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Status of sharks in Sri Lankan fisheries

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Abstract

Sharks (superorder: Selachii) are incredibly diverse with many pelagic species having circumglobal distributions. While some targeted deep-sea shark fisheries exist at small scales in Sri Lanka, the majority of landings are from bycatch in tuna and billfish fisheries by single and multi-day vessels from coastal waters all the way into the high seas. These species are retained for their highly valued fins that are exported, and for domestic consumption of meat. In Sri Lanka, over 540 days of survey across 19 landing sites, a total of 214 blue sharks (*Prionace glauca*); 553 silky sharks (*Carcharhinus falciformis*); 40 shortfin mako sharks (*Isurus oxyrinchus*); 27 longfin mako sharks (*Isurus paucus*); 43 scalloped hammerhead sharks (*Sphyrna lewini*); 15 smooth hammerhead sharks (*Sphyrna zygaena*); and 5 oceanic white tip sharks (*Carcharhinus longimanus*) were recorded. Bias toward the proportion of juvenile and immature specimens are clearly observed in some species. This, together with new data available such as the IUCN Red List assessments, and the fact that multiple countries catch these species within the Indian Ocean, make them extremely poor candidates for commercial fisheries. Recommendations such as improved data collection, mitigation and interim non-retention measures, are strongly recommended to curb population decline and enable recovery.

Keywords: sharks, elasmobranchs, fisheries, tuna bycatch

Introduction

The superorder Selachii of the cartilaginous subclass Elasmobranchii comprises multiple species, many of which are encountered in the Indian Ocean. Growing demand for shark fins and meat have led to increased retention of these species that are captured in fisheries targeting tuna and billfish and using techniques such as gillnets and longlines.

Shark populations are declining across the world, including in Sri Lanka, putting not only these species in danger but also the livelihoods of fishers depending upon them for their survival. Local communities across the island rely on sharks both as affordable sources of protein and as a means of employment. However, many shark species are highly susceptible to overexploitation due to their K-selected life cycles including low fecundity, matrotrophic reproduction, large size at birth, slow growth, late maturity, and longevity.

Methods

A total of 540 days of surveys (comprising 4 hours of surveying or surveying all landings, whichever is earlier) were conducted between August 2017 and August 2019 across 19 landing sites; 8 on the west coast, 3 on the north coast, 7 on the east coast, and 1 on the south coast. At these landing sites, both single and multi-day vessels that within and outside the EEZ, offload their catch. All encountered elasmobranchs were identified to species level, whenever possible. Data on sex, and maturity for males based on clasper length and extent of calcification were collected where possible, in addition to total length, fork length and precaudal length when time permitted prior to or just after auctioning. Sex and maturity could not be collected for all landed specimens since some were gutted at sea prior to storage in the boat hold to reduce spoiling. Additionally, at times the sharks were landed in large piles, often preventing access to clearly determining sex of specimens at the bottom of the pile. In both cases, the total number of species were counted and documented as unsexed. Tissue samples were collected and preserved in 99% ethanol.

Figure 1: Locations of landing sites surveyed

Preliminary Analysis, Summary Findings, and Recommendations

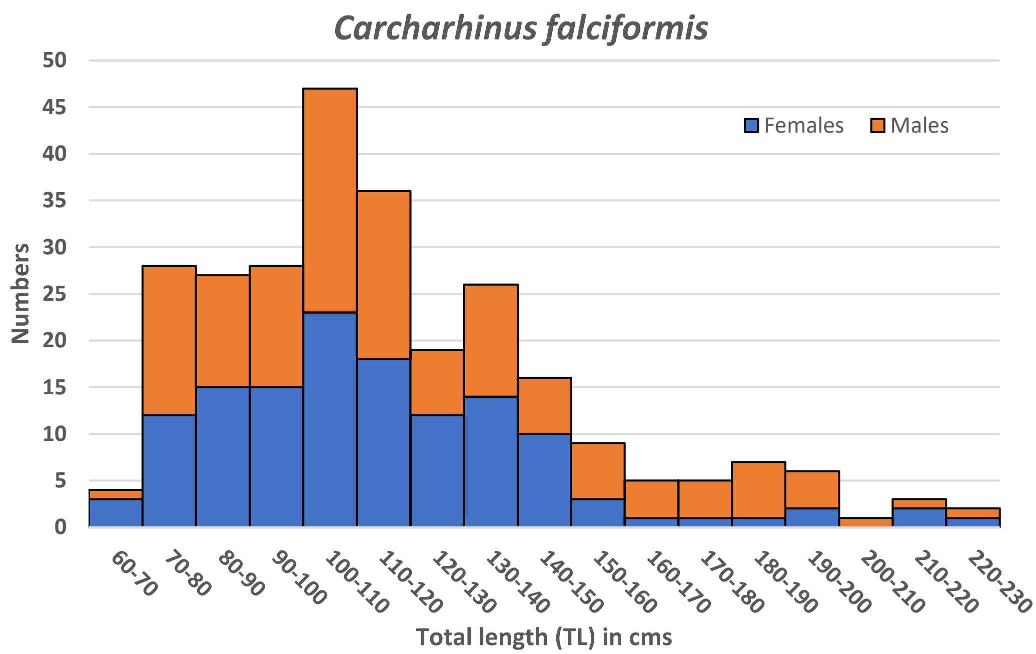

Figure 2: Demographics of silky shark specimens that were measured (n=269)

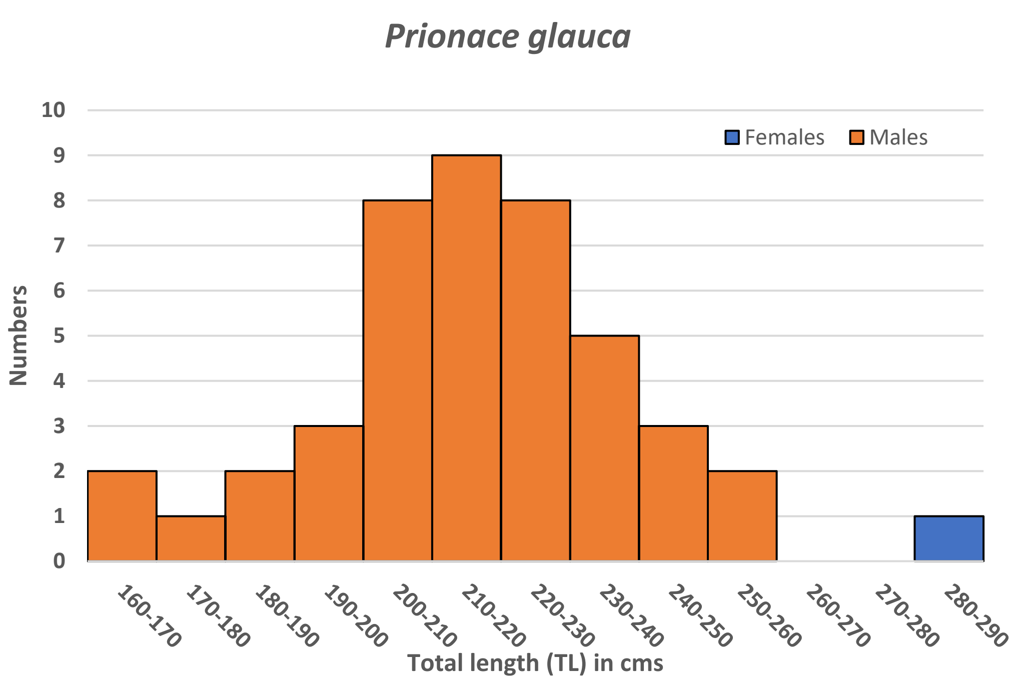

Figure 3: Demographics of blue shark specimens that were measured (n=44)

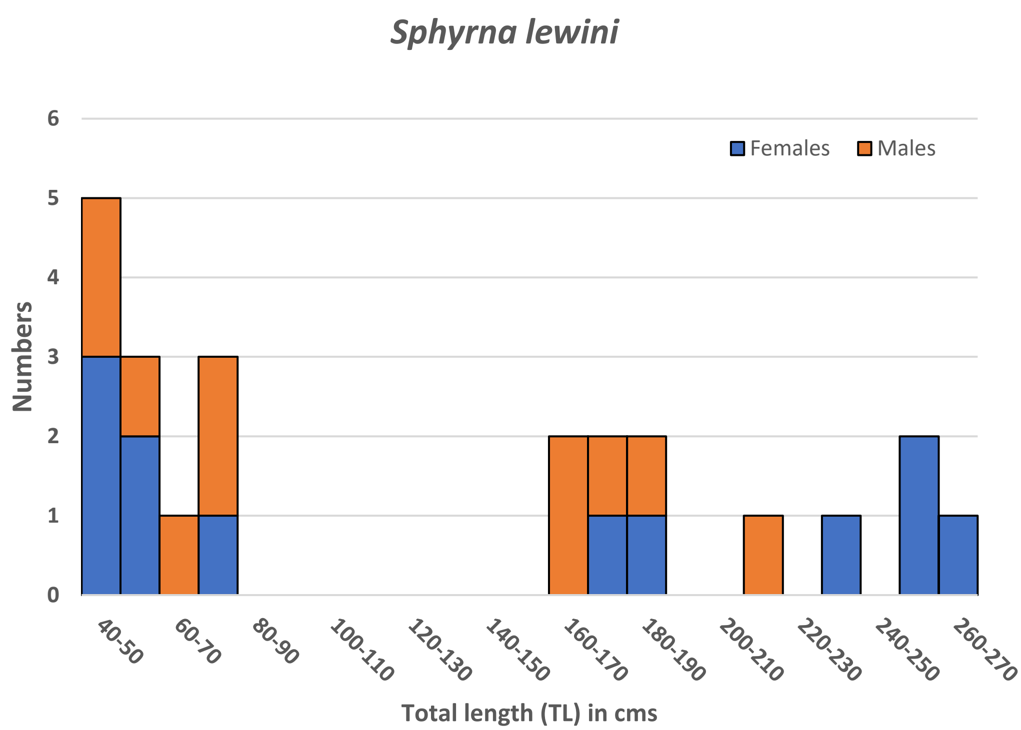

Figure 4: Demographics of scalloped hammerhead shark specimens that were measured (n=23)

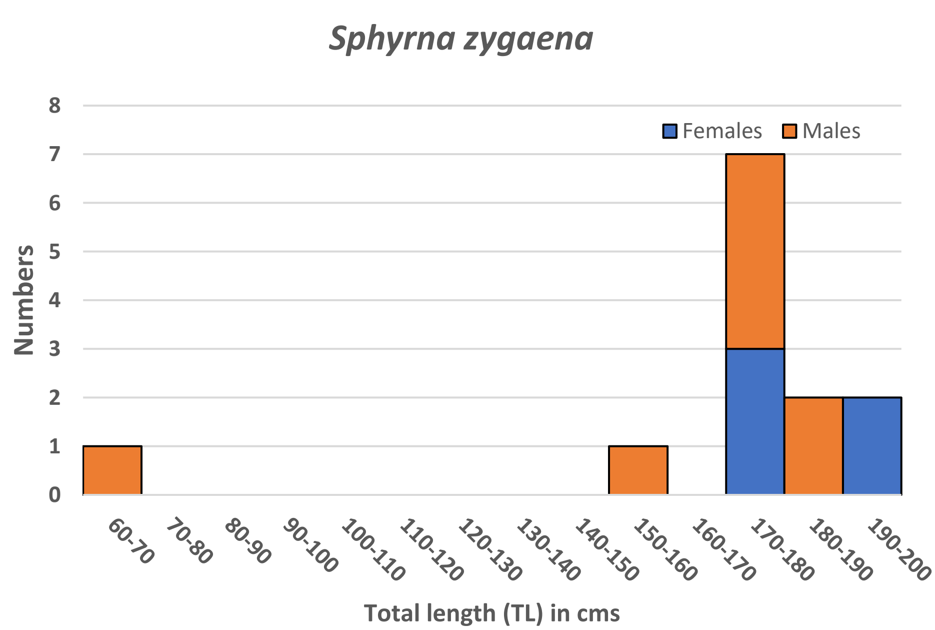

Figure 5: Demographics of smooth hammerhead shark specimens that were measured (n=13)

