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EXTRACT of the Assessment of CITES Proposal 42 from the

Report of the

SIXTH FAO EXPERT ADVISORY PANEL FOR THE ASSESSMENT OF PROPOSALS TO AMEND APPENDICES I AND II OF CITES CONCERNING COMMERCIALLY-EXPLOITED AQUATIC SPECIES

Rome, 21–25 January 2019

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PREPARATION OF THIS DOCUMENT

This is the report of the Sixth FAO Expert Advisory Panel for the Assessment of Proposals to Amend Appendices I and II of CITES Concerning Commercially-Exploited Aquatic Species (Expert Panel), held at FAO headquarters from 21 to 25 January 2019.

The meeting of the Expert Panel was funded by the FAO Regular Programme with extra assistance from the Governments of Japan and the European Union.

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ABSTRACT

The Sixth FAO Expert Advisory Panel for the Assessment of Proposals to Amend Appendices I and II of CITES Concerning Commercially Exploited Aquatic Species was held at FAO headquarters from 21 to 25 January 2019. The Expert Panel was convened in response to the agreement by the Twenty-Fifth session of the FAO Committee on Fisheries (COFI) on the terms of reference for an expert advisory panel for assessment of proposals to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and following endorsement from the Twenty-Sixth session of COFI to convene the Expert Panel for relevant proposals to future CITES Conference of the Parties.

The objectives of the Expert Panel were to:

i. assess each proposal from a scientific perspective in accordance with the CITES biological listing criteria (Resolution Conf. 9.24 [Rev. CoP17]);
ii. comment, as appropriate, on technical aspects of the proposal in relation to biology, ecology, trade and management issues, as well as, to the extent possible, the likely effectiveness for conservation.

The Expert Panel considered the following four proposals submitted to the eighteenth Conference of the Parties to CITES:

- CoP18 Prop. 42. Proposal to include the mako shark, *Isurus oxyrinchus* in Appendix II in accordance with Article II paragraph 2(a) and *Isurus paucus* in Appendix II in accordance with Article II paragraph 2(b). The Expert Panel assessment of Proposal 42 concluded that the available data do not provide evidence that the species meets the CITES Appendix II listing criteria.
- CoP18 Prop. 43. Proposal to include blackchin guitarfish *Glaucostegus cemiculus* and the sharpnose guitarfish, *Glaucostegus granulatus* in Appendix II in accordance with Article II paragraph 2(a) and inclusion of all other giant guitarfish, *Glaugostegus spp*. in accordance with Article II paragraph 2(b). The Expert Panel assessment of Proposal 43 concluded that there was insufficient evidence to make a decision in relation to CITES criteria, recommending that CITES Parties take note of the one example of extirpation, the widespread lack of management and the very high value of guitarfish fins in international trade.
- CoP18 Prop. 44. Proposal to include white-spotted wedgefish, *Rhynchobatus australiae* and *Rhynchobatus djiddensis* in Appendix II in accordance with Article II paragraph 2(a). If listed, this would include *Rhynchobatus cooki, Rhynchobatus immaculatus, Rhynchobatus laevis, Rhynchobatus luebberti, Rhynchobatus palpebratus, Rhynchobatus springeri, Rhynchorhina mauritaniensis, Rhina ancylostoma*, and all other putative species of the Rhinidae (wedgefish) family in Appendix II in accordance with Article II paragraph 2(b). The Expert Panel assessment of Proposal 44 concluded that there was insufficient evidence to make a decision in relation to CITES criteria, recommending that CITES Parties take note of the widespread lack of management and the very high value of wedgefish fins in international trade.
- CoP18 Prop. 45. Proposal to include the subgenus *Holothuria (Microthele)*: *Holothuria fuscogilva, Holothuria nobilis* and *Holothuria whitmaei* in Appendix II in accordance with Article II paragraph 2(a). The Expert Panel assessment of Proposal 45 concluded that the available data for *Holothuria fuscogilva* does not meet the CITES Appendix II listing criteria, that there was insufficient evidence to make a determination for *Holothuria nobilis*, but that *Holothuria whitmaei* does meet the CITES Appendix II listing criteria.

