	29.2	411.6	406.2	1013.7	22.6	154.1	2586.0
2000	61	6246	30.9	436.2	429.1	1690.5	1.7	42.5	2726.5
2001	45	6175	93.9	386.0	557.5	2135.7	0.0	118.5	4702.4
2002	44	5956	72.1	419.5	355.2	2004.8	0.7	14.2	2866.3
2003	36	4000	65.7	205.5	191.3	1184.0	0.2	100.7	2526.3
2004	22	1593	26.6	90.9	152.3	370.0	0.4	46.9	1300.7
2005	6	773	7.3	31.3	35.9	301.4	4.1	12.3	380.6
2006	4	718	10.6	58.7	37.3	311.2	4.5	14.1	436.4
2007	3	738	12.1	69.1	29.3	281.2	1.6	15.3	404.1
2008	5	237	10.3	26.6	1.2	142.2	0.5	10.5	191.0
2009	4	529	19.9	61.7	11.7	349.3	0.3	11.3	454.3
2010	4	622	18.7	65.3	21.9	349.4	0.5	4.8	460.5
2011	2	360	5.8	50.0	14.1	189.9	0.7	1.4	261.9
2012	4	672	13.1	167.4	23.0	209.3	2.5	1.6	417.3
2013	4	610	14.6	90.6	40.5	203.5	2.0	1.0	352.2
2014	4	449	16.6	75.3	19.0	211.6	0.6	5.4	328.6
2015	7	430	19.3	94.3	72.6	200.6	1.5	3.9	392.3

^a NEI denotes species that are 'not elsewhere indicated'

Table 2b Purse seine effort and catch (tonnes live weight) of southern bluefin tuna (by fishing season) and skipjack tuna (by calendar year) by Australian vessels fishing in the IOTC Area of Competence

Southern bluefin tuna					Skipjack tuna			
Fishing season	Search hours	No. of sets	Estimated catch ^a	Actual catch	Calendar year	Estimated catch	Actual catch	Estimated catch
1994–95	526	104	2179	2009	1995	n/a	1840	n/a
1995–96	631	89	2859	3442	1996	n/a	3121	n/a
1996–97	769	118	3134	2505	1997	n/a	2998	n/a
1997–98	671	143	3916	3629	1998	3290	3584	n/a
1998–99	972	129	4418	4991	1999	5120	5325	n/a
1999–00	764	107	4746	5131	2000	4616	5132	n/a
2000–01	799	129	5100	5162	2001	5319	4767	1039
2001–02	1309	159	5400	5234	2002	4920	4683	1144
2002–03	1276	150	5188	5375	2003	5587	5792	<1
2003–04	1202	160	5299	4874	2004	5178	4834	30
2004–05	1168	139	5225	5215	2005	5330	5210	<1
2005–06	1304	156	5463	5302	2006	5852	5629	446
2006–07	1459	160	5091	5230	2007	4822	4809	4
2007–08	1217	134	4530	5211	2008	4431	5010	877
2008–09	1156	139	4348	5015	2009	4316	4884	855
2009–10	417	78	3323	3931	2010	3660	4039	0 ^b
2010–11	835	106	3840	3872	2011	3909	4114	0 ^b
2011–12	1150	156	4328	4485	2012	4423	4444	<1
2012–13	1021	110	4039	4198	2013	4210	4561	<1
2013–14	752	101	4381	5039	2014	3649	4168	0
2014–15	1016	154	4789	4950	2015	4789	5252	<1
2015–16 ^c	1317	124	4826	4896	2016	n/a	n/a	n/a

^a Note that estimated catch is derived from logbook data while actual catch is derived from catch disposal data

^b Note that there was no effort in the Skipjack Tuna Fishery since 2008–109

^c Note that the catch data provided for 2015–16 is preliminary as the SBTf season does not conclude until 30 November 2016

n/a = data not available

Table 2c Numbers of fishing vessels and catch of tuna and tuna-like species (tonnes live weight) in Western Australian state fisheries by method

Year	Dropline		Gillnet		Line ^a		Trawl		Troll	
	Catch (t)	Vessels	Catch (t)	Vessels	Catch (t)	Vessels	Catch (t)	Vessels	Catch (t)	Vessels
2004	0.6	7	2.7	9	36.8	46	3.4	14	435.1	34
2005	0.04	6	2.6	8	46.3	30	5.0	4	310.4	22
2006	n/a	n/a	0.9	6	10.6 ^b	30	23.4	10	283.6	18
2007	0.1	5	1.2	8	23.6	24	n/a	n/a	317.8	18
2008	n/a	n/a	5.0	9	12.6	22	n/a	n/a	333.6	26
2009	n/a	n/a	1.3	7	12.0	18	n/a	n/a	285.6	16
2010	n/a	n/a	0.8	6	27.1	13	n/a	n/a	269.4	15
2011	n/a	n/a	1.1	6	14.7	14	n/a	n/a	285.5	17
2012	n/a	n/a	1.5	6	16.4	17	n/a	n/a	316.4	17
2013	n/a	n/a	0.2	6	11.9	16	n/a	n/a	300.5	25
2014	n/a	n/a	0.3	6	41.6	18	n/a	n/a	299.6	26
2015	n/a	n/a	0.4	7	36.3	17	n/a	n/a	285.1	27

^a Line consists mainly of handline

^b Total includes dropline catches for this year as individual method data could not be presented because of state jurisdictional confidentiality reasons (i.e. <5 active vessels using each method)

n/a = data not available

Table 2d Catch of tuna and tuna-like species in Western Australian state fisheries, by species and method, for 2014 and 2015

Year	Species Common name	Scientific name	Gillnet	Live weight (kg)		
				Line ^a	Trolling	Total
2014	Australia bonito	<i>Sarda australis</i>	5	647	12 995	13 647
	mackerel, grey	<i>Scomberomorus semifasciatus</i>	n/a	1 050	2 444	3 494
	mackerel, shark	<i>Grammatorcynus bicarinatus</i>	n/a	n/a	95	95
	mackerel, Spanish	<i>Scomberomorus commerson</i>	n/a	39 076	282 999	322 075
	mackerel, spotted	<i>Scomberomorus munroi</i>	n/a	520	159	679
	mackerels, general	<i>Scombridae</i>	8	n/a	40	48
	tuna, bigeye	<i>Thunnus obesus</i>	n/a	36	n/a	36
	tuna, northern bluefin	<i>Thunnus orientalis</i>	n/a	n/a	n/a	n/a
	tuna, longtail	<i>Thunnus tonggol</i>	28	n/a	247	275
	tuna, mackerel	<i>Euthynnus affinis</i>	n/a	10	10	20
	tuna, other	<i>Scombridae</i>	213	162	n/a	375
	tuna, skipjack	<i>Katsuwonus pelamis</i>	n/a	n/a	49	49
	tuna, yellowfin	<i>Thunnus albacares</i>	35	112	254	401
	wahoo	<i>Acanthocybium solandri</i>	n/a	n/a	335	335
	TOTAL			289	41 612	299 627

Table 2d (cont.) Catch of tuna and tuna-like species in Western Australian state fisheries, by method and species, for 2014 and 2015