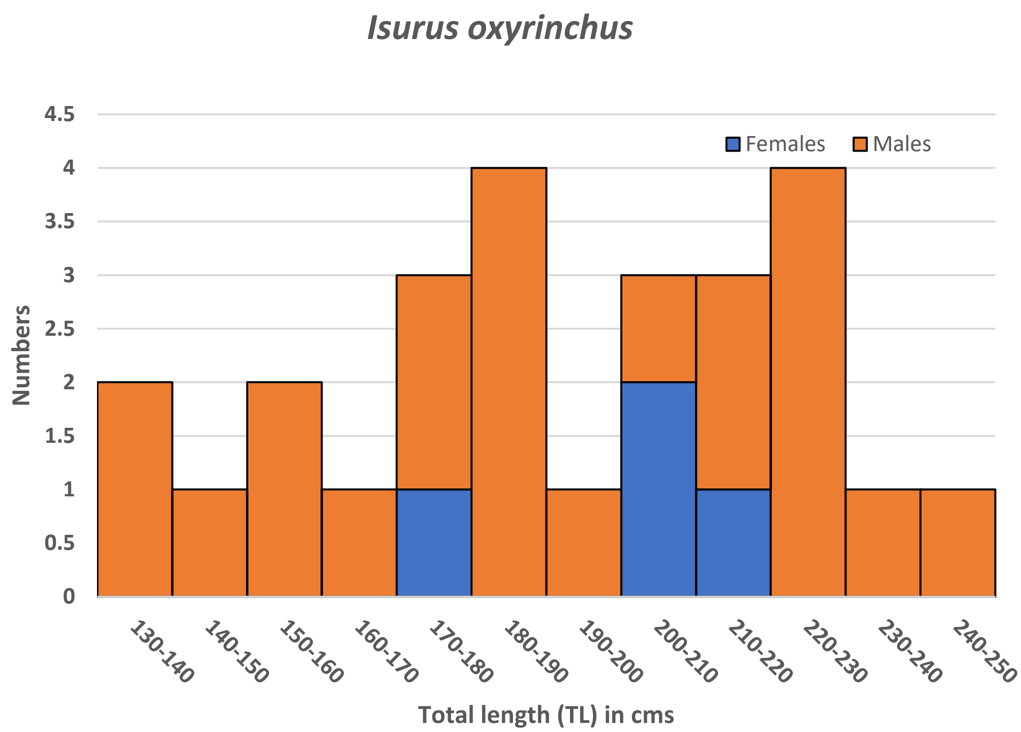

Figure 6: Demographics of shortfin mako shark specimens that were measured (n=26)

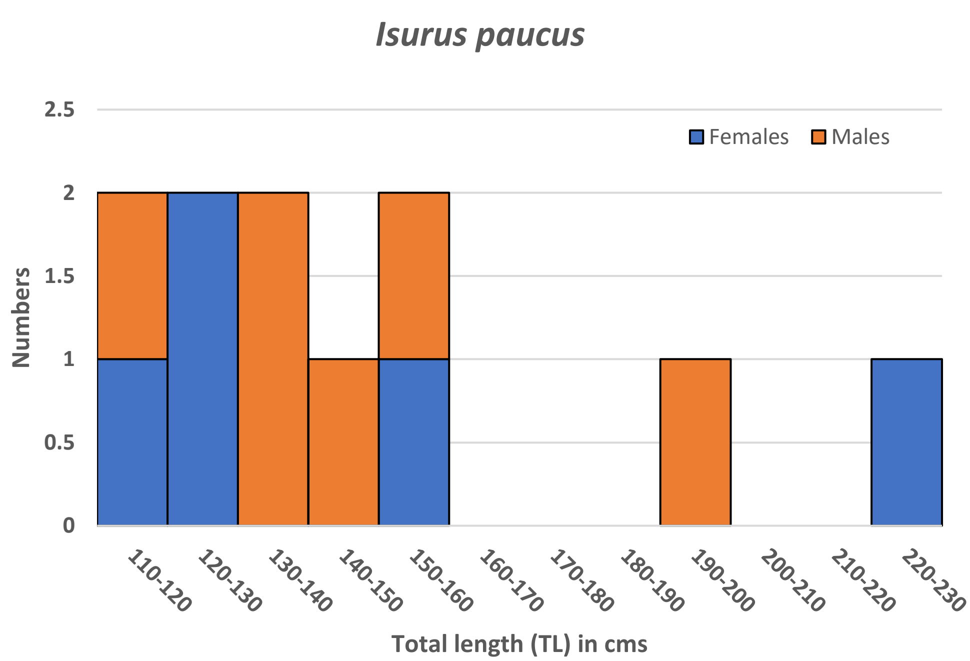

Figure 7: Demographics of longfin mako shark specimens that were measured (n=11)

In Sri Lanka, where fisheries are extremely important for food security, livelihoods, and export earnings, multiple shark species comprise a component of the retained bycatch. These species are retained due to their highly valued shark fins for international trade and domestic utilization of meat; either for consumption in fresh and dried forms, or for animal fodder.

Given the national non-retention measures in place for *Alopias* spp. (thresher sharks) and *Carcharhinus longimanus* (oceanic white tip sharks) in Sri Lanka, there were no landings recorded for the first, and only 3 specimens encountered for the second species; the largest of which was a male at just under 150 cm total length, while the other 2 specimens were smaller females.

The proportions between identified male and female specimens of each species also showed a bias toward males for *P. glauca* and *I. oxyrinchus* (see Figure 8). This bias is particularly extreme for *P. glauca*.

The number of immature specimens were also particularly high for *C. falciformis* (93%), *S. lewini* (91%), *S. zygaena* (100%), and *I. paucus* (64%), while *P. glauca* and *I. oxyrinchus* were landing larger proportions of mature individuals (see figure 9).

While the dataset is relatively small (see Figures 2-7), some species like the *I. paucus* and *C. falciformis* appear to land significantly larger proportions of smaller specimens. Given that *C. falciformis* males are estimated to mature at 208 cm TL and females at 216 cm TL, it is quite concerning that the majority of specimens recorded were well under 160 cm TL. And *I. paucus* are reported to mature at TL of at least 225 cm, while the few recorded specimens, with the exception of one, were below this length.

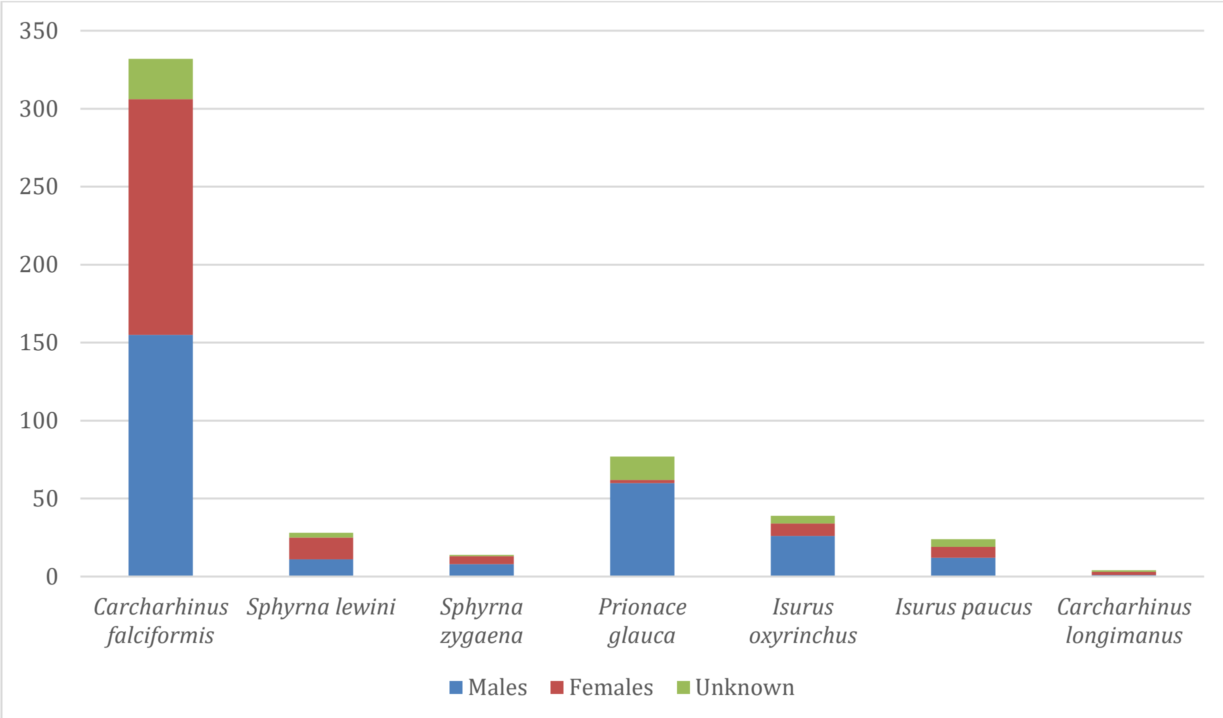

Figure 8: Ratios of males to females (and unidentified/unknown)

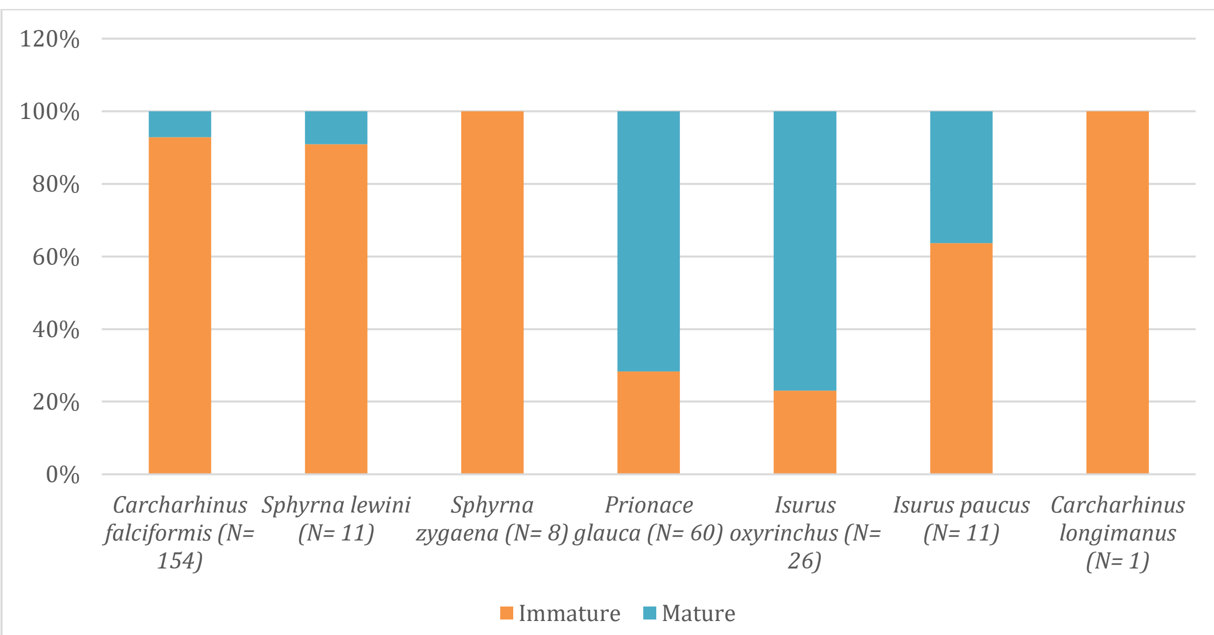

Figure 9: Proportion of immature to mature males

Given these species' conservative life history and migratory nature, there are some concerns on the long-term sustainability of these fisheries. These concerns are likely further exacerbated by ghost fishing and the lack of species level, or genus level, data on discards. As a result of several fisheries that are similar to Sri Lanka occurring across the region within the IOTC Area of Competence, it is highly recommended that additional measures are introduced to halt any potential overexploitation and pressure of commercial extinction on these species and provide them with the opportunity to recover.

It is recommended to collect data, where possible, to species level for all retained or discarded (dead and alive) specimens. Investigations into the proportions and demographics of shark captures between FAD and free-swimming schools should be conducted in further detail. Opportunities for bycatch mitigation should also be explored in further detail. Trials on methods such as the use of various coloured lights on gillnets or adjusting the depths of long-lines should be undertaken. The feasibility to shift from techniques such as gillnets to more targeted gear should be investigated. Finally, given that many specimens of multiple shark species will be alive when hauled onboard, safe release techniques endorsed by other fisheries should be adopted (Poisson *et al*., 2014).

Noting declines of species like silky sharks and mako sharks in other regions, it is advisable to adopt the precautionary approach and consider interim non-retention measures until stock assessments are concluded to verify the status of these species.

Such measures if introduced across the Indian Ocean would provide these generally conservative shark species with the opportunity to recover. Improved data collection would support the development of stock assessments, which in turn would allow for the allocation of appropriate quotas to ensure sustainable fisheries are maintained, while preventing long-term non-retention measures from having to be adopted.

Acknowledgements

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References

Poisson, F., Séret, B., Vernet, A.L., Goujon, M. and Dagorn, L., 2014. Collaborative research: Development of a manual on elasmobranch handling and release best practices in tropical tuna purse-seine fisheries. *Marine Policy*, *44*, pp.312-320.