The report includes an assessment of each of the four proposals in-line with the objectives outlined above, highlighting the Expert Panel's determination of whether information on the species in question meet the CITES Appendix criteria, and noting biology, ecology, trade and management issues, as well as, to the extent possible, the likely effectiveness of a listing for conservation.

CONTENTS

ABBREVIATIONS AND ACRONYMS

CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on the Conservation of Migratory Species of Wild Animals
COFI	FAO Committee on Fisheries
CPUE	catch per unit of effort
EEZ	exclusive economic zone
EPO	Eastern Pacific Ocean
FAD	fish aggregating device
HKCSD	Hong Kong Census and Statistics Department
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IFS	Introduction from the Sea (provisions of CITES)
IPOA-Sharks	International Plan of Action for Conservation and Management of Sharks
ITQ	individually transferable quota
IUCN	International Union for Conservation of Nature
IUU	illegal, unreported and unregulated (fishing)
LEMIS	U.S. Fish and Wildlife Service Law Enforcement Management Information System
MPA	marine protected area
NDF	non-detriment findings
NPOA	National Plan of Action
NPOA-Sharks	National Plan of Action for Conservation and Management of Sharks
RFMO	regional fisheries management organization
TAC	total allowable catch
WCO	World Customs Organization
WCPFC	Western and Central Pacific Fisheries Commission

INTRODUCTION

Background and purpose of the Expert Panel

1. The Fifth FAO Expert Advisory Panel for the Assessment of Proposals to Amend Appendices I and II of CITES Concerning Commercially Exploited Aquatic Species was held in response to the agreement of the Twenty-Fifth Session of the FAO Committee on Fisheries (COFI) to the Terms of Reference for an expert advisory panel for assessment of proposals to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in February 2003. This agreement, to convene the Expert Panel for relevant proposals to future CITES Conference of the Parties, has received the endorsement of subsequent sessions of COFI. The Sixteenth Session of the Sub-Committee on Fish Trade of COFI (Republic of Korea, 4–8 September 2017) acknowledged the positive contribution made by FAO in convening the Expert Panel for the assessment of CITES proposals, and unanimously supported the convening of the Expert Panel for the assessment of proposals to CITES CoP-18, charged with listing or delisting commercially exploited aquatic species.

2. The FAO Expert Panel also falls within the agreement between CITES and FAO – as elaborated in the Memorandum of Understanding between the two organizations – for FAO to carry out a scientific and technical review of all relevant proposals for amendment of Appendices I and II. The results of this review are to be taken into account by the CITES Secretariat when communicating their recommendations on the proposals to the Parties to CITES.

3. The Terms of Reference agreed at the Twenty-Fifth Session of COFI are attached to this report as Appendix A. In accordance with those Terms of Reference, the Expert Panel was established by the FAO Secretariat, according to its standard rules and procedures and observing the principle of equitable geographical representation, and drawing from a roster of recognized experts.

4. The Expert Panel's task was to:

i) assess each proposal from a scientific perspective in accordance with the CITES biological listing criteria, taking account of the recommendations on the criteria made to CITES by FAO;

ii) comment, as appropriate, on technical aspects of the proposal in relation to biology, ecology, trade and management issues, as well as, to the extent possible, the likely effectiveness for conservation.

5. The Thirty-Third COFI (Italy, 9–13 July 2018) noted the need for the timely sharing of expert information on the status of species proposed for CITES listing amendments in order to enable sufficient time for country decision-making.

6. The Sixty-Ninth Standing Committee of CITES (Switzerland, 27 November–1 December 2017) noted the importance of Parties having access to the best available scientific information on species proposed for listing well in advance of the meeting of the Conference of the Parties, and encouraged Parties to consult with FAO as soon as possible when considering submissions of proposals for marine species. The CITES Secretariat was encouraged to consider ways to further enhance the communication of the FAO Expert Panel report.