Year	Species Common name	Scientific name	Gillnet	Live weight (kg)		
				Line ^a	Trolling	Total
2015	Australia bonito	<i>Sarda australis</i>	<500	<500	11 907	12 010
	mackerel, grey	<i>Scomberomorus semifasciatus</i>	<500	<1000	6 018	6 753
	mackerel, shark	<i>Grammatorcynus bicarinatus</i>	<500		<500	52
	mackerel, Spanish	<i>Scomberomorus commerson</i>	<500	35 244	266 462	301 724
	mackerel, spotted	<i>Scomberomorus munroi</i>			8	8
	mackerels, general	<i>Scombridae</i>	<500			<500
	tuna, bigeye	<i>Thunnus obesus</i>	<500	<500		36
	tuna, northern bluefin	<i>Thunnus orientalis</i>				
	tuna, longtail	<i>Thunnus tonggol</i>			178	178
	tuna, mackerel	<i>Euthynnus affinis</i>			<500	<500
	tuna, other	<i>Scombridae</i>	<500	<500	<500	202
	tuna, skipjack	<i>Katsuwonus pelamis</i>		<500	78	<500
	tuna, yellowfin	<i>Thunnus albacares</i>	<500	115	<500	437
	wahoo	<i>Acanthocybium solandri</i>			202	202
		TOTAL		409	36 179	285 058

^a Line consists mainly of handline

n/a = data not available

4 Recreational fishery

Recreational fishing is undertaken in Australian states and the Northern Territory. The Western Australian recreational gamefish fishery targets sailfish (*Istiophorus platypterus*), black marlin (*Makaira indica*) and yellowfin tuna, with blue marlin (*Makaira mazara*) and striped marlin caught on occasions. There is a daily bag limit of one billfish (sailfish and marlins combined) in Western Australia but the majority of sailfish and marlins are tagged and released alive. There is also a combined daily bag limit of two fish for yellowfin tuna and SBT. In South Australia, Victoria and Tasmania, gamefishers mainly target albacore, skipjack tuna and SBT. Daily bag limits or possession limits also apply in those states. Estimates of total recreational catch for tuna and tuna-like species in Australia are currently not collected.

5 Ecosystem and bycatch issues

In Australia, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary legislation that covers environmental issues, including the ecologically sustainable use of marine resources. The EPBC Act requires that:

- all Commonwealth and State/Northern Territory wild capture marine fisheries with an export component be assessed to determine the extent to which management arrangements will ensure each fishery is being managed in an ecologically sustainable way;
- all Commonwealth fisheries are also assessed to determine the impact of actions taken under a fishery management plan on matters of national environmental significance; and
- all Commonwealth fisheries and any State/Northern Territory-managed fisheries that operate in Commonwealth waters must also be assessed to determine the impacts of fishing operations on cetaceans, listed threatened species and ecological communities, migratory species and listed marine species under the EPBC Act.

The assessments consider the impacts of the fishery on target and non-target species caught and the impacts of fishing on the broader marine environment. Initial and subsequent assessments have been completed for the WTBF, ETBF, SJF and SBTF, and continue to guide the development of improved management arrangements to reduce the ecological impacts of Australian tuna and billfish fisheries (see <http://environment.gov.au/coasts/fisheries/commonwealth/index.html>).

Measures to reduce the ecological impacts of these fisheries rely initially on the analysis of fishery-dependent and -independent data collected through observer programs, logbooks and targeted research activities. As data are collected and the impacts of fishing operations on ecologically related species become clearer, strategies to reduce these impacts continue to be developed and refined.

In this context, Australia has:

- continued to use catch and effort logbooks to collect data on the catch of target and non-target species
- introduced and maintained observer programs in the WTBF, ETBF, SJF and SBTF, which include specific reporting requirements for threatened, endangered and protected (TEP) species
- initiated a range of at-sea programs to trial strategies to reduce the incidental mortality of seabirds caught during longlining operations (e.g. increasing line sink rates)
- introduced detailed strategies to reduce bycatch and impacts on ecologically related species, performance measures to monitor progress, and reporting and review targets to assess the effectiveness of these strategies, and refine them where necessary. An important part of these strategies is the development of fishing industry codes of practice to reduce impacts on ecologically related species (see below).

AFMA has carried out an Ecological Risk Assessment (ERA) for each of its fisheries. AFMA's Ecological Risk Management (ERM) process responds to the ERAs for major fisheries managed by the Australian Government and develops a framework for future risk assessments as additional information becomes available. The ERA/ERM framework aims to inform government agencies and stakeholders of priorities for research, data collection, monitoring and management, and ensure there is a high level of confidence in verifiable results. For more

information on the ERM framework see: <http://www.afma.gov.au/wp-content/uploads/2010/06/Ecological-Risk-Management-Further-Information.pdf>

The ERAs rely on existing biological and catch information and consider five ecosystem components: target species, byproduct and bycatch species, TEP species, habitats, and communities. The assessments categorise various species as being at high, medium or low relative risk on the basis of a range of factors, including their susceptibility to capture by the various fishing methods, their distribution, and the ability for populations to recover from fisheries impacts. The aim of the ERA process is to help prioritise research, data collection and monitoring needs and management actions for fisheries, and ensure that they are managed both sustainably and efficiently. There are three levels at which an ERA may be conducted: Level 1 (Scoping); Level 2 (Productivity and Susceptibility Assessment); Level 3 (Sustainability Assessment for Fishing Effects).

AFMA, in conjunction with the Commonwealth Scientific and Industrial Research Organisation (CSIRO), has completed ERAs for the WTBF (Webb et al. 2007a, AFMA 2009e, Zhou et al. 2009, AFMA 2010b), ETBF (Webb et al. 2007b, AFMA 2009a), SBTf (Hobday et al. 2007, AFMA 2009b, Zhou et al. 2009) and SJF (Daley et al. 2007, Zhou et al. 2009, AFMA 2010a). These reports are available at: (<http://www.afma.gov.au/managing-our-fisheries/environment-and-sustainability/Ecological-Risk-Management/>).

Western Tuna and Billfish Fishery

The ERA examined 187 species in the WTBF (38 chondrichthyans and 149 teleosts), none of which were classified as at risk of potential overfishing, based on the Level 3 analysis (Zhou et al. 2009). However, an increase in fishing effort could potentially move some species into a higher risk category, particularly sharks that are more vulnerable to fishing pressure. Therefore, a priority action identified in the WTBF ERM report (AFMA 2010b) is to monitor the catch and interaction level with sharks. Management of shark interactions in this fishery will be reviewed if the landed amount of any one species exceeds 50 t within a year (AFMA 2010b). Given the connectivity of highly migratory fish stocks beyond the EEZ, the ERM response may need to take into account broader Indian Ocean issues in the future.

A summary of priority issues for managing the ecological effects of fishing in the WTBF, arising from the three levels of ERA, is described in AFMA (2010b), and available at: <http://www.afma.gov.au/managing-our-fisheries/environment-and-sustainability/Ecological-Risk-Management/>.

Eastern Tuna and Billfish Fishery

AFMA, in conjunction with the CSIRO, has undertaken three levels of ecological risk assessment (ERA) for the ETBF (Webb et al. 2007b, AFMA 2009c, Zhou et al. 2009). A total of 390 species were initially assessed in the ERA process (Webb et al. 2007b). After a Level 3 assessment for fish species only, three shark species (crocodile shark, longfin mako and pelagic thresher) were identified as being at high risk due to the effects of fishing in the ETBF (Zhou et al. 2007). The priority of the management response is to reduce interactions with TEP species (AFMA 2009a). The ETBF ERM report also aims to decrease the capture and mortality of sharks.

A summary of priority issues for managing the ecological effects of fishing in the ETBF, arising from the three levels of ecological risk assessment is described in AFMA (2009a), and available at: http://afma.gov.au/environment/eco_based/eras/docs/ETBF_ERM_May09.pdf.

Southern Bluefin Tuna Fishery

The Level 2 assessment indicated that only two species, of the 193 assessed, were considered to be at high risk: SBT and white shark (Hobday et al. 2007). A Level 3 assessment was also conducted on 83 non-target species (6 chondrichthyans and 77 teleosts) to determine the impact of SBT fishing on these species (AFMA 2009d). It was determined that the risk to these non-target species was low (Zhou et al. 2009).