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Eighteenth meeting of the Conference of the Parties
Geneva (Switzerland), 17–28 June 2019

SUPPLEMENTARY INFORMATION ON CITES COP 18 PROPOSAL 42:
CONFIRMING THAT SHORTFIN AND LONGFIN MAKO SHARKS
FULLY MEET THE CRITERIA FOR INCLUSION ON CITES APPENDIX II

This document has been submitted by Senegal in relation with proposal 42.[1]

1. Overview

Prop. 42 concerns the inclusion in Appendix II of the shortfin mako shark, *Isurus oxyrinchus*, in accordance with Article II, paragraph 2 (a) of the Convention and satisfying Criterion B in Annex 2a of Resolution Conf. 9.24 (Rev. CoP17); and of *Isurus paucus*, the longfin mako shark, in accordance with Article II, paragraph 2 (b) of the Convention and satisfying Criterion A in Annex 2b of Resolution Conf. 9.24 (Rev. CoP17).

This document presents the 2019 IUCN Red List assessment and summarises two major new scientific studies[2,3] published after Prop. 42 was drafted, submitted and analyzed by the FAO Expert Panel and CITES Secretariat. This research throws new light on the severely threatened status of the shortfin mako, and the urgent need to introduce sustainable fisheries management and regulate international trade.

These studies demonstrate that shortfin mako stocks are in danger of population collapse. The cause is a very high geographic overlap between their oceanic habitat and decades of intensive longline fishing effort that may have removed the majority of juveniles aged 3–10 years. Shortfin mako caught in recent years were the offspring of females born before fisheries expanded. High juvenile mortality since the 1980s means that the adult sharks now dying of old age will not be replaced by similar numbers of maturing sharks. This combination of high juvenile mortality, a 10–20 year lag between exploitation and maturity, and the imminent loss of the large cryptic biomass of aging mature sharks has masked an impending collapse in recruitment and population crash that we are only now beginning to understand.

Current fisheries management measures under ICCAT will not halt the decline. No other RFMOs limit mako catches, although the same intrinsic and extrinsic threats apply elsewhere. A CITES Appendix II listing will supplement and support fisheries management efforts, including for high seas stocks.

We urge Parties to consider this additional information in their CoP decision-making on Proposal 42..

* *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat (or the United Nations Environment Programme) concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

[2] *https://www.iccat.int/Documents/Meetings/Docs/2019/REPORTS/2019_SMA_SA_ENG.pdf. Report of the 2019 shortfin mako shark stock assessment update meeting.*

[3] *https://www.nature.com/articles/s41586-019-1444-4. Queiroz et al. Global spatial risk assessment of sharks under the footprint of fisheries.*

2. New IUCN Red List assessments[4], released in March 2019

The new IUCN Red List of Threatened Species assessment for the shortfin mako shark, summarized here, finds the species to be Globally **Endangered**. It did not consider the new studies described below.

"The Shortfin Mako is a large pelagic shark, widespread in temperate and tropical oceans. It has low biological productivity with a triennial reproductive cycle and late age at maturity. Steep population declines have occurred in the north and south Atlantic. Declines are also evident in the north Pacific and Indian Oceans. The south Pacific population appears to be increasing but with fluctuating catch rates. The weighted global population trend estimated the highest probability of 50–79% reduction over three generation lengths (72–75 years), and therefore the Shortfin Mako is assessed as Endangered A2bd."

CITES Appendix II listing facilitates management of species that *'although not necessarily now threatened with extinction may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilization incompatible with their survival'*[5]. The shortfin mako is already threatened with extinction and the case for listing in Appendix II, as stipulated in the Convention text, is clear. Furthermore, in several locations the species meets the Appendix I criteria and requires full protection. Listing in CITES Appendix II will ensure that trade in mako products is legal and sustainable, and facilitate the application of trade controls to complement the domestic and regional biodiversity conservation and fisheries management measures that this species urgently needs.

3. New ICCAT stock assessment and advice[6]

In May 2019, ICCAT Shark Species Group scientists met to update the Atlantic shortfin mako shark stock assessment and refine their 2017 advice to ICCAT Parties for the North and South Atlantic fisheries. All assessment models indicate that the North Atlantic stock will continue to decline until at least 2035, even if fishing ceases immediately. This is due to a combination of depleted age classes following 30 years of overfishing 3–10 year old juveniles (larger sharks are only caught in research surveys), and aging/dying mature females. The species' high age at maturity (50% at 21 years old) and longevity produces a cryptic biomass of mature animals that has enabled recruitment to continue and, until now, masked massively unsustainable juvenile mortality. Earlier, more optimistic, stock assessments had not fully considered the 10–20 year lag between exploitation and reproduction, nor the impact on pup production of 30 years of depleted age classes. Females only produce ~12 pups every 2–3 years, so pup production is closely related to mature female abundance. The low numbers of survivors from 30 years of overfishing will produce significantly fewer pups than the unfished adult generations that they are replacing.

No projections were prepared for the data-poor South Atlantic stock, but its similar biology and fisheries development trends indicate a high risk that this will follow a similar trajectory and require decades to rebuild even after significant catch reductions.

The ICCAT Shark Species Group concluded by reiterating its 2017 advice for a complete prohibition on retention of North Atlantic mako sharks. This represents far stronger action than mandated by a CITES Appendix II listing. However, ICCAT Parties have failed to take action to prevent stock collapse, leaving inclusion in Appendix II necessary to ensure that landings are reduced to sustainable levels, not only in the Atlantic, but worldwide. The management history of the oceanic whitetip shark, rejected for Appendix II until after the tuna RFMOs had prohibited its retention, is a salutary reminder of the result of failing to take timely action to introduce sustainable management measures for threatened pelagic sharks.

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4 https://www.iucnredlist.org/search?taxonomies=117291&searchType=species

5 *CITES Convention Text, Article 2: Fundamental Principles.*

6 https://www.iccat.int/Documents/Meetings/Docs/2019/REPORTS/2019_SMA_SA_ENG.pdf. *Report of the 2019 shortfin mako shark stock assessment update meeting.*

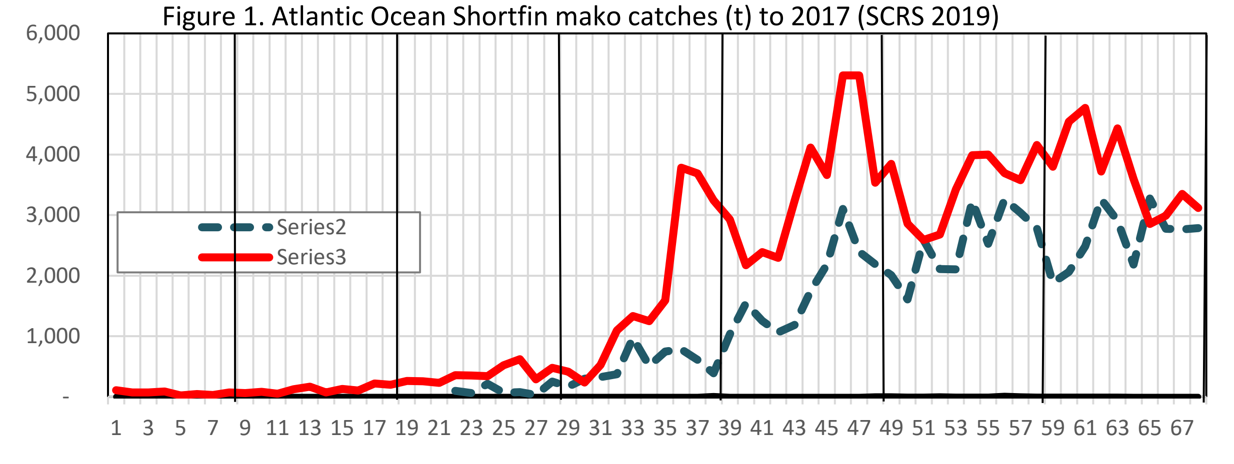

Figure 1. Atlantic Ocean Shortfin mako catches (t) to 2017 (SCRS 2019)

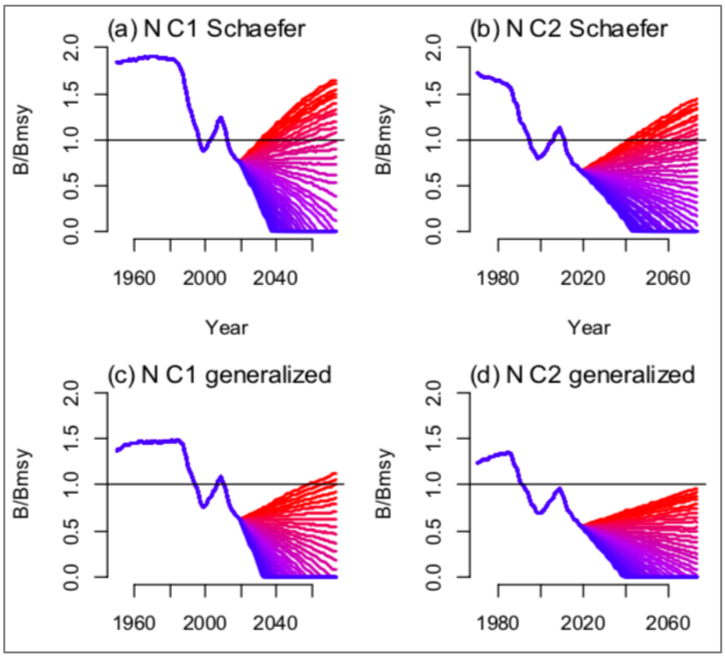

Figure 2. North Atlantic shortfin mako stock projections from 2019 to 2073, updated in 2019 from the 2017 assessment. (SCRS/2019/092)

Lines are TACs from zero catch (red) to 4,000 mt (blue), in 100 mt increments.

This figure presents four modelled scenarios for a range of Total Allowable Catches (TAC), from recent catch levels, which lead to stock collapse, to a zero TAC. All TACs are inclusive of dead discards. The Shark Species Group noted that zero mortality is unachievable because some dead discard of bycatch is inevitable, even with a prohibition on retention of mako.

The key conclusions of the 2019 ICCAT Shark Species Group report are as follows:

a) Despite its binding nature, the ICCAT Recommendation has not stopped overfishing:

ICCAT Rec. [17-08], to reduce shortfin mako fishing mortality, requires CPCs to report catches for the first six months of 2018. The total was 1,530 t, not a significant reduction from recent years (see Figure 1). "*The Group agreed that the exceptions in Rec. [17-08] that allow for the retention of some caught shortfin mako will not permit the recovery of the stock by 2070*."

b) The findings regarding North Atlantic shortfin mako current status and future projections from the 2019 analysis updates those contained in CoP18 Prop. 42, and considered by the Sixth FAO Expert Advisory Panel Assessment of Proposals (CoP18 Doc. 105.3 Annex 1):

"The Group conducted new projections using two Stock Synthesis model scenarios that incorporated important aspects of shortfin mako biology. This was a feature that was not possible with the production model projections developed in the 2017 [ICCAT SCRS] assessment and, therefore, the Group considers the new projections as a better representation of the stock dynamics."

c) The status of North Atlantic shortfin mako population has continued to deteriorate since the 2017 assessment. The stock will continue to decline for at least another fifteen years before rebuilding can begin. The report summarizes:

- *Regardless of the TAC (including a TAC of 0 t), the stock will continue to decline until 2035 before any biomass increases can occur;*
- *The stock synthesis projections indicated that: a zero TAC[*] will allow the stock to be rebuilt and without overfishing (in the green quadrant of the Kobe plot) by 2045 with a 53% probability;*
- *A TAC of 300 tons, including dead discards, has only a 60% probability of rebuilding the stock to levels above SSF_{MSY} and below F_{MSY} in 2070[7].*

d) Far stronger management is needed for this species:

For the North Atlantic, the ICCAT scientists recommended the following: "*Given the vulnerable biological characteristics of this stock and the pessimistic findings of the projections, to accelerate the rate of recovery and to increase the probability of success the Group recommends that the Commission adopt a non-retention policy as it has already done with other shark species.*"

For the South Atlantic, the ICCAT scientists recommended the following: "*Given that fishery development in the South predictably follows that in the North and that the biological characteristics of the stock are similar, there is a significant risk that this stock could follow a similar history to that of the North stock. If the stock declines it will, like the North stock, require a long time for rebuilding even after significant catch reductions. To avoid this situation and considering the uncertainty in the stock status, the Group recommends that, at a minimum catch levels should not exceed the minimum catch in the last five years of the assessment (2011-2015; 2,001 t).*"

Furthermore, reporting of dead discards and live release of bycatch is of utmost importance. Additional measures to further reduce incidental mortality, including time/area closures, gear restrictions, and safe handling and best practices for the release of live specimens (since post-release survival can reach 75%).