The Expert Panel meeting

7. The Expert Panel met in Rome from 21 to 25 January 2019, hosted by FAO with funding from the FAO regular programme, with specific funding allocations from the Governments of Japan and the European Union. The agenda adopted for the meeting is included as Appendix B.

8. The Expert Panel consisted of seventeen members (core members and specialists on the species being considered, as well as on aspects of fisheries management and international trade). In addition, observers were invited to attend; two from the CITES Secretariat and one from the Western Australian Fisheries Department. Advice was also sought, as required, from FAO Staff expertise. The list of participants at the meeting (including proponents and observers and those invited who could not attend), is included as Appendix C.

9. The meeting was opened by Mr Manuel Barange, Director of the Fisheries and Aquaculture Department, who welcomed participants and provided some background information to the convening of the meeting of the Expert Panel, and the importance of its task. The welcome speech is included as Appendix D.

10. Mr Alastair Macfarlane was elected Chair of the Expert Panel, and three working groups were formed; the first for mako shark led by Ms Elizabeth Babcock; the second for guitarfish and wedgefish, led by Mr Maurice

Clarks and Mr John Pope; the third, for sea cucumbers, was jointly led by Mr Jeff Kinch and Mr Steve Purcell. Mr Marcelo Vasconcellos, Ms Monica Barone and Mr Kim Friedman from FAO assisted as rapporteurs, while Ms Manuela D'Antoni assisted with required artwork and Mr Fabio Carocci, former FAO employee, assisted in creating mapping products. Ms Safa Gritli provided general logistical and secretarial support.

11. The agenda of the meeting was adopted as tabled, and is attached to this report as Appendix B.

12. Mr Kim Friedman, FAO Senior Fisheries Resources Officer, made a presentation on the Expert Panel Terms of Reference and on the FAO interpretation of the CITES criteria for the inclusion of commercially exploited aquatic species in the CITES Appendices. A secondary presentation highlighted expert feedback on the Fifth Expert Panel reporting process, which was part of an on-going study to improve reporting and communication by FAO into the CITES listing amendment process.

13. Proponents of the four proposals for listing in CITES Appendices were invited to present to the Expert Panel either in person or via voice over internet protocol, and to answer any questions by panel participants for the purposes of clarification. Proponents were represented by the following individuals:

- CoP18 Prop. 42. Mr Hesiquio Benítez Díaz from Mexico (remote access) spoke on the proposal for inclusion of the mako shark, *Isurus oxyrinchus*.
- CoP18 Prop. 43. Mr Mamadou Diallo from Sengal (in person) spoke on the proposal for inclusion of the blackchin guitarfish *Glaucostegus cemiculus* and the sharpnose guitarfish, *Glaucostegus granulatus*. He was assisted by Ms Sarah Fowler (in person).
- CoP18 Prop. 44. Mr Daniel Fernando from Sri Lanka (remote access) spoke on the proposal for inclusion of the white-spotted wedgefish, *Rhynchobatus australiae* and *Rhynchobatus djiddensis*.
- CoP18 Prop. 45. Ms Chantal Conand, MNHN, Mr Arnaud Horellou, MNHN and SA CITES France and Ms Marie Di Simone, MNHN Honorary spoke from France (remote access) on the proposal to include teatfish, *Holothuria (Microthele)*.

14. Mr Kim Friedman presented the methods used and the results of a preliminary assessment of the key criteria for each species. This work involved expert participants filling in an MS Excel file with information and preliminary thoughts on each proposal in advance, noting information relevant to the CITES criteria. These pre-liminary assessments (and related information sources) were used in the panel's deliberations between the 21–25 January 2019.

Proposals of commercial aquatic species for CoP 18

1. Evaluation of the proposals

The Expert Panel considered the following four proposals submitted to the CITES Eighteenth Conference of the Parties (proposals can be downloaded from the CITES website: https://cites.org/eng/cop/18/prop/index.php):

CoP18 Prop. 42. Proposal to include mako shark, *Isurus oxyrinchus* in Appendix II in accordance with Article II paragraph 2(a) and *Isurus paucus* in Appendix II in accordance with Article II paragraph 2(b).