A summary of priority issues for managing the ecological effects of fishing in the SBTF arising from the three levels of ERA, including monitoring interactions with threatened species, is described in AFMA (2009b), and available at: http://www.afma.gov.au/wp-content/uploads/2010/06/sbt_erm.pdf

Skipjack Tuna Fishery

For the Level 2 assessment 328 species were assessed. After the residual risk assessment was applied, 25 species, mostly TEP species, were deemed to be at high risk. However, after the Level 3 assessment no species was assessed as high risk (Daley et al. 2007, Zhou et al. 2009, AFMA 2010a).

Ecological risk management for the SJTF is designed to achieve an adequate level of monitoring to establish the level of interaction that may occur if effort increases and to quantify the effect that the fishery is having on the species identified as being at high risk from the effects of fishing (AFMA 2010a).

Bycatch and discard work plan

In response to bycatch issues, AFMA has formulated a Bycatch and Discard Work Plan for both the WTBF and ETBF (AFMA 2008). The work plan outlines a series of measures to improve the monitoring of, and reduce fishery impacts on, the bycatch species identified in the ERA process as being at high risk from fishing operations. AFMA has reviewed the Bycatch and Discard Workplan, which commenced in 2008, and an updated plan for 2014–2016 commenced in 2014 (AFMA 2014) and can be found at: <http://www.afma.gov.au/wp-content/uploads/2010/06/ATB-Bycatch-and-Discarding-Workplan-2014-2016-FINAL.pdf>

Sharks

NPOA-Sharks

Australia's National Plan of Action for Conservation and Management of Sharks (NPOA-Sharks), first released in 2004, was reviewed and revised in July 2012 (Shark-plan 2) (DAFF 2012). It is currently under review again. Consistent with the International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks), Shark-plan 2 incorporates scientific information and issues identified in the 2009 Shark Assessment Report (Bensley et al. 2010). Shark-plan 2 aims to coordinate action on shark conservation and management by prioritising issues and identifying actions to address them. A copy of Shark-plan 2 can be found at: <http://www.daff.gov.au/fisheries/environment/sharks/sharkplan2>

Shark catch and finning regulation

The Australian Commonwealth prohibits the possession or landing of fins separate from shark carcasses. There is a landing limit of 20 sharks per longline vessel per fishing trip, and a ban on wire traces in order to decrease the likelihood of retaining shark. Longline vessels undertaking

single jurisdiction high seas trips may apply for a permit to retain 100 sharks per fishing trip, of which only 80 can be blue sharks.

Shortfin mako, longfin mako and porbeagle sharks were listed under the Convention on Migratory Species (CMS) in 2008, which triggered a mandatory legal obligation to list them for protection under the EPBC Act. Listing under the EPBC Act came into effect on 29 January 2010. As a consequence, in February 2010 all Australian fisheries that interact with these species in Commonwealth waters were assessed under the EPBC Act. The management arrangements for each fishery were reaccredited on the basis that the arrangements in place required all reasonable steps to be taken to ensure that shortfin and longfin makos and porbeagles are not killed or injured as a result of fishing activities. These species may be retained in accredited fisheries if the sharks have come onboard dead. Live caught specimens must be released unharmed and fishers are required to report interactions. Australia requires all tuna longline vessels to carry line cutters and de-hookers to ensure the safe release of shark and turtle species in the water, which may help improve their chances of survival.

A number of species for which Australia is a range state were added to Appendix I and/or II of the Convention on the Conservation of Migratory Species (CMS) at its 11th Conference of Parties in November 2014. Following the completion of our domestic processes, the following species were included in the list of migratory species under the *Environment Protection and Biodiversity Conservation Act 1999*:

- *Anoxypristis cuspidata* (narrow sawfish)
- *Pristis clavata* (dwarf sawfish)
- *Pristis zijsron* (green sawfish)
- *Pristis pristis* (largetooth sawfish)
- *Carcharhinus falciformis* (silky shark)
- *Manta alfredi* (reef manta ray)
- *Mobula eregoodootenkee* (pygmy devil ray)
- *Mobula japanica* (Japanese devil ray)
- *Mobula thurstoni* (bentfin devil ray)

As listed migratory species, it is now an offence to kill, injure, take, trade, keep or move these species in Commonwealth waters. Any interactions with the above species in Commonwealth waters will also need to be reported, as is currently the case with other protected species such as dugongs and whale sharks. Further information on reporting requirements can be found at:

<http://www.environment.gov.au/biodiversity/threatened/listed-species-and-ecological-communities-notification>

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II listing of the oceanic white tip, porbeagle and the smooth, scalloped and great hammerhead sharks, and the giant and reef manta rays, came into effect on 14 September 2014. CITES Appendix II designates species that may not be threatened with extinction, but require trade to be regulated to ensure their ongoing survival in the wild.

International trade in the listed species from each CITES Party must be underpinned by an assessment of sustainability, known as a non-detriment finding. Australia has made this assessment for all domestic fisheries interacting with these shark species, and determined

appropriate harvest levels for the three hammerhead sharks (<https://www.environment.gov.au/biodiversity/wildlife-trade/publications/non-detriment-finding-five-shark-species>). This underpins CITES export permits for these species. Oceanic white tip sharks and porbeagles are not permitted to be harvested for export from Australia, and there is no commercial take in Australian fisheries of the listed manta ray species.

Interactions

Western Tuna and Billfish Fishery

Total interactions by the Commonwealth Australian longline fleet with shark species in the IOTC Area of Competence are provided in Tables 3a, 3b and 4. In 2015, 10 individual sharks were landed (Table 3a) weighing less than 1 t (Table 3b), while 5553 individuals were discarded/released (Table 4). No information is currently available from logbooks on the life status of discarded/released sharks, other than those considered to be threatened species under the EPBC Act. In 2015, observer data recorded 264 sharks captured in the IOTC area (mainly in the WTBF), mainly crocodile sharks and blue sharks. Of these sharks, 15 were dead, 52 were released alive and the life status of 197 was undetermined.

Eastern Tuna and Billfish Fishery

As very little effort from the ETBF has occurred in the IOTC Area of Competence in recent years, a full description of shark interactions is not provided here, but can be found in Australia's national report to the Western and Central Pacific Fisheries Commission (WCPFC; Patterson et al. 2016).

Southern Bluefin Tuna Fishery

No interactions with sharks were reported by observers in the IOTC Area of Competence relevant to the SBTF in 2015. All interactions with ecologically related species are reported to the Commission for the Conservation of Southern Bluefin Tuna (CCSBT; Patterson et al. 2015).

Minor line fisheries

Other fisheries in Western Australia use a variety of minor line gear types (e.g. Tables 2c, 2d) which take small incidental catches of tuna and tuna-like species. No data is available on the interaction of these minor line fisheries with sharks. However, given the nature of the fishing and the small catches in these fisheries, they likely have negligible impacts on shark populations.