4. **Nature paper on global spatial risk assessment of sharks under the footprint of fisheries**[8].

This landmark research, published in July 2019, showcases the extreme vulnerability of shortfin mako sharks to high seas longline fisheries. It explains and reinforces the declines described in the IUCN Redlist and the 2019 ICCAT stock assessment, by quantifying the high geographic and temporal degree of overlap between satellite tracked pelagic sharks and commercial fisheries in all oceans. It highlights the particularly high risk faced by the shortfin mako, whose juveniles are captured in large numbers during eight of their first ten years of life before they reach a size refuge from fisheries, due to their limited spatial and temporal refuge from fishing.

The shortfin mako shark was the second (after blue shark) most frequently tagged and tracked of the 22 species analysed, with 261 tags and 56,071 tracking days, mostly in the North Atlantic and East Pacific (Figure 4). In the North Atlantic, shortfin mako was at significantly greater risk compared to all other tracked species except blue sharks, with a mean monthly space use overlap of 62% (median, 71%), co-occurring with a high mean fishing exposure index (FEI). Globally, there was a 37% overlap between shortfin mako tracks and longline vessels, with an 18% overlap in Oceania and 13% in the East Pacific.

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[*] *All TACs are inclusive of dead discards.*

[7] *SSF: spawning (pupping) stock fecundity = biomass of reproductive females. F: fishing pressure. MSY: the level that gives the maximum sustainable yield.*

[8] https://www.nature.com/articles/s41586-019-1444-4. Queiroz et al., July 2019.

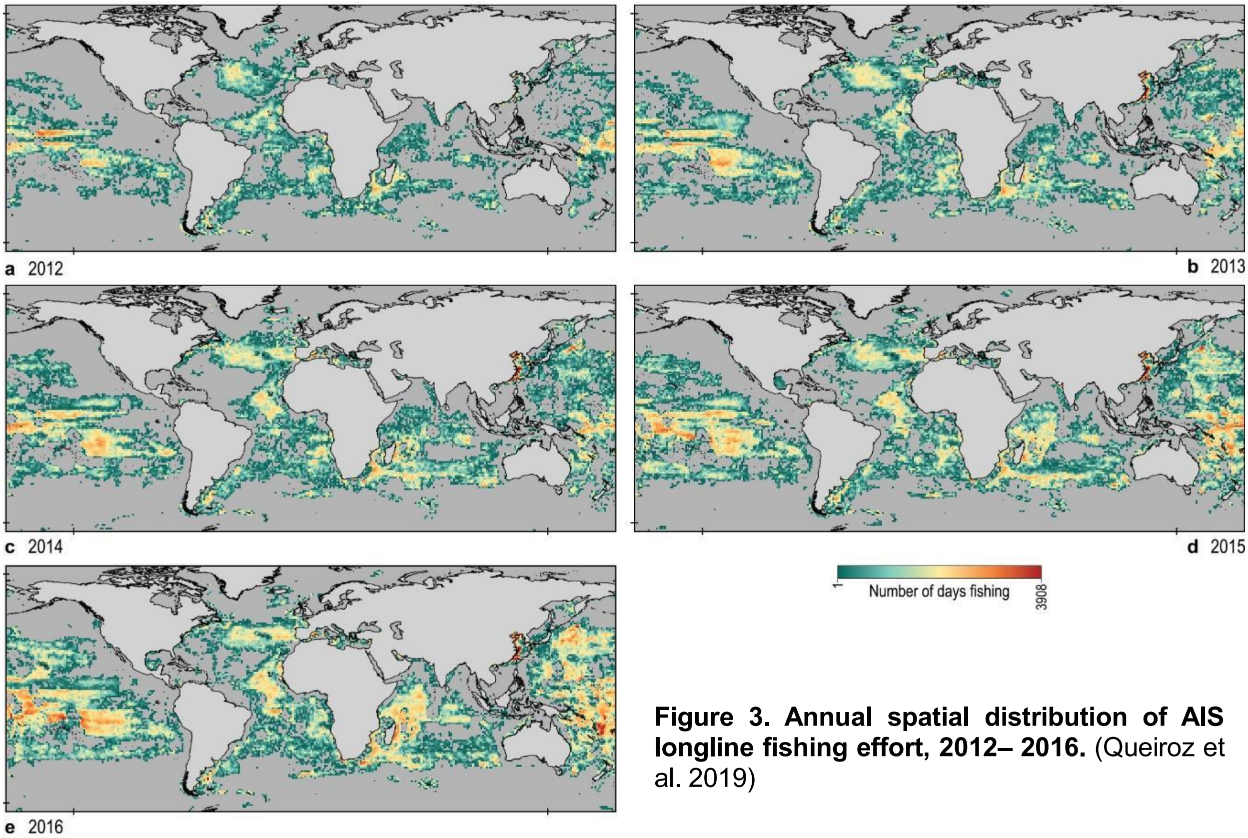


Figure 3. Annual spatial distribution of AIS longline fishing effort, 2012– 2016. (Queiroz et al. 2019)

In other words, habitat hotspots for mako shark coincide with hotspots for industrial fishing vessels and high fishing effort. This species had by far the highest proportion of tag recaptures, at 11.5% globally and 19.3% in the North Atlantic. This is the highest tag recapture rate observed for any oceanic shark species in an ocean-basin scale study. The fishing overlap and effort on shortfin mako habitat appears less extensive in the eastern Pacific, southern Indian Ocean and the Oceania region, but there are fewer tracks to analyse in the South Pacific and southern Indian Ocean, and no data for the South Atlantic, Western and Central Pacific and Indian Oceans, although intensive fishing effort certainly coincides with mako habitat in these regions (Figures 3 and 4). Management within the EEZs of Australia, Canada, Chile, New Zealand and the USA may be sufficient to reduce landings in these areas, but high seas fisheries remain largely unmanaged and likely also unsustainable.

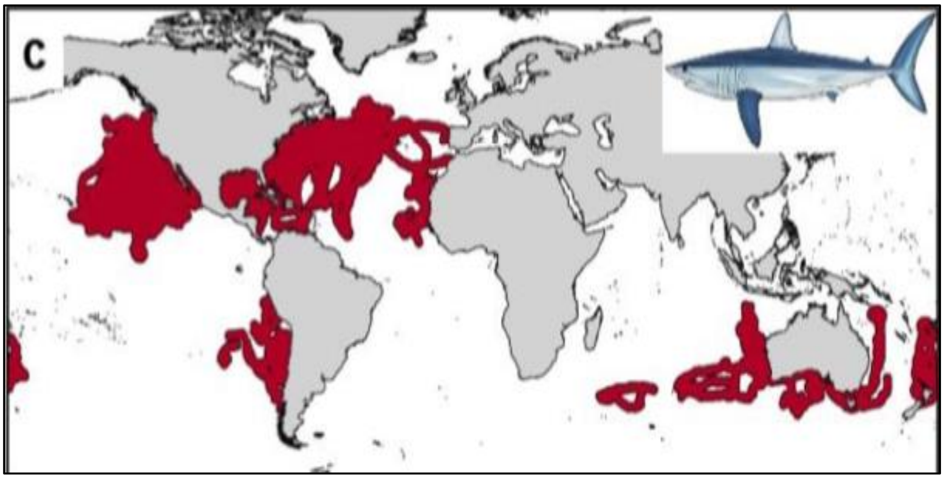


Figure 4. Movements of shortfin mako sharks. Daily state-space model locations estimated from locations obtained via satellite transmitters deployed on 261 tags and 56,071 tracking days between 2002–2017**.** (Queiroz et al. 2019)

These observations complement other recent analyses indicating the previously hidden impact of intensive fisheries on juvenile makos during the first decade of their life, and the very damaging long-term impact on mako stocks once large females cease pup production, die, and no longer mask the huge juvenile mortality in previous decades. This extreme exposure to high fishing effort, affecting up to 64% of mako space use per month, extends across ocean-wide population ranges and overlaps areas in the high seas where makos are most abundant, and where little to no management is in place.

In addition to reported declines and a vulnerable life-history, These results show that there is an incredibly high probability of mako sharks encountering commercial fisheries in every ocean. Combined with their vulnerable life history, this high level of fishing pressure explains This reinforces the reasons for the declines noted in the IUCN and ICCAT assessments, and reinforces the real risk that those declines are also happening in parts of the Pacific and Indian Ocean, making a global CITES listing essential.

5. Conclusions

Far stronger management action is needed for this species; inclusion on CITES Appendix II can assist in implementing, monitoring and enforcing such action.

This new evidence, unavailable at the time of proposal drafting and assessment, shows clearly that juvenile makos need to survive intensive longline fisheries for ten years (males) or two decades (females) if they are to reach maturity and reproduce. They have not been doing so in sufficient numbers over the past few decades, with the consequences seen clearly in the new ICCAT and IUCN assessments. This staged collapse of mako populations is currently playing out in the North Atlantic, where ICCAT scientists have been recommending the prohibition of catches since 2017, and the South Atlantic stock isn't far behind. Based on the new information on global fishing footprint overlap with mako sharks from Quieroz et al (2019), it seems possible that the Indian Ocean and Pacific populations, where intensive longline fisheries began more recently, will soon follow this trend unless ocean-wide sustainable management is implemented.

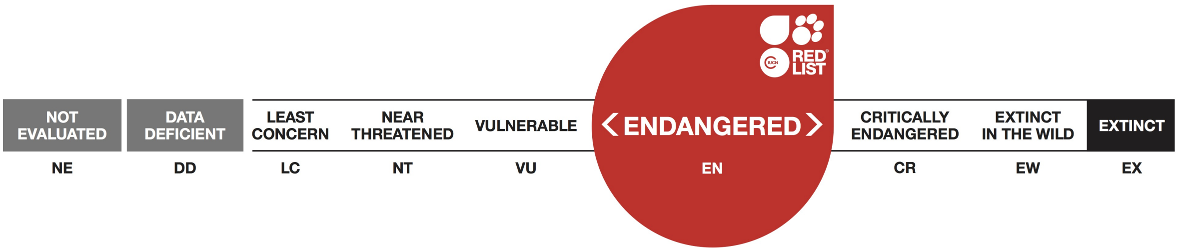
Mako sharks fully meet the CITES Appendix II listing criteria. CoP18 may represent the last opportunity to secure the future sustainability of mako shark fisheries, by including all stocks in Appendix II to ensure that sustainable management measures are introduced and implemented as a matter of priority. This measure will allow commercial catch and trade to continue, and prevent the commercial extinction of the species.

The Conference of Parties has seen the effect of being too slow to adopt trade management measures for numerous pelagic shark and ray species that are now prohibited in all or several tuna RFMO fisheries. These include Whale shark, oceanic whitetip, porbeagle, hammerheads, thresher sharks, silky shark, and the mobulid rays. CITES action in 2019 may be too late for the North Atlantic shortfin mako, but will be in time to prevent the commercial extinction of stocks in other oceans.

The IUCN Red List of Threatened Species™
ISSN 2307-8235 (online)
IUCN 2008: T39341A2903170
Scope: Global
Language: English

Isurus oxyrinchus, Shortfin Mako

Assessment by: Rigby, C.L. *et al.*



View on www.iucnredlist.org

Short citation: Rigby, C.L. *et al.* 2019. *Isurus oxyrinchus*. The IUCN Red List of Threatened Species 2019: e.T39341A2903170. http://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T39341A2903170.en [see full citation at end]

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Chondrichthyes	Lamniformes	Lamnidae

Taxon Name: *Isurus oxyrinchus* Rafinesque, 1810

Regional Assessments:

- Europe
- Mediterranean

Infra-specific Taxa Assessed:

- *Isurus oxyrinchus* (Atlantic subpopulation)
- *Isurus oxyrinchus* (Eastern North Pacific subpopulation)
- *Isurus oxyrinchus* (Indo-west Pacific subpopulation)

Common Name(s):

- English: Shortfin Mako

Taxonomic Source(s):

Rafinesque, C.S. 1810. *Caratteri di alcuni nuovi generi e nuove specie di animali e piante della Sicilia, con varie osservazioni sopra i medisimi*. Sanfilippo, Palermo.