CoP18 Prop. 43. Proposal to include blackchin guitarfish *Glaucostegus cemiculus* and the sharpnose guitarfish, *Glaucostegus granulatus* in Appendix II in accordance with Article II paragraph 2(a) and inclusion of all other giant guitarfish, *Glaugostegus* spp. in accordance with Article II paragraph 2(b).

CoP18 Prop. 44. Proposal to include white-spotted wedgefish, *Rhynchobatus australiae* and *Rhynchobatus djiddensis* in Appendix II in accordance with Article II paragraph 2(a). If listed, this would include *Rhynchobatus cooki*, *Rhynchobatus immaculatus*, *Rhynchobatus laevis*, *Rhynchobatus luebberti*, *Rhynchobatus palpebratus*, *Rhynchobatus springeri*, *Rhynchorhina mauritaniensis*, *Rhina ancylostoma*, and all other putative species of the Rhinidae (wedgefish) family in Appendix II in accordance with Article II paragraph 2(b).

CoP18 Prop. 45. Proposal to include the subgenus *Holothuria* (*Microthele*): *Holothuria fuscogilva*, *Holothuria nobilis* and *Holothuria whitmaei* in Appendix II in accordance with Article II paragraph 2(a).

2. General comments and observations

2.1. Comments received by the FAO Secretariat from Members and Organizations

15. In accordance with the Expert Panels Terms of Reference, FAO Members and Regional Fishery Management Organizations (RFMOs) were notified of the proposals submitted that dealt with commercially exploited aquatic species and were informed that FAO would be convening the Expert Panel. They were invited to send any comments or relevant information to the FAO Secretariat for consideration by the panel. All information received from this call for information and datasets, scientific papers, reports and articles – were held on a shared document drive for use by all the Expert Panel participants.

16. Publicly available information sourced by FAO conveners and Expert Panel participants were shared among the Expert Panel, as well as with the IUCN-Traffic panel and the IUCN Shark Specialist Group (SSG, https://www.iucnssg.org/) on a shared document drive. Information was shared with IUCN and Traffic so that FAO could help ensure the best information available was accessible to all; similarly we hope that if any IUCN or Traffic staff noticed any missing documentation, they might return the favour of sharing information and data with the Expert Panel. Due to the time constraints on the assessment process, and the fact that securing sufficient resources to complete assessments can be a challenge, the development of more cooperative links between various assessment teams has the potential to offer CITES Parties clearer and more harmonized advice from UN and international organizations that have an interest in supporting the management and conservation of aquatic resources.

2.2. Interpretation of the Annex 2a criteria for the inclusion of species in Appendix II in accordance with Article II, paragraph 2(a) of the Convention

17. The Expert Panel applied the CITES Res. Conf. 9.24 (Rev. CoP17) criteria interpreted in accordance with the initial advice provided to CITES by FAO on criteria suitable for commercially exploited aquatic species and as applied since the Second Meeting of the Expert Advisory Panel in 2007. CITES Document CoP14 Inf. 64 – prepared by the FAO Secretariat and submitted to the Fourteenth Conference of the Parties to CITES in 2007 – also provides an explanation of the interpretation of Annex 2a criteria for the inclusion of species in Appendix II, as applied by the Expert Panel.

18. The Expert Panel also noted the conclusions of the "Workshop to review the application of CITES criterion Annex 2a (B) to commercially exploited aquatic species" (FAO, 2002; FAO, 2011), which confirmed the view expressed by FAO (2007) and in CoP14 Inf. 64; in other words that the same definitions, explanations and guidelines in Annex 5 of the Res. Conf. 9.24 (Rev. CoP17), including the 'decline' criteria, apply for both Criterion A and Criterion B of Annex 2a.

19. The Expert Panel was informed of the recommendations made by the CITES Animals Committee and Standing Committee in 2012 (SC62 Doc. 39, see Appendix D) regarding the application of Annex 2a criterion B and the introductory text to commercially exploited aquatic species, in particular the following:

"The Animals Committee finds that there are diverse approaches to the application of Annex 2a criterion B in Resolution Conf. 9.24 (Rev. CoP16). The Animals Committee finds that it is not possible to provide guidance preferring or favouring one approach over another. The Animals Committee recommends that Parties, when applying Annex 2a criterion B when drafting or submitting proposals to amend the CITES Appendices, explain their approach to that criterion, and how the taxon qualifies for the proposed amendment."