Table 3a Total number of sharks, by species, retained by Australian longline vessels in the IOTC Area of Competence from 2007 to 2015 (source: AFMA logbook data)

Common name	Scientific name	2007	2008	2009	2010	2011	2012	2013	2014	2015
Blacktip shark	<i>Carcharhinus</i> spp.	2	0	0	0	0	0	0	0	0
Blue shark	<i>Prionace glauca</i>	612	309	366	148	2	2	0	0	0
Bronze whaler	<i>Carcharhinus brachyurus</i>	0	0	0	0	0	1	0	0	0
Cookie-cutter shark	<i>Isistius brasiliensis</i>	0	0	0	0	0	0	0	0	0
Crocodile shark	<i>Pseudocarcharias kamoharai</i>	6	0	51	105	0	16	20	0	10
Dusky shark	<i>Carcharhinus obscurus</i>	0	0	0	0	0	0	0	0	0
Hammerhead	<i>Sphyrna</i> spp.	0	0	0	0	13	0	3	0	0
Oceanic whitetip	<i>Carcharhinus longimanus</i>	14	24	11	7	11	10	1	0	0
Porbeagle	<i>Lamna nasus</i>	2	9	0	3	0	0	0	0	0
Roughskin shark	<i>Centroscymnus</i> spp.; <i>Deania</i> spp.	0	0	0	0	0	0	0	0	0
Sandbar shark	<i>Carcharhinus plumbeus</i>	0	0	0	0	0	0	0	0	0
Scalloped hammerhead	<i>Sphyrna lewini</i>	0	0	0	0	0	0	0	0	0
Shortfin mako	<i>Isurus oxyrinchus</i>	21	8	16	20	43	6	34	73	0
Longfin mako	<i>Isurus paucus</i>	0	0	0	0	0	0	0	0	0
Silky shark	<i>Carcharhinus falciformis</i>	0	0	1	0	0	0	0	0	0
Smooth hammerhead	<i>Sphyrna zygaena</i>	0	0	0	0	0	0	0	0	0
Thresher shark	<i>Alopias vulpinus</i>	1	0	1	1	0	0	0	0	0
Tiger shark	<i>Galeocerdo cuvier</i>	0	2	0	0	0	0	0	0	0
Shark - other	-	0	0	0	0	0	0	0	0	0
TOTAL		658	352	446	284	69	35	58	73	10

Table 3b Total weight (tonnes trunked weight) of shark species retained by Australian longline vessels in the IOTC Area of Competence from 2007 to 2015 (source: AFMA logbook data)

Common name	Scientific name	2007	2008	2009	2010	2011	2012	2013	2014	2015
Blacktip shark	<i>Carcharhinus</i> spp.	0.05	0	0	0	0	0	0	0	0
Blue shark	<i>Prionace glauca</i>	15.1	9.2	10.2	3.9	0.04	0.05	0	0	0
Bronze whaler	<i>Carcharhinus brachyurus</i>	0	0	0	0	0	0.02	0	0	0
Cookie-cutter shark	<i>Isistius brasiliensis</i>	0	0	0	0	0	0	0	0	0
Crocodile shark	<i>Pseudocarcharias kamoharai</i>	0.03	0	0.1	0.3	0	0.03	0.04	0	0.03
Dusky shark	<i>Carcharhinus obscurus</i>	0	0	0	0	0	0	0	0	0
Hammerhead	<i>Sphyrna</i> spp.	0	0	0	0	0.2	0	0.04	0	0
Oceanic whitetip	<i>Carcharhinus longimanus</i>	0.3	0.7	0.3	0.1	0.2	0.3	0.02	0	0
Porbeagle	<i>Lamna nasus</i>	0.06	0.2	0	0.05	0	0	0	0	0
Roughskin shark	<i>Centroscymnus</i> spp.; <i>Deania</i> spp.	0	0	0	0	0	0	0	0	0
Sandbar shark	<i>Carcharhinus plumbeus</i>	0	0	0	0	0	0	0	0	0
Scalloped hammerhead	<i>Sphyrna lewini</i>	0	0	0	0	0	0	0	0	0
Shortfin mako	<i>Isurus oxyrinchus</i>	0.6	0.2	0.2	0.4	0.6	0.1	0.5	1.5	0
Longfin mako	<i>Isurus paucus</i>	0	0	0	0	0	0	0	0	0
Silky shark	<i>Carcharhinus falciformis</i>	0	0	0.04	0	0	0	0	0	0
Smooth hammerhead	<i>Sphyrna zygaena</i>	0	0	0	0	0	0	0	0	0
Thresher shark	<i>Alopias vulpinus</i>	0.03	0	0.04	0.03	0	0	0	0	0
Tiger shark	<i>Galeocerdo cuvier</i>	0	0	0	0	0	0	0	0	0
Shark - other	-	0	0	0	0	0	0	0	0	0
TOTAL		16.2	10.3	10.9	4.8	1.1	0.5	0.6	1.5	0.03

Table 4 Total number of sharks, by species, released/discarded by Australian longline vessels in the IOTC Area of Competence from 2007 to 2015 (source: AFMA logbook data)

Common name	Scientific name	2007	2008	2009	2010	2011	2012	2013	2014	2015
Blacktip shark	<i>Carcharhinus</i> spp.	0	0	0	0	0	0	0	0	0
Blue shark	<i>Prionace glauca</i>	7 213	4 044	8 596	7 073	5 148	5 315	3 333	3 273	2 315
Bronze whaler	<i>Carcharhinus brachyurus</i>	14	3	2	0	1	39	27	106	11
Cookie-cutter shark	<i>Isistius brasiliensis</i>	0	0	0	0	0	0	0	1	1
Crocodile shark	<i>Pseudocarcharias kamoharai</i>	3 650	900	4 651	5 861	7 167	4 880	2 118	2 911	2 716
Dusky shark	<i>Carcharhinus obscurus</i>	0	0	0	0	0	1	0	11	0
Hammerhead	<i>Sphyrna</i> spp.	79	32	3	2	6	96	7	39	91
Oceanic whitetip	<i>Carcharhinus longimanus</i>	85	19	66	171	51	131	12	14	11
Porbeagle	<i>Lamna nasus</i>	2	0	0	0	0	0	0	7	3
Roughskin shark	<i>Centroscymnus</i> spp.; <i>Deania</i> spp.	0	0	0	0	0	0	0	0	0
Sandbar shark	<i>Carcharhinus plumbeus</i>	0	0	0	0	0	1	2	0	0
Scalloped hammerhead	<i>Sphyrna lewini</i>	0	0	0	0	0	0	0	0	0
Shortfin mako	<i>Isurus oxyrinchus</i>	356	50	575	756	525	758	290	238	361
Longfin mako	<i>Isurus paucus</i>	0	0	0	0	0	3	1	0	0
Silky shark	<i>Carcharhinus falciformis</i>	0	0	0	0	0	0	0	0	0
Smooth hammerhead	<i>Sphyrna zygaena</i>	0	0	0	0	0	0	0	0	0
Thresher shark	<i>Alopias vulpinus</i>	0	4	1	1	4	14	84	19	32
Tiger shark	<i>Galeocerdo cuvier</i>	131	0	0	0	0	1	1	2	8
Shark - other	-	0	0	0	0	0	132	0	0	4
TOTAL		11 530	5 052	13 894	13 864	12 902	11 371	5 875	6 621	5 553

Seabirds

Seabirds are opportunistic feeders and are attracted to longline vessels, particularly during line setting, but also during line hauling, when the seabirds are at risk of being caught or entangled in the fishing gear. Seabirds are also attracted to discarded offal and are at risk of ingesting discarded hooks still attached to discarded baits. The design of purse-seine nets and the way this fishing gear is deployed, means that the risk of seabird bycatch during purse seine fishing operations is low.

Threat Abatement Plan

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 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 2014 for the incidental catch (or bycatch) of seabirds during longline fishing operations*, made on 14 August 2014 (Commonwealth of Australia 2014). The ultimate aim of this plan is to achieve zero bycatch of seabirds from longline fishing in Commonwealth fisheries. The plan is subject to review within five years. Copies of this plan may be obtained from the Australian Antarctic Division of the Department of the Environment and Energy:

<http://www.antarctica.gov.au/science/southern-ocean-ecosystems-environmental-change-and-conservation/southern-ocean-fisheries/seabird-bycatch/threat-abatement-plan-seabirds>

Considerable progress has been made under successive threat abatement plans to reduce the impact of pelagic longlining on seabirds (Commonwealth of Australia 2014). The incidental bycatch rates for several fisheries are well below 0.01 or 0.05 birds per 1000 hooks, which are the maximum permissible levels set as performance criteria for different fisheries under the current plan, and which apply to individual fishing seasons and fishing areas, as relevant. This reduction in bycatch rates 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 the current 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 pelagic longline fishing developed under the *Agreement on the Conservation of Albatrosses and Petrels* (ACAP). 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 night setting (in certain instances). These mitigation measures form the basis of the prescriptions set out in this threat abatement plan.