Assessment Information

Red List Category & Criteria: Endangered A2bd ver 3.1

Year Published: 2019

Date Assessed: November 5, 2018

Justification:

The Shortfin Mako (*Isurus oxyrinchus*) is a large (to 445 cm total length) pelagic shark, widespread in temperate and tropical oceans to depths of 888 m. The species has low biological productivity with a triennial reproductive cycle and late age at maturity. It is caught globally as target and bycatch in coastal and pelagic commercial and small-scale longline, purse seine, and gillnet fisheries, and is generally retained for the high-value meat as well as its fins. Steep population declines have occurred in the north and south Atlantic, with declines also evident, though not as steep in the north Pacific and Indian Oceans. The south Pacific population appears to be increasing but with fluctuating catch rates. The weighted global population trend estimated a median decline of 46.6%, with the highest probability of 50–79% reduction over three generation lengths (72–75 years), and therefore the Shortfin Mako is assessed as Endangered A2bd.

Previously Published Red List Assessments

2009 – Vulnerable (VU)
http://dx.doi.org/10.2305/IUCN.UK.2009-2.RLTS.T39341A10207466.en

2000 – Lower Risk/near threatened (LR/nt)

Geographic Range

Range Description:

The Shortfin Mako (*Isurus oxyrnchus*) is widespread in temperate and tropical waters of all oceans (Ebert *et al.* 2013).

Country Occurrence:

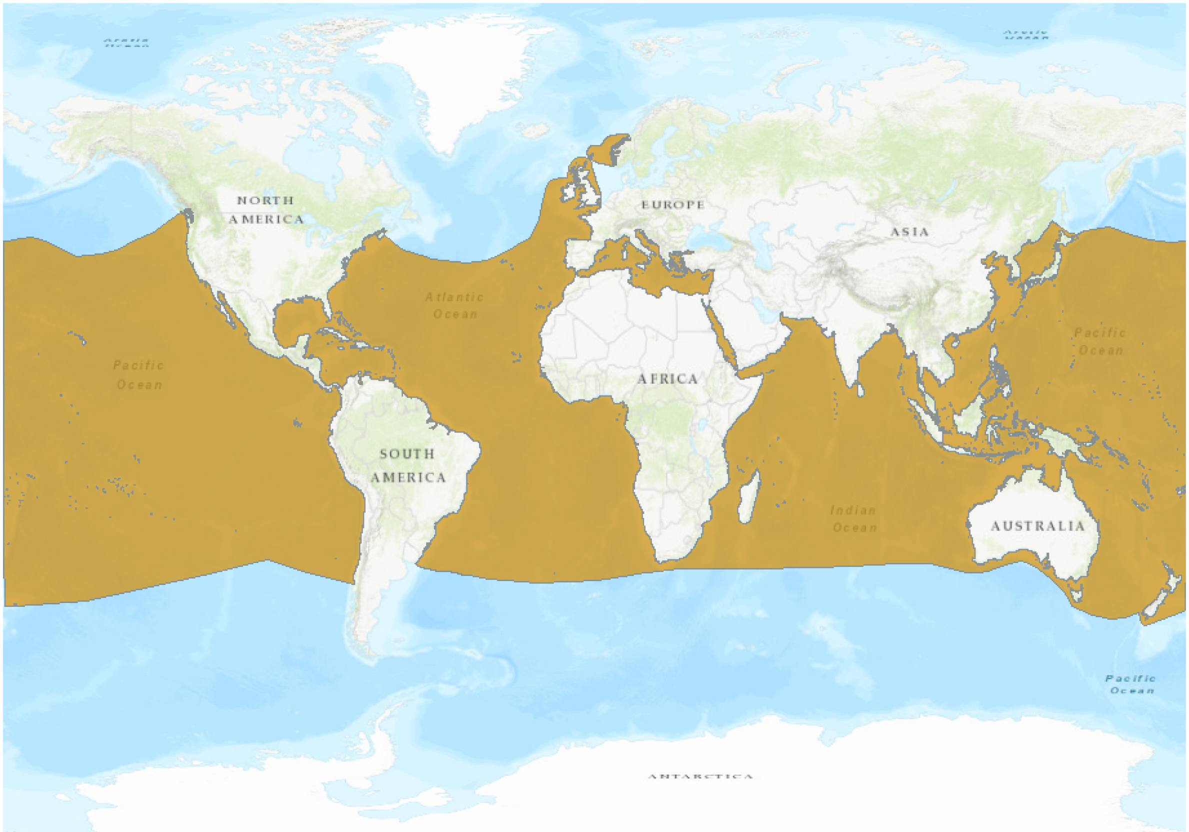
Native: Albania; Algeria; American Samoa; Angola; Anguilla; Antigua and Barbuda; Argentina; Aruba; Australia; Bahamas; Bangladesh; Barbados; Belize; Benin; Bermuda; Bonaire, Sint Eustatius and Saba; Brazil; Brunei Darussalam; Cabo Verde; Cambodia; Cameroon; Canada; Cayman Islands; Chile (Easter Is.); China; Christmas Island; Cocos (Keeling) Islands; Colombia; Congo; Cook Islands; Costa Rica; Côte d'Ivoire; Croatia; Cuba; Curaçao; Cyprus; Dominica; Dominican Republic; Ecuador (Ecuador (mainland), Galápagos); Egypt; El Salvador; Equatorial Guinea (Annobón, Equatorial Guinea (mainland)); Eritrea; Fiji; France (Clipperton I., France (mainland)); French Guiana; French Polynesia; Gabon; Gambia; Ghana; Gibraltar; Greece; Grenada; Guadeloupe; Guam; Guatemala; Guinea; Guinea-Bissau; Guyana; Haiti; Honduras; India (Andaman Is., Nicobar Is.); Indonesia; Iran, Islamic Republic of; Ireland; Israel; Italy; Jamaica; Japan; Kenya; Kiribati; Korea, Democratic People's Republic of; Korea, Republic of; Liberia; Libya; Macao; Madagascar; Malaysia; Maldives; Malta; Marshall Islands; Martinique; Mauritania; Mauritius; Mexico; Micronesia, Federated States of ; Montenegro; Montserrat; Morocco; Mozambique; Myanmar; Namibia; Nauru; New Caledonia; New Zealand; Nicaragua; Nigeria; Niue; Norfolk Island; Northern Mariana Islands; Norway; Oman; Pakistan; Palau; Panama; Papua New Guinea; Peru; Philippines; Pitcairn; Portugal (Azores, Madeira, Portugal (mainland), Selvagens); Puerto Rico (Navassa I., Puerto Rico (main island)); Réunion; Russian Federation; Saint Barthélemy; Saint Helena, Ascension and Tristan da Cunha; Saint Kitts and Nevis; Saint Lucia; Saint Martin (French part); Saint Vincent and the Grenadines; Samoa; Sao Tome and Principe; Saudi Arabia; Senegal; Seychelles; Sierra Leone; Singapore; Sint Maarten (Dutch part); Solomon Islands; Somalia; South Africa; Spain (Canary Is., Spain (mainland), Spanish North African Territories); Sri Lanka; Sudan; Suriname; Taiwan, Province of China; Tanzania, United Republic of; Thailand; Timor-Leste; Tokelau; Tonga; Trinidad and Tobago; Tunisia; Turkey; Turks and Caicos Islands; Tuvalu; United Kingdom; United States (Aleutian Is., Hawaiian Is.); United States Minor Outlying Islands (Howland-Baker Is., Johnston I., Midway Is., US Line Is., Wake Is.); Uruguay; Vanuatu; Venezuela, Bolivarian Republic of (Venezuela (mainland), Venezuelan Antilles); Viet Nam; Virgin Islands, British; Virgin Islands, U.S.; Wallis and Futuna; Western Sahara; Yemen

FAO Marine Fishing Areas:

Native: Atlantic - northwest, Atlantic - southeast, Atlantic - southwest, Atlantic - eastern central, Atlantic - northeast, Atlantic - western central, Indian Ocean - eastern, Indian Ocean - western, Mediterranean and Black Sea - , Pacific - northeast, Pacific - southwest, Pacific - western central, Pacific - southeast, Pacific - eastern central, Pacific - northwest

Distribution Map

Isurus oxyrinchus



0 7,200

Kilometer

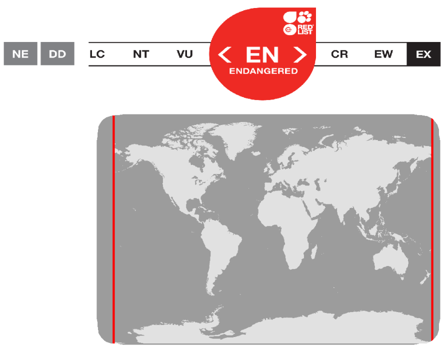
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

Range

Extant (resident)

Compiled by:

IUCN SSC Shark Specialist Group



The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There are no data available on the absolute global population size of the Shortfin Mako. Genetic results indicate one global population, however there is some genetic structuring between ocean basins (Schrey and Heist 2003, Taguchi *et al*. 2015, Corrigan *et al*. 2018).

Population trend data are available from four sources: (1) stock assessments in the north Atlantic and south Atlantic (ICCAT 2017); (2) stock assessment in the north Pacific (ISC 2018); (3) standardized catch-per-unit-effort (CPUE) in the south Pacific (Francis *et al*. 2014); and (4) a preliminary stock assessment in the Indian Ocean (Brunel *et al*. 2018). The trend data from each source were analysed over three generation lengths using a Bayesian state-space framework (a modification of Winker *et al*. 2018). This analysis yields an annual rate of change, a median change over three generation lengths, and the probability of the most likely IUCN Red List category percent change over three generations (see the Supplementary Information).

First, while the previous north Atlantic stock assessment suggested low probability of overfishing and that stocks were healthy (ICCAT 2012), the most recent north Atlantic stock assessment revealed that the stock was both overfished and that overfishing was occurring (ICCAT 2017). The south Atlantic stock assessment biomass estimates were deemed unreliable by the stock assessors, although they inferred that fishing mortality is likely unsustainable (ICCAT 2017). This concern is corroborated by a recent analysis of standardized catch rates of Shortfin Mako on longlines in the south Atlantic that revealed steep declines of 99% in the average CPUE of 1979–1997 and 1998–2007 (Barreto *et al*. 2016a). As a result of the unreliable stock assessment, the north Atlantic stock assessment was considered as representative of the south Atlantic for the trend analysis. The trend analysis of the north Atlantic modelled biomass for 1950–2017 (68 years) revealed annual rates of decline of 1.2%, consistent with an estimated median decline of 60.0% over three generation lengths (75 years), with the highest probability of 50–79% reduction over three generation lengths.

Second, the north Pacific stock assessment revealed that the stock was likely not overfished and that overfishing was likely not occurring (ISC 2018). The trend analysis of the modelled spawning abundance for 1975–2016 (42 years) revealed annual rates of decline of 0.6%, consistent with a median decline of 36.5% over three generation lengths (72 years), with the highest probability of 30–49% reduction over three generation lengths. Although the stock assessment used a long data time series of 40 years, the trend analysis considered the population change over a longer period of 72 years, which results in a greater decline than that of the stock assessment.

Third, the New Zealand longline observer Shortfin Mako standardized CPUE for 1995–2013 (19 years) (Francis *et al*. 2014) was used to represent the catches in that region as it is observer data with good coverage, comes from the part of the region with highest catch rates, and Shortfin Mako move between New Zealand waters and areas further north. The trend analysis indicated annual rates of increase of 0.5%, consistent with a median increase of 35.2% over three generation lengths (72 years), with the highest probability of an increasing population over three generation lengths.

Fourth, the Indian Ocean preliminary stock assessment indicated that the Shortfin Mako stock is not currently overfished but subject to overfishing, however the biomass trajectories trend towards overfished with overfishing status (Brunel *et al*. 2018). The trend analysis of the biomass for 1971–2015

(45 years) revealed annual rates of decline of 0.9%, consistent with a median decline of 47.9% over three generation lengths (72 years), with the highest probability of 30–49% reduction over three generation lengths.

Further to the above data and trend analyses, steep declines have occurred in the Mediterranean Sea; Ferretti *et al*. (2008) compiled nine time series of abundance indices from commercial and recreational fishery landings, scientific surveys, and sighting records, to reconstruct long-term population trends of large sharks in the northwestern Mediterranean Sea. Shortfin Mako and Porbeagle (*Lamna nasus*) showed an average instantaneous rate of decline in abundance of -0.12 (time range 135 years) and biomass of -0.15 (time range 106 years), which equates to an estimated decline of 99.9% in abundance and biomass since the early 19th century (Ferreti *et al*. 2008).

Across the regions, the Shortfin Mako was estimated to be declining in all oceans, other than the south Pacific where it is increasing. To estimate a global population trend, the estimated three generation population trends for each region were weighted according to the relative size of each region. The overall estimated median reduction was 46.6%, with the highest probability of 50–79% reduction over three generation lengths (72–75 years), and therefore the species is assessed as Endangered A2.

For further information about this species, see Supplementary Material.