Threat abatement plans must specify actions needed to achieve their objective. Under the current plan:

- AFMA will require all pelagic longline tuna fishers operating within either the ETBF or WTBF, 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 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;
 - 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 exclusion devices and/or managing offal discharge during line hauling, night setting, and area closures).
- 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.
- AFMA will implement an appropriate management response if identified circumstances 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.
- Require that seabird bycatch in all fishing areas and seasons in the ETBF and WTBF is less than 0.05 birds per 1000 hooks.
- Areas within the ETBF or WTBF south of the parallel of 25 degrees South are divided for the purposes of the above bycatch rate criteria into five degree latitudinal bands. Seasons are defined, for the purposes of the criteria, into two: summer 1 September – 30 April, and winter 1 May – 31 August.

NPOA-Seabirds

Australia is developing a National Plan of Action minimising the incidental catch of seabirds in Australian capture fisheries (NPOA) to address the potential risk posed to seabirds by other fishing methods, including longline fishing in state and territory waters, which are not covered by the current threat abatement plan. The NPOA will apply to all commercial, recreational and Indigenous capture fisheries within Australian jurisdiction, as well as to fishing undertaken by Australian-flagged fishing vessels on the high seas including areas governed by regional fisheries and conservation bodies. Currently, data about the risks to seabird populations from other fishing methods not covered by the threat abatement plan are limited. Inshore areas are however, proximate to a range of coastal and offshore island breeding sites and seabird foraging activity and intensity is high during the austral summer, particularly during daylight hours. The NPOA will complement the FAO's best practice technical guidelines for member countries to use when drafting NPOAs, which recommends fishing methods apart from longline (particularly gillnet and trawl) be assessed for risk, and mitigation methods be developed and prescribed when drafting an NPOA. The Australian Government is investigating sources of seabird mortality

from other fishing practices, including trawl, gillnet and purse seine fishing, with a view to developing an appropriate response to mitigate the effects of these practices on seabird species.

Recovery Plan

A *National Recovery Plan for threatened albatrosses and giant petrels* in Australia has been in place since 2001, with the current recovery plan adopted in 2011. A copy of the current recovery plan may be obtained from the Department of the Environment and Energy: <http://www.environment.gov.au/biodiversity/threatened/publications/recovery/albatrosses-and-giant-petrels.html>. The recovery plan's objective is to ensure the long-term survival and recovery of albatross and giant petrel populations breeding and foraging in Australian jurisdiction. 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. The recovery plans also collect specific data on population trends of those threatened species found breeding in Australia. A five-year review of the recovery plan was completed in early 2016.

Mitigation measures

The mitigation measures required in the WTBF are detailed in Appendix B and include the use of weighted lines and tori lines when fishing south of 25°S, where all seven vessels fished in 2015; 100 per cent of vessels used these methods in 2015. This requirement is the same in the ETBF. Of the sets done in the IOTC area in 2015, 79 per cent were at night.

Interactions

Western Tuna and Billfish Fishery

The abundance of seabirds on the west coast of Australia and the level of fishing effort for tuna-like species are considerably lower than on the east coast. In addition, the majority of the fleet in the WTBF targets swordfish and operates at night, which reduces the risk of interactions with many species of seabirds vulnerable to bycatch. While observer data are only available for recent years, when fishing activity has been very low, the data indicate that seabird interactions are near zero and well below the limit of 0.05 seabirds per 1000 hooks prescribed by the threat abatement plan. In 2015, there were no observed interactions with seabirds and two interactions recorded in logbooks (albatross; both dead).

Eastern Tuna and Billfish Fishery

With the implementation of the original threat abatement plan in 1998, a large proportion of the ETBF longline fleet began to set their lines during the night to avoid interactions with albatross species. In doing so, they dramatically reduced the catch of albatross but increased the catch of shearwaters. Through a number of at-sea trials and the subsequent significant improvements to mitigation measures, the total catch of all seabirds in the fishery has been considerably reduced to a level below the 0.05 seabirds per 1000 hooks set, despite the widespread return to day setting. As very little effort from the ETBF has occurred in the IOTC Area of Competence in recent years, a full description of seabird interactions is not provided here, but can be found in Australia's national report to the Western and Central Pacific Fisheries Commission (WCPFC; Patterson et al. 2016).

Southern Bluefin Tuna Fishery

There are very few incidences of seabirds interacting with purse seine fishing vessels or gear in the SBTf recorded by observers. Observers did not report any seabird interactions in the purse

seine sector in 2013–14 or 2014–15. All interactions with ecologically related species are reported to the CCSBT (Patterson et al. 2015).

Marine turtles

Recovery plan

A Recovery Plan for Marine Turtles in Australia was developed, with an overall objective to reduce the detrimental impacts on Australian populations of marine turtles and hence promote their recovery in the wild. A copy of the plan can be obtained from:

<http://www.environment.gov.au/coasts/publications/turtle-recovery/index.html>.

Interactions

Western Tuna and Billfish Fishery

In the WTBF, no turtle interactions were observed in 2015. Eighteen turtle interactions were recorded in logbooks (16 leatherbacks, 1 loggerhead and 1 Pacific Ridley) with 16 released alive (2 leatherbacks were dead).

Eastern Tuna and Billfish Fishery

A full description of sea turtle interactions in the ETBF can be found in Australia's national report to the WCPFC (Patterson et al. 2016).

Southern Bluefin Tuna Fishery

Observers did not report any turtle interactions in the purse seine sector in 2013–14 or 2014–15. All interactions with ecologically related species are reported to the CCSBT (Patterson et al. 2015b).

Table 5 Observed annual estimated captures of species of special interest (seabirds, turtles and marine mammals) for the Australian longline fleet, in the IOTC Area of Competence, for 2007 to 2015 (source: AFMA scientific observer data)

Group	Common name	Scientific name	2007	2008	2009	2010	2011	2012	2013	2014	2015
Seabirds	Yellow-nosed albatross	<i>Thalassarche chlororhynchos</i>	0	0	1	0	0	0	0	0	0
	Flesh footed shearwater	<i>Puffinus carneipes</i>	0	0	1	0	0	0	0	0	0
Turtles	Loggerhead turtle	<i>Caretta caretta</i>	1	2	1	0	0	0	0	0	0
	Hawksbill turtle	<i>Eretmochelys imbricata</i>	0	0	2	0	0	0	0	1	0
	Leatherback turtle	<i>Dermochelys coriacea</i>	0	2	4	1	0	1	0	1	0
	Green turtle	<i>Chelonia mydas</i>	0	0	0	0	0	0	0	0	0
	Olive Ridley turtle	<i>Lepidochelys olivacea</i>	0	0	0	0	0	0	0	0	0
Mammals	Australian fur seal	<i>Arctocephalus pusillus doriferus</i>	0	0	0	2	0	0	0	0	0

6 National data collection and processing systems

Logbooks

Catch and effort data continues to be collected in daily fishing logbooks for the Australian longline and purse seine vessels operating in the IOTC Area of Competence. AFMA distributes, collects and processes these logbooks. Logbooks have been in place for purse seiners in the SBTF and SJF since the 1960s. Logbooks for Australian longline fisheries first began in 1986. The current Longline Daily Fishing Log, AL06 has existed since 2007. Electronic logbooks have been implemented for the ETBF and the WTBF.

Disposal of catch is monitored using catch disposal record forms for the WTBF and ETBF longline, and the SJF and SBT purse seine fisheries.

Vessel monitoring system

A Vessel Monitoring System (VMS) has been required on all boats in all Commonwealth managed-fisheries since 1 July 2007, including the WTBF, ETBF, SJF and SBTF. Compliance with VMS requirements has increased markedly since 2008, and from 1 November 2011, any vessel operator with a VMS that stops reporting could be ordered to return to port.

Observer program

Western Tuna and Billfish Fishery

In 2007, an ongoing observer program was implemented in the WTBF with a target level of observer coverage set at 5 per cent. In 2015, observer coverage was 7.1 per cent of hooks set (30 435 hooks; Table 6). This figure includes both on-board observers and e-monitoring.

Eastern Tuna and Billfish Fishery

Five vessels in the ETBF fished in the IOTC Area of Competence in 2015. As with the WTBF, these vessels were subject to on-board observers and e-monitoring. Observer coverage rates in the ETBF are reported to the WCPFC (Patterson et al. 2016).

Southern Bluefin Tuna Fishery

The ongoing target observer coverage for the SBT purse seine fleet operating out of Port Lincoln is 10 per cent of the total catch and effort for the fishery. During the 2014–15 quota year, Australian observers spent 37 days at sea. They observed purse seine activities for 17 days and tow activities for 20 days. The observers monitored 14 purse seine sets where fish were retained and no set that was aborted, representing 9.1 per cent coverage for sets where fish were retained. This equates to approximately 19.9 per cent of the total catch.

Regional observer scheme

In March 2010, the IOTC passed Resolution 10/04 on a regional observer scheme, which was superseded by Resolution 11/04, which specifies:

2. *In order to improve the collection of scientific data, at least 5% of the number of operations/sets for each gear type by the fleet of each CPC while fishing in the IOTC Area of*

Competence of 24 meters overall length and over, and under 24 meters if they fish outside their Exclusive Economic Zone (EEZ) shall be covered by this observer scheme. For vessels under 24 meters if they fish outside their EEZ, the above mentioned coverage should be achieved progressively by January 2013.

3. *When purse seiners are carrying an observer as stated in paragraph 1, this observer shall also monitor the catches at unloading to identify the composition of bigeye tuna catches. The requirement for the observer to monitor catches at unloading is not applicable to CPCs already having a sampling scheme, with at least the coverage set out in paragraph 2.*

Resolution 11/04 also sets out the following tasks for observers:

a) Record and report fishing activities, verify positions of the vessel; b) Observe and estimate catches as far as possible with a view to identifying catch composition and monitoring discards, by-catches and size frequency; c) Record the gear type, mesh size and attachments employed by the master; d) Collect information to enable the cross-checking of entries made to the logbooks (species composition and quantities, live and processed weight and location, where available); and e) Carry out such scientific work (for example, collecting samples), as requested by the IOTC Scientific Committee.

AFMA has recruited and trained observers since its establishment in 1992. Approximately 22 observers are currently employed in the AFMA observer program. They are sourced from universities and maritime industries from around Australia and must be able to live and work at sea, have demonstrated experience in collecting biological data at sea, and experience in fisheries research methodologies and collection of associated scientific data. Observers must also hold marine radio operators certificate of proficiency (or similar qualifications and/or experience), a sea safety certificate and medical certificate, and have completed an AFMA observer training course.

Recently, AFMA has introduced electronic monitoring (e-monitoring) to its longline fisheries. E-monitoring of the WTBF and ETBF became compulsory from 1 July 2015 for vessels operating within the Australian Exclusive Economic Zone. As a minimum, e-monitoring information from 10 per cent of the hauls is reviewed and used to acquit information provided in logbooks.

In 2015, a total of 430 515 longline hooks were deployed in the IOTC Area of Competence by Australian vessels. Figure 5 depicts the spatial distribution of the longline observer coverage in the IOTC Area of Competence. Note that the observer coverage of the SBTF is not included on the map as the operations are generally confined to a small spatial area in the Great Australian Bight and this information is reported to the CCSBT.

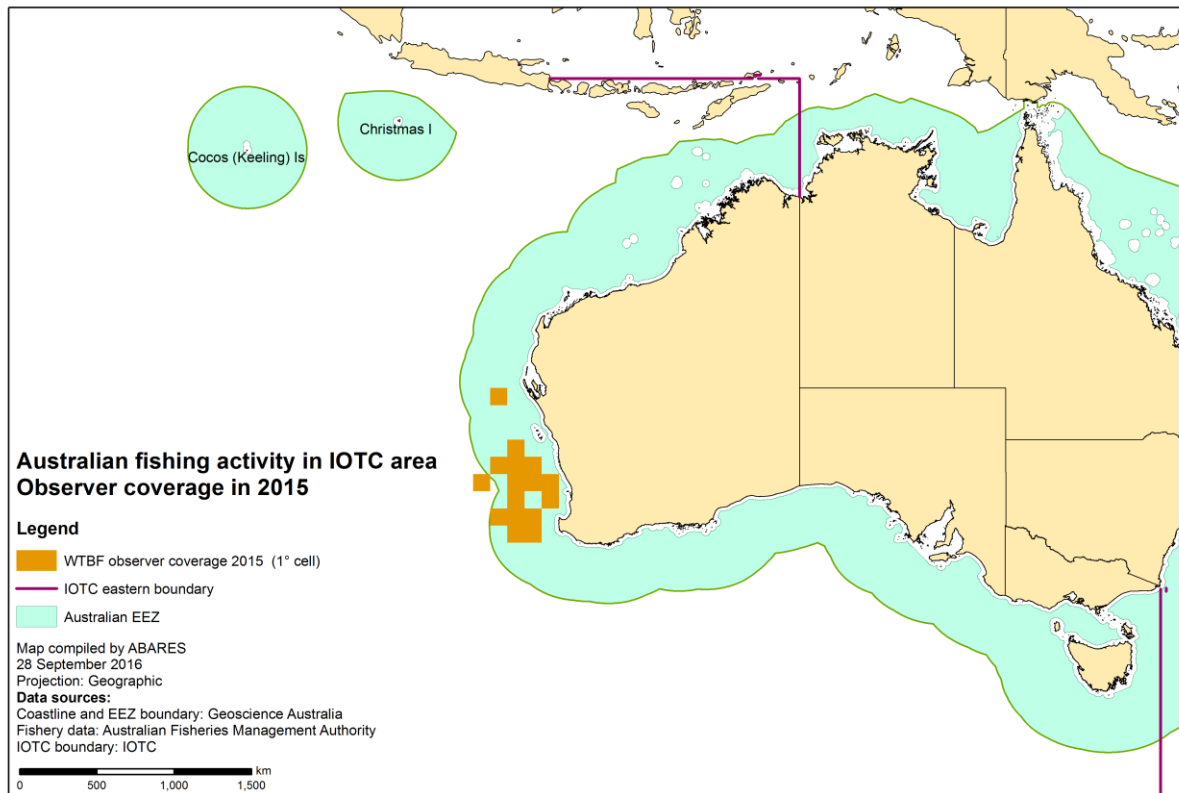
Table 6 Observer coverage, by hooks in the WTBF longline sector and by sets in the purse seine sector, in the IOTC Area of Competence for 2006 to 2015 (calendar year). The purse seine coverage noted here refers only to fishing for southern bluefin tuna (SBT).