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

The Shortfin Mako is a neritic and oceanic, epipelagic and mesopelagic species, found worldwide in tropical and warm-temperate seas to depths of 888 m (Abascal *et al.* 2011, Ebert *et al.* 2013, Weigmann 2016). The species reaches a maximum size of about 445 cm total length (TL) (Weigmann 2016). Males mature at 166–204 cm TL and females at 265–312 cm TL (Pratt and Casey 1983, Stevens 1983, Cliff *et al.* 1990, Francis and Duffy 2005, Varghese *et al.* 2017). Reproduction is viviparous and oophagous with an estimated gestation period of 15–18 months and a three-year reproductive cycle (Mollet and Cailliet 2002). Litter size is 4–25 pups (possibly up to 30, mostly 10–18) with a size at birth of 60–70 cm TL (Garrick 1967, Compagno 2001). Female age at maturity varies from 18–21 years and maximum age from 28–32 years in New Zealand, the Southwest Pacific, Southwest Atlantic, and Northwest Atlantic Oceans; generation length is therefore 24–25 years (Bishop *et al.* 2006, Natanson *et al.* 2006, Wells *et al.* 2013, Doño *et al.* 2014, Barreto *et al.* 2016b).

Systems: Marine

Use and Trade

This is one of the most valuable shark species due to its high-quality meat. The meat is utilized fresh, frozen, smoked, and dried-salted for human consumption. The fins of the Shortfin Mako are commonly traded, comprising 1.2% of the fin imported in Hong Kong in 2014 (Fields *et al.* 2017). The liver oil, jaws, and skin are also used (Compagno 2001).

Threats (see Appendix for additional information)

The Shortfin Mako is caught globally as target and bycatch in pelagic commercial and small-scale longline, purse seine, and gillnet fisheries. The majority of the catch is taken as bycatch of industrial pelagic fleets in offshore and high-seas waters (Camhi *et al.* 2008). It is also captured in coastal longlines, gillnets, trammel nets, and sometimes trawls, particularly in areas with narrow continental shelves (Camhi *et al.* 2008, Martínez-Ortiz *et al.* 2015).

The species is generally retained for the meat and fins (Clarke *et al.* 2006a*,* Clarke *et al.* 2006b, Dent and Clarke 2015*,* Fields *et al.* 2017), unless regulations prohibit retention. Under-reporting of catches is likely in pelagic and domestic fisheries (Dent and Clarke 2015, Campana *et al*. 2016a). The species is highly valued by big-game recreational fishers, and although many practice catch and release, recreational fishing could be a threat due to post-release mortality, although such mortality is reported at 10% for recreational fishing (Camhi *et al.* 2008, French *et al.* 2015). Commercial post-release mortality has been reported as 30–33% for the Shortfin Mako on longlines (Campana *et al.* 2016b). The species is taken in beach protection programs that target large sharks (Dudley and Simpfendorfer 2006, Simpfendorfer *et al.* 2010, Reid *et al.* 2011).

Conservation Actions (see Appendix for additional information)

The success of actions agreed through international wildlife and fisheries treaties depends on implementation at the domestic level; for sharks, such follow up actions have to date been seriously lacking. In 2008, the Shortfin Mako was listed on Appendix II of the Convention on Migratory Species (CMS), which reflects Parties' commitments to work regionally toward conservation. The species is also covered by the CMS Memorandum of Understanding for Migratory Sharks, which is aimed at facilitating conservation. In 2018, Mexico announced its intention to propose adding the Shortfin Mako to Appendix II of the Convention on International Trade in Endangered Species (CITES). If the proposal is adopted at the 2019 CITES Conference, Shortfin Mako exports from CITES Parties would need to be accompanied by permits based on findings that parts are sourced from legal and sustainable fisheries.

Globally, there are very few limits on Shortfin Mako catch. In 2012, the General Fisheries Commission for the Mediterranean (GFCM) banned retention and mandated careful release for the Shortfin Mako and 23 other elasmobranch species listed on the Barcelona Convention Annex II. Implementation by GFCM Parties, however, has been very slow. Whereas the European Union implemented this measure through domestic regulations, it has yet to limit Shortfin Mako catch from anywhere else, even as Spain is consistently the world's top Shortfin Mako fishing nation. A 2017 measure agreed by the International Commission for the Conservation of Atlantic Tunas (ICCAT) – in response to scientific advice to ban retention of overfished north Atlantic Shortfin Makos – instead aims to maximize live release by narrowing the conditions under which Shortfin Makos from this population can be landed.

To allow recovery, it is recommended Shortfin Mako landings be prohibited as long as the global population is classified as Endangered. Short of that, improved reporting of catch and discard data, regional and national limits on Shortfin Mako catch based on scientific advice and/or the precautionary approach, and promotion of safe release protocols are urgently needed, as is full implementation of additional commitments agreed through international treaties.

Credits

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Bibliography

Abascal, F.J., Quintans, M., Ramos-Cartelle, A. and Mejuto, J. 2011. Movements and environmental preferences of the shortfin mako,*Isurus oxyrinchus*, in the southeastern Pacific Ocean. *Marine Biology* 158(5): 1175-1184.

Barreto, R., Ferretti, F., Flemming, J.M., Amorim, A., Andrade, H., Worm, B. and Lessa, R. 2016a. Trends in the exploitation of South Atlantic shark populations. *Conservation Biology* 30(4): 792-804.

Barreto, R.R., de Farias, W.K.T., Andrade, H., Santana, F.M. and Lessa, R. 2016b. Age, growth and spatial distribution of the life stages of the Shortfin Mako, *Isurus oxyrinchus* (Rafinesque, 1810) caught in the Western and Central Atlantic. *PLOS ONE* 11(4): e0153062.

Bishop, S.D.H., Francis, M.P., Duffy, C. and 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.

Brunel, T., Coelho, R., Merino, G., Ortiz de Urbina, J., Rosa, D., Santos, C., Murua, H., Bach, P., Saber, S. and Macias, D. 2018. A preliminary stock assessment for the shortfin mako shark in the Indian Ocean using data-limited approaches. IOTC-WPEB14-2018-037.

Camhi, M.D., Pikitch, E.K. and Babcock, E.A. 2008. *Sharks of the Open Ocean: Biology, Fisheries and Conservation*. John Wiley & Sons.

Campana, S.E. 2016a. Transboundary movements, unmonitored fishing mortality, and ineffective international fisheries management pose risks for pelagic sharks in the Northwest Atlantic. *Canadian Journal of Fisheries and Aquatic Sciences* 73(10): 1599-1607.

Campana, S.E., Joyce, W., Fowler, M. and Showell, M. 2016. Discards, hooking, and post-release mortality of porbeagle (*Lamna nasus*), shortfin mako (*Isurus oxyrinchus*), and blue shark (*Prionace glauca*) in the Canadian pelagic longline fishery. *ICES Journal of Marine Science* 73(2): 520–528.

Clarke, S.C., McAllister, M.K., Milner-Gulland, E.J., Kirkwood, G.P., Michielsens, C.G.J., Agnew, D.J., Pikitch, E.K., Nakano, H. and Shivji, M.S. 2006b. Global estimates of shark catches using trade records from commercial markets. *Ecology Letters* 9: 1115-1126.

Clarke, S., Magnusson, J.E., Abercrombie, D.L., McAllister, M. and Shivji, M.S. 2006a. Identification of shark species composition and proportion in the Hong Kong shark fin market using molecular genetics and trade records. *Conservation Biology* 20: 201-211.

Cliff, G., Dudley, S.F.J. and Davis, B. 1990. Sharks caught in the protective gillnets of Natal, South Africa. 3. The shortfin mako shark *Isurus oxyrinchus* (Rafinesque). *South African Journal of Marine Science* 9: 115-126.

Compagno, L.J.V. 2001. *Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Volume 2. Bullhead, Mackerel and Carpet Sharks (Heterodontiformes, Lamniformes and Orectolobiformes)*. FAO, Rome.

Corrigan, S., Lowther, A.D., Beheregaray, L.B., Bruce, B.D., Cliff, G., Duffy, C.A., Foulis, A., Francis, M.P., Goldsworthy, S.D., Hyde, J.R., Jabado, R.W., Kacev, D., Marshall, L., Mucientes, G.R., Naylor, G.J.P., Pepperell, J.G., Queiroz, N., White, W.T., Wintner, S.P. and Rogers, P.J. 2018. Population connectivity of the highly migratory Shortfin Mako (*Isurus oxyrinchus* Rafinesque 1810) and implications for management in the southern hemisphere. *Frontiers in Ecology and Evolution* 6(187): doi: 10.3389/fevo.2018.00187.

Dent, F. and 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, Italy. 187 pp.

Doño, F., Montealegre-Quijano, S., Domingo, A. and Kinas, P.G. 2015. Bayesian age and growth analysis of the shortfin mako shark *Isurus oxyrinchus* in the Western South Atlantic Ocean using a flexible model. *Environmental Biology of Fishes* 98(2): 517-533.

Dudley, S. and Simpfendorfer, C. 2006. Population status of 14 shark species caught in the protective gillnets off KwaZulu-Natal beaches, South Africa, 1978-2003. *Marine and Freshwater Research* 57: 225-240.

Ebert, D.A., Fowler, S. and Compagno, L. 2013. *Sharks of the World. A Fully Illustrated Guide*. Wild Nature Press, Plymouth, United Kingdom.

Ferretti, F., Myers, R.A., Serena, F. and Lotze, H.K. 2008. Loss of large predatory sharks from the Mediterranean Sea. *Conservation Biology* 22: 952-964.

Fields, A.T., Fischer, G.A., Shea, S.K.H., Zhang, H., Abercrombie, D.L., Feldheim, K.A., Babcock, E.A. and Chapman, D.D. 2017. Species composition of the international shark fin trade assessed through retail-market survey in Hong Kong. *Conservation Biology* 32(2): 376–389.

Francis, M.P. and Duffy, C. 2005. Length at maturity in three pelagic sharks (*Lamna nasus, Isurus oxyrinchus* and *Prionace glauca*) from New Zealand. *Fishery Bulletin* 103: 489–500.

Francis, M.P., Clarke, S.C., Griggs, L.H and Hoyle, S.D. 2014. Indicator based analyses of the status of New Zealand blue, mako and porbeagle sharks. New Zealand Fisheries Assessment Report 2014/69. Ministry for Primary Industries.

French, R.P., Lyle, J., Tracey, S., Currie, S. and Semmens, J. M. 2015. High survivorship after catch-and-release fishing suggests physiological resilience in the endothermic shortfin mako shark (*Isurus oxyrinchus*). *Conservation Physiology* 3(1): 1-15.

Garrick, J.A.F. 1967. Revision of sharks of genus *Isurus* with description of a new species. (Galeoidea, Lamnidae). *Proceedings of the United States National Museum* 118: 663-690.

ICCAT. 2012. Shortfin Mako Stock Assessment and Ecological Risk Assessment Meeting. Olhao, Portugal, June 11-18, 2012.

ICCAT. 2017. Report of the 2017 ICCAT Shortfin Mako Assessment Meeting. Madrid, Spain 12-16 June 2017.

ISC. 2018. Stock Assessment of Shortfin Mako Shark in the North Pacific Ocean Through 2016. WCPFC-NC14-2018/IP-06. Western and Central Pacific Fisheries Commission. Northern Committee Fourteenth Regular Session, Fukuoka, Japan 4-7 September, 2018.

IUCN. 2019. The IUCN Red List of Threatened Species. Version 2019-1. Available at: www.iucnredlist.org. (Accessed: 21 March 2019).

Martínez-Ortiz, J., Aires-da-Silva, A.M., Lennert-Cody, C.E. and Maunder, M.N. 2015. The Ecuadorian artisanal fishery for large pelagics: species composition and spatio-temporal dynamics. *PloS one* 10(8): e0135136.

Mollet, H.F. and Cailliet, G.M. 2002. Comparative population demography of elasmobranchs using life history tables, Leslie matrices and stage-based matrix models. *Marine and Freshwater Research* 53(8): 503-516.

Natanson, L.J., Kohler, N.E., Ardizzone, D., Cailliet, G.M., Wintner, S.P. and Mollet, H.F. 2006. Validated age and growth estimates for the shortfin mako, *Isurus oxyrinchus*, in the North Atlantic Ocean. *Environmental Biology of Fishes* 77: 367–383.

Pratt, H.L. and Casey, J.G. 1983. Age and growth of the shortfin mako, *Isurus oxyrinchus*. In: Prince, E.D. and Pulos, L.M. (eds), Proceedings of the international workshop on age determination of oceanic pelagic fishes: Tunas, billfishes, and sharks NOAA Tech. Rep. NMFS 8: 175-177.

Reid, D.D., Robbins, W.D. and 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.