Year	Longline Hooks Observed	Percentage Coverage (Hooks)	SBT Season	Purse Seine Sets Observed	Percentage Coverage (Sets)
2006	n/a	n/a	2006-07	9	5.6
2007	n/a	1.42	2007-08	16	11.8
2008	n/a	n/a	2008-09	11	7.9
2009	44 790	8.46	2009-10	7	9.0
2010	15 330	2.45	2010-11	21	19.8
2011	6 232	1.7	2011-12	17	11.1
2012	119 757	17.8	2012-13	14	12.7
2013	0	0.0	2013-14	16	17.0
2014	41 066	9.1	2014-15	14	9.1
2015 ^a	30 435	7.1	2015-16	25	18.9

n/a = data not available

^a Note that observer coverage in 2015 includes both human observers and data obtained from electronic monitoring systems

Figure 5 Spatial distribution of 2015 observer coverage in the longline fishery in the IOTC Area of Competence



Port sampling program

A fish size monitoring program for the WTBF has been conducted since 1999. When possible, a contractor collects weights and lengths for yellowfin tuna, bigeye tuna and swordfish from processors in Western Australia. However, given the generally low effort in the WTBF, this program is integrated with Australia's observer program and measurements reported were primarily recorded by observers on board fishing vessels or in port.

No fish were measured in 2015 as part of the port sampling program in the IOTC Area of Competence. However, on-board observers recorded measurements of all fish retained while at sea.

Unloading/transhipment

This section is not applicable to Australia as Australian-flagged vessels do not tranship at sea in the IOTC Area of Competence.

7 National research programs

Australia undertakes research projects and programs that are applicable to IOTC fisheries. Details of recent projects are provided below in Table 7.

Table 7 Summary table of recent national research programs

Mitigation measure	Lead agency and collaborators	Results to date	Planned development/testing	Status
Line weighting regimes	AFMA, Australian Antarctic Division (AAD), ETBF operators	Completed.	Comparing the use of 60 g weights for live baits: <ul style="list-style-type: none"> • directly adjacent to the hook • 0.5 m from the hook • 3.5 m from the hook 	Results published as Abery et al. 2015 Report available at http://www.afma.gov.au/wp-content/uploads/2010/06/GloLead-BrochureFinal-13-903.pdf
Underwater bait setting machine	AAD, Amerro Engineering, ETBF operators	Completed.	<p>Stage 1: R&D; initial operational testing of prototype unit (Mk1)</p> <p>Stage 2: Testing Mk1 unit in ETBF under normal operational fishing</p> <p>Stage 3: At-sea testing and refinement of the performance of Mk1 prototype.</p> <p>Stage 4: Controlled experiment to compare and evaluate the Mk1 prototype underwater setting machine with the conventional method of setting branch lines by hand at the surface.</p> <p>Stage 5: Extensive modification of Mk1 prototype, based on experience from the experiment. Improvements to design and performance, especially concerning maximum depth and cycle time. Extensive operational testing. Construction of new</p>	Results published as Robertson et al. 2015

prototype unit (Mk2).

Stage 6: Proof-of-concept experiment with Mk2 prototype in the Uruguayan swordfish fishery.

Stage 7: Complete scientific paper on effectiveness of underwater setting method in minimising mortality of albatrosses and petrels in pelagic longline fisheries.

^a FRDC = Fisheries Research & Development Corporation

^b DE= Department of the Environment

^c WWF = World Wide Fund for Nature

8 Implementation of Scientific Committee recommendations and resolutions of the IOTC relevant to the SC

Australia is compliant with IOTC resolutions relevant to the Scientific Committee. Table 8 details the resolutions and how they have been implemented.

Table 8 Scientific requirements contained in the Resolutions of the Commission

No.	Resolution	Scientific requirement	CPC progress
16/06	On measures applicable in case of non-fulfilment of reporting obligations in the IOTC	Paragraph 1	<ul style="list-style-type: none"> -Australia is compliant with data reporting requirements and has implemented reporting obligations in their IOTC fisheries. -Australia has reported on the implementation of electronic monitoring in its longline fisheries. This will improve the accuracy of the data recorded in logbooks, including data on shark interactions. -Such data will be reported in the implementation report and in the annual data submission to the IOTC.
15/01	On the recording of catch and effort by fishing vessels in the IOTC area of competence	Paragraphs 1-10	<ul style="list-style-type: none"> - Catch and effort data prescribed in the Resolution are collected in daily fishing logbooks for the Australian longline and purse seine vessels operating in the IOTC area of competence. - Catch and effort data are also recorded in daily fishing logbooks for relevant fisheries managed by Western Australia that operate in the IOTC area of competence. - Disposal of catch is monitored using catch disposal record forms for the WTBF and ETBF longline, and the SJF and SBT purse seine fisheries. -Australia has submitted templates of its official logbooks to record data in accordance with Annex I, II and III to the IOTC Executive Secretary for publishing on the IOTC website. - Data submitted by 30 June each year.
15/02	Mandatory statistical reporting requirements for IOTC Contracting Parties and Cooperating Non-Contracting Parties (CPCs)	Paragraphs 1-7	<ul style="list-style-type: none"> - Data submitted including: <ul style="list-style-type: none"> -Total catch data -Catch and effort data -Size data

No.	Resolution	Scientific requirement	CPC progress
			- Data submitted by 20 June each year.
15/05	On conservation measures for striped marlin, black marlin and blue marlin	Paragraph 4	<ul style="list-style-type: none"> - Australia has no fisheries using gillnets for tuna or tuna-like species in the IOTC area of competence - Commercial fisheries in Australia are not permitted to keep black or blue marlin - Catch of striped marlin in the WTBF is very low (<1 t in 2014)
13/04	On the conservation of cetaceans	Paragraphs 7-9	<ul style="list-style-type: none"> - Resolution 13/04 has been implemented through conditions on boat statutory fishing rights in the WTBF and permit conditions in the SJF. - The setting of purse seines around cetaceans is prohibited and concession holders are required to report all interactions with cetaceans through their daily catch and effort logbooks. This information is also collected by observers if on board. - All cetacean species are protected by Australian law (EPBC Act).
13/05	On the conservation of whale sharks (<i>Rhincodon typus</i>)	7-9	<ul style="list-style-type: none"> - Resolution 13/05 has been implemented through conditions on boat statutory fishing rights in the WTBF and permit conditions in the SJF. - The setting of purse seines around whale sharks is prohibited and concession holders are required to report all interactions with cetaceans through their daily catch and effort logbooks. This information is also collected by observers if on board. - Whale sharks are protected by Australian law (EPBC Act).
13/06	On a scientific and management framework on the conservation of shark species caught in association with IOTC managed fisheries	5-6	<ul style="list-style-type: none"> -The retention, transshipment, landing or storage of oceanic whitetip sharks, whole or parts of, is prohibited in the WTBF and ETBF. - Australia continues to collect data, including on ocean whitetip sharks, through Australia's scientific observer program.
12/09	On the conservation of thresher sharks (family Alopiidae) caught in association with fisheries in the IOTC area of competence	Paragraphs 4-8	<ul style="list-style-type: none"> - Australia provides data on interactions with thresher sharks to the IOTC. - In 2011, Australia implemented new permit conditions to prohibit licence holders from retaining, transshipping, landing, storing or selling thresher sharks in the IOTC Area of Competence. - Commercial interactions with thresher sharks in 2015 have been reported to the IOTC as