Schrey, A. and Heist, E. 2003. Microsatellite analysis of population structure in the shortfin mako (*Isurus oxyrinchus*). *Canadian Journal of Fisheries and Aquatic Science* 60: 670-675.

Simpfendorfer, C.A., de Jong, S.K. and Sumpton, W. 2010. Long-term trends in large shark populations from inshore areas of the Great Barrier Reef World Heritage Area: results from the Queensland Shark Control Program. Marine and Tropical Sciences Research Facility Transition Program Report.

Stevens, J.D. 1983. Observations on reproduction in the shortfin mako *Isurus oxyrinchus*. *Copeia* 1983(1): 126-130.

Taguchi, M., Ohshimo, S. and Yokawa, K. 2015. Genetic stock structure of shortfin mako (*Isurus oxyrinchus*) in the Pacific Ocean. ISC/15/SHARKWG-1/. National Research Institute of Far Seas Fisheries, Shimizu, Shizuoka, Japan.

Varghese, S.P., Unnikrishnan, N., Gulati, D.K. and Ayoob, A.E. 2017. Size, sex and reproductive biology of seven pelagic sharks in the eastern Arabian Sea. *Journal of the Marine Biological Association of the United Kingdom* 97(1): 181–196.

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(3): 837–1037.

Wells, R.J.D., Smith, S.E., Kohni, S., Freund, E., Spear, N. and Ramon, D.A. 2013. Age validation of juvenile Shortfin Mako (*Isurus oxyrinchus*) tagged and marked with oxytetracycline off southern California. *Fishery Bulletin* 111(2): 147-160.

Winker, H., Carvalho, F. and Kapur, M. 2018. JABBA: Just Another Bayesian Biomass Assessment. *Fisheries Research* 204: 275–288.

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
10. Marine Oceanic -> 10.1. Marine Oceanic - Epipelagic (0-200m)	Resident	Suitable	Yes
10. Marine Oceanic -> 10.2. Marine Oceanic - Mesopelagic (200-1000m)	Resident	Suitable	Yes

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.1. Intentional use: (subsistence/small scale) [harvest]	Ongoing	Majority (50-90%)	Unknown	Low impact: 5
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.2. Intentional use: (large scale) [harvest]	Ongoing	Majority (50-90%)	Unknown	Low impact: 5
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.3. Unintentional effects: (subsistence/small scale) [harvest]	Ongoing	Majority (50-90%)	Unknown	Low impact: 5
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Unknown	Low impact: 5
	Stresses:	2. Species Stresses -> 2.1. Species mortality		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions in Place
In-Place Research, Monitoring and Planning
Action Recovery plan: No
Systematic monitoring scheme: No
In-Place Land/Water Protection and Management
Conservation sites identified: No
Occur in at least one PA: Yes

Conservation Actions in Place
Area based regional management plan: No
Invasive species control or prevention: Not Applicable
In-Place Species Management
Harvest management plan: No
Successfully reintroduced or introduced beningly: No
Subject to ex-situ conservation: No
In-Place Education
Subject to recent education and awareness programmes: No
Included in international legislation: No
Subject to any international management/trade controls: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions Needed
1. Land/water protection -> 1.1. Site/area protection
3. Species management -> 3.1. Species management -> 3.1.1. Harvest management
3. Species management -> 3.1. Species management -> 3.1.2. Trade management
3. Species management -> 3.2. Species recovery

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.3. Life history & ecology
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.2. Harvest level trends
3. Monitoring -> 3.3. Trade trends

Additional Data Fields

Distribution
Lower depth limit (m): 888

Distribution
Upper depth limit (m): 0
Habitats and Ecology
Generation Length (years): 24-25

The IUCN Red List Partnership

The IUCN Red List of Threatened Species™ is produced and managed by the IUCN Global Species Programme, the IUCN Species Survival Commission (SSC) and The IUCN Red List Partnership.

The IUCN Red List Partners are: Arizona State University; BirdLife International; Botanic Gardens Conservation International; Conservation International; NatureServe; Royal Botanic Gardens, Kew; Sapienza University of Rome; Texas A&M University; and Zoological Society of London.

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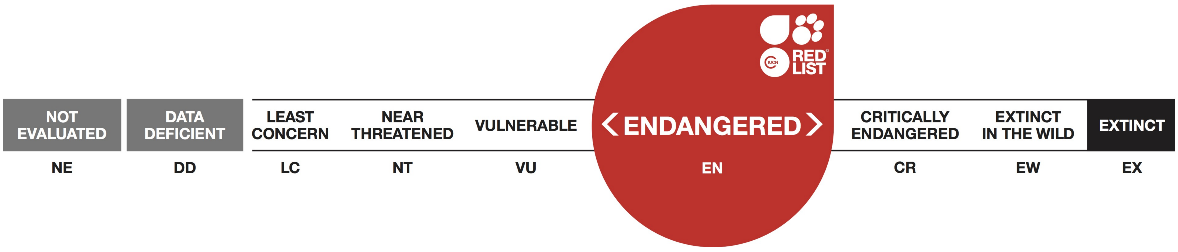
Isurus paucus, Longfin Mako

Assessment by: Rigby, C.L. *et al.*



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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Chondrichthyes	Lamniformes	Lamnidae

Taxon Name: *Isurus paucus* Guitart, 1966

Regional Assessments:

- Europe
- Mediterranean

Common Name(s):

- English: Longfin Mako

Taxonomic Source(s):

Eschmeyer, W.N., Fricke, R. and Van der Laan, R. (eds). 2017. Catalog of Fishes: genera, species, references. Updated 30 March 2017. Available at: http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp. (Accessed: 06 April 2017).

Assessment Information

Red List Category & Criteria: Endangered A2d ver 3.1

Year Published: 2019

Date Assessed: November 5, 2018

Justification:

The Longfin Mako (*Isurus paucus*) is a large (to 427 cm total length), widely distributed but infrequently encountered, pelagic oceanic shark. It usually occurs to depths of 760 m, but has been reported to 1,752 m. The species is caught globally as target and bycatch in pelagic commercial and small-scale longline, purse seine, and gillnet fisheries that operate throughout its range. It is caught less frequently than the Shortfin Mako (*Isurus oxyrinchus*) and is usually retained for the meat and fins. Most catches of the Longfin Mako are inadequately recorded and likely underestimated in landings data, particularly as it is commonly misidentified as the Shortfin Mako. The Longfin Mako is of serious conservation concern due to its apparent rarity, large maximum size, low fecundity, and continued, poorly-documented take in intensive fisheries. The limited available population trend data indicates strong declines and it is suspected to have undergone a population reduction of 50–79% globally over the last three generations (75 years), similar to its congener, the Shortfin Mako. The Longfin Mako is therefore assessed as Endangered A2d. As this assessment includes only one time series and is based on suspected declines, the assessment should be revisited when catch data are available from more regions.

Previously Published Red List Assessments

2006 – Vulnerable (VU)
http://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T60225A12328101.en

Geographic Range

Range Description:

The Longfin Mako is widespread in tropical and warm temperate waters, and likely occurs in all oceans, although its distribution is poorly recorded (Ebert *et al.* 2013).

Country Occurrence:

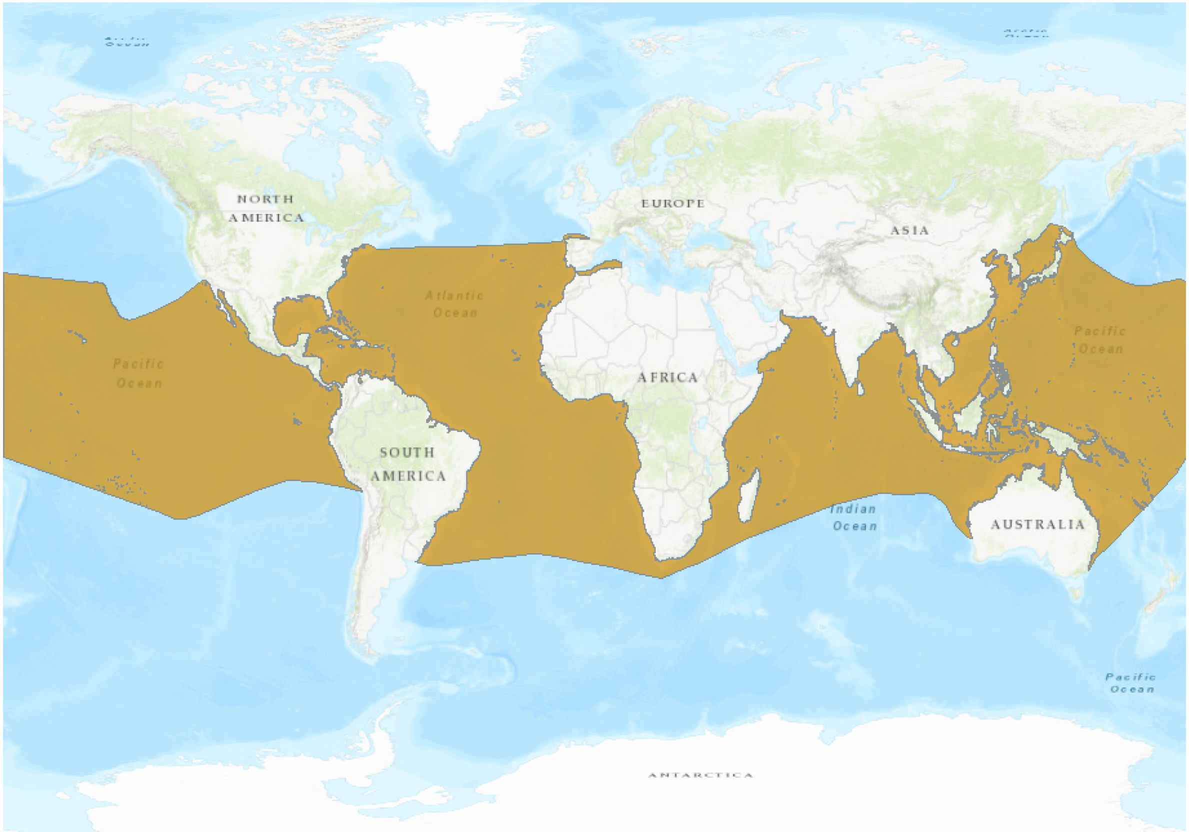
Native: Algeria; American Samoa; Angola (Angola, Cabinda); Anguilla; Antigua and Barbuda; Aruba; Australia; Bahamas; Bangladesh; Barbados; Belize; Benin; Bermuda; Bonaire, Sint Eustatius and Saba; Brazil; British Indian Ocean Territory (Chagos Archipelago); Brunei Darussalam; Cabo Verde; Cambodia; Cameroon; Cayman Islands; China; Christmas Island; Cocos (Keeling) Islands; Colombia (Colombia (mainland), Malpelo I.); Comoros; Cook Islands; Costa Rica; Côte d'Ivoire; Cuba; Curaçao; Dominica; Dominican Republic; Ecuador (Ecuador (mainland), Galápagos); El Salvador; Equatorial Guinea (Annobón, Equatorial Guinea (mainland)); French Guiana; French Polynesia; Gabon; Gambia; Ghana; Grenada; Guadeloupe; Guam; Guatemala; Guinea; Guinea-Bissau; Guyana; Haiti; Honduras (Honduran Caribbean Is., Honduras (mainland)); Hong Kong; India (Andaman Is.); Indonesia; Iran, Islamic Republic of; Jamaica; Japan; Kenya; Korea, Democratic People's Republic of; Korea, Republic of; Liberia; Macao; Madagascar; Malaysia; Maldives; Marshall Islands; Martinique; Mauritania; Mauritius (Rodrigues); Mayotte; Mexico; Micronesia, Federated States of ; Montserrat; Morocco; Mozambique; Myanmar; Namibia; Nauru; New Caledonia; Nicaragua; Niue; Northern Mariana Islands; Oman; Pakistan; Palau; Panama; Papua New Guinea; Peru; Philippines; Portugal (Azores, Madeira, Portugal (mainland), Selvagens); Puerto Rico (Navassa I., Puerto Rico (main island)); Réunion; Saint Barthélemy; Saint Helena, Ascension and Tristan da Cunha (Ascension, Saint Helena (main island)); Saint Kitts and Nevis; Saint Lucia; Saint Martin (French part); Saint Vincent and the Grenadines; Samoa; Sao Tome and Principe; Senegal; Seychelles; Sierra Leone; Singapore; Sint Maarten (Dutch part); Solomon Islands; Somalia; South Africa; Spain (Canary Is., Spain (mainland), Spanish North African Territories); Sri Lanka; Suriname; Taiwan, Province of China; Tanzania, United Republic of; Thailand; Timor-Leste; Togo; Tokelau; Trinidad and Tobago; Turks and Caicos Islands; Tuvalu; United States (Hawaiian Is.); Vanuatu; Venezuela, Bolivarian Republic of (Venezuela (mainland), Venezuelan Antilles); Viet Nam; Virgin Islands, British; Virgin Islands, U.S.; Western Sahara; Yemen

FAO Marine Fishing Areas:

Native: Atlantic - southwest, Atlantic - southeast, Atlantic - eastern central, Atlantic - northeast, Atlantic - northwest, Atlantic - western central, Indian Ocean - western, Indian Ocean - eastern, Pacific - southwest, Pacific - western central, Pacific - northwest, Pacific - southeast, Pacific - eastern central, Pacific - northeast

Distribution Map

Isurus paucus



0 7,200

Kilometer

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

Range

Extant (resident)

Compiled by:

IUCN SSC Shark Specialist Group

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There are no data available on the population size or structure of the Longfin Mako. The only available population trend data are from standardized catch-per-unit-effort (CPUE) in the Atlantic Ocean United States pelagic longline fishery. The observer data trends from this fishery were analysed over three generation lengths using a Bayesian state-space framework (a modification of Winker *et al.* 2018). This analysis yields an annual rate of change, a median change over three generation lengths, and the probability of the most likely Red List Category percent change over three generations (see the Supplementary Information). The observer data were considered more reliable than the logbook data reported in Lynch *et al.* (2018). The observer modelled catch rate data for 1992–2015 (24 years) showed declines to the mid 1990s, followed by an increase to the mid 2000s and declines thereafter (J. Carslon unpubl. data). The trend analysis of these data revealed annual rates of decline of 3.7%, consistent with an estimated median decline of 93.4% over three generation lengths (75 years), with the highest probability of >80% reduction over three generation lengths.