No.	Resolution	Scientific requirement	CPC progress
			<p>required. Captured thresher sharks were released as required.</p> <ul style="list-style-type: none"> - The results from recreational tuna catch surveys indicated that interactions with thresher sharks by recreational fishers are also extremely rare.
12/06	On reducing the incidental bycatch of seabirds in longline fisheries.	Paragraph 3-7	<ul style="list-style-type: none"> - Australia has conducted research on methods to reduce seabird bycatch and reported the results to the IOTC (e.g. Robertson & Ashworth 2010; Robertson et al. 2010a, b; Robertson & Candy 2013; Robertson et al. 2013). - In 2014, Australia implemented a revised Threat Abatement Plan for seabirds to minimise seabird interactions in pelagic longline operations. Under the 2014 plan, longline vessels are required to maintain the bycatch rate of 0.05 seabirds per 1000 hooks set in all fishing areas and fishing seasons. - Consistent with the objectives of the plan and with Resolution 12/06, Australia requires that all longline vessels fishing south of 25°S employ an approved line-weighting strategy and a bird-scaring line or another approved method; longline vessels in all other areas must use at least one mitigation method. - Australia reports on seabird interactions and mitigation measures in its national report.
12/04	On the conservation of marine turtles	Paragraphs, 3, 4, 6-10	<ul style="list-style-type: none"> - Australian vessels are required to record and report interactions with marine turtles; this information is reported to the IOTC. - Research using circle hooks has been undertaken and reported to IOTC (Ward & Hall 2009). - Australia is a signatory member of Indian Ocean South-East Asia Marine Turtle Memorandum of Understanding and has committed to implement conservation and management measures to protect sea turtle habitat and nesting sites. - Australia requires the operators of all longline vessels to carry line cutters and de-hookers to facilitate the appropriate handling and prompt release of marine turtles that are caught or entangled.
11/04	On a regional observer scheme	Paragraph 9	<ul style="list-style-type: none"> - Australia provides information on observer coverage including the number of vessels monitored and the coverage rates by gear type. Australia has had observers for a number of years and aims to achieve 5 per cent observer coverage each year.
05/05	Concerning the conservation of sharks caught in association with	Paragraphs 1-12	<ul style="list-style-type: none"> - Data submitted to meet the data reporting requirements outlined in the resolution. - Landing requirements are in place: sharks must be landed with fins attached naturally or by

No.	Resolution	Scientific requirement	CPC progress
	fisheries managed by IOTC		<p>other means; landing of shark livers only (i.e. without the carcass) is not permitted.</p> <ul style="list-style-type: none"> - The use of wire leaders is not permitted. - In the Australian EEZ, a longline shark trip limit of 20 sharks per vessels per trip applies, as well as a 15 kg trip limit for gulper sharks. - Good handling practices are encouraged to return sharks to the sea alive and vigorous. - Research pertaining to the conservation of sharks has been conducted by Australia and reported to the IOTC (e.g. Hindmarsh 2007; Ward et al. 2007; Ward & Hall 2009; Patterson et al. 2014). - A shark bycatch mitigation guide was produced and distributed to encourage practical solutions that can be used by fishers (Patterson & Tudman 2009). - Under Australia's <i>Environment Protection and Biodiversity Conservation Act 1999</i>, licence holders must take measures to avoid the catch of porbeagle shark (<i>Lamna nasus</i>), shortfin (<i>Isurus oxyrinchus</i>) and longfin (<i>Isurus paucus</i>) makos and any live animals must be returned to the water alive.

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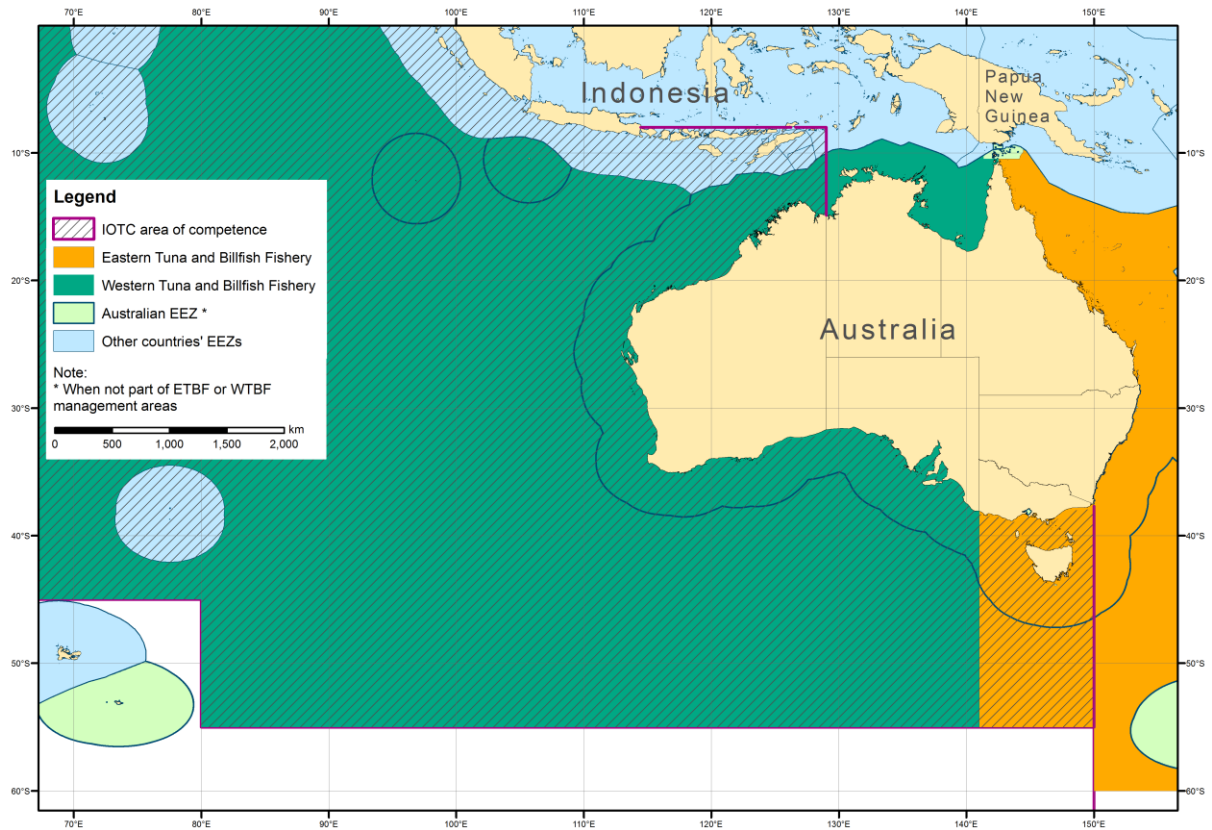
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Appendix A Fishery boundaries

Locations of the ETBF and the WTBF in relation to the IOTC Area of Competence. The Western Skipjack Fishery and the Eastern Skipjack Fishery use the same boundary line as the WTBF and ETBF.



Appendix B Mandatory mitigation measures in the WTBF 2016

(Source: AFMA website: <http://www.afma.gov.au/wp-content/uploads/2014/08/WTBF-management-arrangements-booklet-2016-FINAL.pdf>)

Seabirds

At all times you must:

- Carry an assembled tori line on board
- Carry either:
 - 1000 weighted swivels each weighing at least 60 g; or
 - 1000 weights each weighting at least 40 g
- Not discharge offal while setting
- Not discharge offal while hauling. An exemption for small boats may be given by AFMA.

When you are fishing south of 25°S you must:

- Deploy a tori line before commencing all shots that take place between nautical dawn and nautical dusk
- Use only thawed bait
- Weight longlines with either a minimum of:
 - 1) 60 g swivels at a distance of no more than 3.5 m from each hook ; or
 - 2) 98 g swivels at a distance of no more than 4 m from each hook; or
 - 3) 40 g weights at each hook.
- At all times carry 1000 weighted swivels each weighing at least 60 g or 1000 weights each weighing at least 40 g
- Not discharge offal while setting
- Not discharge offal while hauling. An exemption for small boats may be given.

Tori line specifications:

- At least 100 m long
- Set up from a position on the boat that allows it to stay above the water for at least 90 m;
- Have streamers attached at least every 3.5 m

- Streamers should be maintained ensuring that their lengths are as close to the water as possible.
- Have a drogue at the end of the line to give sufficient drag to meet the 90 m aerial coverage criteria.