The species is considered to occur in all oceans and hence population trend data are missing from the south Atlantic, Indian, and Pacific Oceans, which accounts for approximately 80% of the species' range. To estimate a global population trend, the estimated three generation population trends for each region were weighted according to the relative size of each region. Regions with no trend data are assumed to have declined by 0 to 100% (this range excludes the possibility that the regional trend may have increased), and a global trend estimated that incorporates this uncertainty. The global analyses estimated a median decline of 60.4% with the highest probability of >80 % reduction over three generation lengths (75 years). Considering the large areas of the species distribution with no data, expert judgement suspected that global scale declines would be similar to those of the Shortfin Mako (*Isurus oxyrinchus*), and in the range of 50–79% over three generation lengths. As this assessment includes only one time series and is based on suspected declines, the assessment should be revisited when catch data are available from more regions.

For further information about this species, see Supplementary Material.

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

The Longfin Mako is a poorly-known epi-, meso- and bathypelagic species found in tropical and warm-temperate seas. It usually occurs to depths of 760 m, but has been reported to 1,752 m (Ebert *et al.* 2013, Hueter *et al.* 2016, Weigmann 2016). Very little is known of the biology of the Longfin Mako. It reaches a maximum size of at least 427 cm total length (TL); both males and females are reported to mature at >245 cm TL, although the smallest observed mature male is 225 cm TL (Gilmore 1993, Castro *et al*. 1999, Varghese *et al.* 2017). Reproduction is lecithotrophic viviparous with oophagy and uterine cannibalism with litter sizes of possibly 2–8, and a size at birth of 97–120 cm TL (Castro *et al*. 1999, Compagno 2001). Age data are not available for this species, but data from the close relative the Shortfin Mako in the Northwest Atlantic were used to estimate a generation length of 25 years (Natanson *et al.* 2006).

Systems: Marine

Use and Trade

The meat and fins of the Longfin Mako are traded (Clarke *et al.* 2006).

Threats (see Appendix for additional information)

The Longfin Mako is caught globally as target and bycatch in pelagic commercial and small-scale longline, purse seine, and gillnet fisheries. The majority of the catch is taken as bycatch of industrial pelagic fleets in offshore and high-seas waters (Camhi *et al.* 2008). It is also captured in coastal longlines, gillnets, trammel nets, and sometimes trawls, particularly in areas with narrow continental shelves (Camhi *et al.* 2008, Martínez-Ortiz *et al.* 2015). The Longfin Mako is likely less vulnerable to shallow set pelagic longline gear than the Shortfin Mako, because its preferred depth distribution is deeper than that of the Shortfin Mako. For example in Sri Lanka, the proportional catches of the Longfin Mako to Shortfin Mako are less outside the Exclusive Economic Zone (EEZ) than within the EEZ; likely attributed to surface longline gear set near the surface outside the EEZ compared to longline gear set deeper on the continental shelf edge within the EEZ (D. Fernando unpubl. data).

The species is generally retained for the meat and fins (Clarke *et al.* 2006, Dent and Clarke 2015, Fields *et al.* 2017), unless regulations prohibit retention. It is reported less frequently than the Shortfin Mako in the Hong Kong fin markets. Under-reporting of catches is likely in pelagic and domestic fisheries (Dent and Clarke 2015). Post-release mortality of pelagic sharks varies by species and has been reported as 30–33% for the closely-related Shortfin Mako on longlines (Campana *et al.* 2016).

Conservation Actions (see Appendix for additional information)

The success of actions agreed through international wildlife and fisheries treaties depends on implementation at the domestic level; for sharks, such follow up actions have to date been seriously lacking. In 2008, the Longfin Mako was listed on Appendix II of the Convention on Migratory Species (CMS), which reflects Parties' commitments to work regionally toward conservation. The species is also covered by the CMS Memorandum of Understanding for Migratory Sharks, which is aimed at facilitating conservation. In 2018, Mexico announced its intention to propose adding the Longfin Mako to Appendix II of the Convention on International Trade in Endangered Species (CITES) as a "look alike" species with respect to the focus of the listing proposal, the Shortfin Mako. If the proposal is adopted at the 2019 CITES Conference, Longfin Mako exports from CITES Parties would need to be accompanied by permits based on findings that parts are sourced from legal and sustainable fisheries.

The Longfin Mako is rarer than the Shortfin Mako, but the two species are often caught alongside each other and confused or combined in landings reports. The United States adopted a precautionary ban on retention of Atlantic Longfin Mako in 1999. There are no other known species-specific Longfin Mako catch limits.

To allow recovery, it is recommended that Longfin Mako landings be prohibited as long as the global population is classified as Endangered. Short of that, improved reporting of catch and discard data, regional and national limits on Longfin Mako catch based on scientific advice and/or the precautionary approach, and promotion of safe release protocols are urgently needed, as is full implementation of additional commitments agreed through international treaties.

Credits

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Bibliography

Camhi, M.D., Pikitch, E.K. and Babcock, E.A. 2008. *Sharks of the Open Ocean: Biology, Fisheries and Conservation*. John Wiley & Sons.

Campana, S.E., Joyce, W., Fowler, M. and Showell, M. 2016. Discards, hooking, and post-release mortality of porbeagle (*Lamna nasus*), shortfin mako (*Isurus oxyrinchus*), and blue shark (*Prionace glauca*) in the Canadian pelagic longline fishery. *ICES Journal of Marine Science* 73(2): 520–528.

Castro, J.I., Woodley, C.M. and Brudek, R.L. 1999. A preliminary evaluation of the status of shark species. *FAO Fisheries Technical Paper 380*. FAO, Rome

Clarke, S., Magnusson, J.E., Abercrombie, D.L., McAllister, M. and Shivji, M.S. 2006. Identification of shark species composition and proportion in the Hong Kong shark fin market using molecular genetics and trade records. *Conservation Biology* 20: 201–211.

Compagno, L.J.V. 2001. *Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Vol. 2. Bullhead, mackeral and carpet sharks (Heterodontiformes, Lamniformes and Orectolobiformes)*. FAO species catalogue for fisheries purposes. No. 1. Vol. 2. FAO, Rome.

Dent, F. and 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, Italy. 187 pp.

Ebert, D.A., Fowler, S. and Compagno, L. 2013. *Sharks of the World. A Fully Illustrated Guide*. Wild Nature Press, Plymouth, United Kingdom.

Fields, A.T., Fischer, G.A., Shea, S.K.H., Zhang, H., Abercrombie, D.L., Feldheim, K.A., Babcock, E.A. and Chapman, D.D. 2017. Species composition of the international shark fin trade assessed through retail-market survey in Hong Kong. *Conservation Biology* 32(2): 376–389.

Gilmore, R.G. 1993. Reproductive biology of lamnoid sharks. *Environmental Biology of Fishes* 38: 95–114.

Hueter, R.E., Tyminski, J.P., Morris, J.J., Abierno, A.R. and Valdes, J.A. 2016. Horizontal and vertical movements of longfin mako (*Isurus paucus*) tracked with satellite-linked tags in the northwestern Atlantic Ocean. *Fishery Bulletin* 115(1): 101–116.

IUCN. 2019. The IUCN Red List of Threatened Species. Version 2019-1. Available at: www.iucnredlist.org. (Accessed: 21 March 2019).

Lynch, P.D., Shertzer, K.W., Cortés, E. and Latour, R.J. 2018. Abundance trends of highly migratory species in the Atlantic Ocean: accounting for water temperature profiles. *ICES Journal of Marine Science* 75(4): 1427–1438.

Martínez-Ortiz, J., Aires-da-Silva, A.M., Lennert-Cody, C.E. and Maunder, M.N. 2015. The Ecuadorian artisanal fishery for large pelagics: species composition and spatio-temporal dynamics. *PloS one* 10(8): e0135136.

Natanson, L.J., Kohler, N.E., Ardizzone, D., Cailliet, G.M., Wintner, S.P. and Mollet, H.F. 2006. Validated age and growth estimates for the shortfin mako, *Isurus oxyrinchus*, in the North Atlantic Ocean. *Environmental Biology of Fishes* 77: 367–383.

Varghese, S.P., Unnikrishnan, N., Gulati, D.K. and Ayoob, A.E. 2017. Size, sex and reproductive biology of seven pelagic sharks in the eastern Arabian Sea. *Journal of the Marine Biological Association of the United Kingdom* 97(1): 181–196.

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(3): 837–1037.

Winker, H., Carvalho, F. and Kapur, M. 2018. JABBA: Just Another Bayesian Biomass Assessment. *Fisheries Research* 204: 275–288.

Citation

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
10. Marine Oceanic -> 10.1. Marine Oceanic - Epipelagic (0-200m)	Resident	Suitable	Yes
10. Marine Oceanic -> 10.2. Marine Oceanic - Mesopelagic (200-1000m)	Resident	Suitable	Yes
10. Marine Oceanic -> 10.3. Marine Oceanic - Bathypelagic (1000-4000m)	Resident	Suitable	Yes

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.1. Intentional use: (subsistence/small scale) [harvest]	Ongoing	Majority (50-90%)	Unknown	Low impact: 5
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.2. Intentional use: (large scale) [harvest]	Ongoing	Majority (50-90%)	Unknown	Low impact: 5
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.3. Unintentional effects: (subsistence/small scale) [harvest]	Ongoing	Majority (50-90%)	Unknown	Low impact: 5
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Unknown	Low impact: 5
	Stresses:	2. Species Stresses -> 2.1. Species mortality		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions in Place
In-Place Research, Monitoring and Planning
Action Recovery plan: No
Systematic monitoring scheme: No
In-Place Land/Water Protection and Management
Conservation sites identified: No

Conservation Actions in Place
Occur in at least one PA: Yes
Area based regional management plan: No
Invasive species control or prevention: Not Applicable
In-Place Species Management
Harvest management plan: No
Successfully reintroduced or introduced beningly: No
Subject to ex-situ conservation: No
In-Place Education
Subject to recent education and awareness programmes: No
Included in international legislation: No
Subject to any international management/trade controls: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions Needed
1. Land/water protection -> 1.1. Site/area protection
3. Species management -> 3.1. Species management -> 3.1.1. Harvest management
3. Species management -> 3.1. Species management -> 3.1.2. Trade management
3. Species management -> 3.2. Species recovery

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.3. Life history & ecology
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.2. Harvest level trends
3. Monitoring -> 3.3. Trade trends

Additional Data Fields

Distribution
Lower depth limit (m): 1752
Upper depth limit (m): 0
Habitats and Ecology
Generation Length (years): 25

The IUCN Red List Partnership

The IUCN Red List of Threatened Species™ is produced and managed by the IUCN Global Species Programme, the IUCN Species Survival Commission (SSC) and The IUCN Red List Partnership.

The IUCN Red List Partners are: Arizona State University; BirdLife International; Botanic Gardens Conservation International; Conservation International; NatureServe; Royal Botanic Gardens, Kew; Sapienza University of Rome; Texas A&M University; and Zoological Society of London.