2.3. General comments by the Expert Panel on the proposals

20. The Expert Panel welcomed presentations by the representatives of the four proposals. Both the presentations of the key issues outlined in the proposals and the opportunity to ask questions or make clarifications after the initial deliberations improved the Expert Panels ability to make informed assessments of the proposals.

21. With regards to the proposals themselves, the Expert Panel noted that the quality of evidence (data and information) provided to show that the species in question met the CITES Appendix II listing criteria was often particularly poor. Generally speaking the proposals would have benefited from a greater focus on presenting evidence that is related to the CITES criteria as articulated in Res. Conf. 9.24 (Rev. CoP17), as well as the inclusion of the best available information, rather than the selective inclusion of supporting information. Presentation of reliable indices, quantitative wherever possible, is central to determining whether species meet criteria for inclusion in the Appendices, and the basis for such indices should be presented clearly and concisely. Even where information is difficult to quantify, all efforts should be made to present the information

in a form that can be objectively assessed. Participants of this Expert Panel found comments from previous panels were still applicable to most proposals.

22. Most of the proposals relied to some extent on sources that are unpublished or difficult to access. The assessment of proposals would be easier if proponents provided access to copies of all source documents (in pdf format, or similar) along with references within their listing proposals. The Expert Panel gratefully acknowledges those proponents who provided copies of source materials during the meeting.

23. Assessing proposals against the listing criteria requires an assessment of the importance of international trade in driving exploitation and in affecting a species' status. Little information on the relative importance of international trade in driving exploitation was presented in some proposals. This is often due in part to the lack of information on the subject, resulting from the lack of species-level reporting or data collection.

24. As requested by the Thirty-Second Session of COFI in 2012, the Expert Panel made efforts to improve its comments on the technical aspects of proposals and their likely effectiveness for conservation, drawing on inputs from experts on trade, management and issues related to implementation of CITES provisions. However, the Expert Panel noted that the technical aspects involved in the implementation of CITES listings are context-specific and need to be considered on a case-by-case basis. To improve knowledge of these technical aspects, the panel welcomes the current effort to further understand implementation through the delivery of more empirical studies on the impacts and factors influencing the successful implementation of CITES listings of commercially exploited aquatic species (e.g. Friedman *et al.,* 2018).

25. The Chair of the Expert Panel, Mr Alastair Macfarlane, noted in a letter to FAO a number of issues which had an impact on the work of panel experts in their reviews. The letter highlighted the large workload that the Expert Panel was required to cover and the limited time available, suggesting FAO continue to work with CITES to normalize this process so that it is 'fit for purpose' (Appendix F).

2.4. For consideration when reading the reports

26. As in the previous panels, when considering the trends in abundance reported by the proposals, the Expert Panel attempted to evaluate the reliability of each source of information. This was done by assigning a score between zero (no value) and five (highly reliable) to each item of information used to demonstrate population trends. The criteria used to assign a score are included in Appendix E. The Expert Panel recommends that when conducting evaluations and using the reliability index, participants also consider the scientific quality of the references used, granting higher reliability to sources that have been subjected to a robust peer review.

FAO EXPERT ADVISORY PANEL ASSESSMENT REPORT: COP18 PROPOSAL 42

Species

Shortfin Mako shark, *Isurus oxyrinchus* and longfin Mako shark, *Isurus paucus*

Proposal

To include the mako shark, *Isurus oxyrinchus* in Appendix II in accordance with Article II paragraph 2(a) and *Isurus paucus* in Appendix II in accordance with Article II paragraph 2(b).

Assessment summary

SPECIES	MEETS CITES CRITERIA	DOES NOT MEET CITES CRITERIA	OTHER
Isurus oxyrinchus		✓	

Shortfin mako shark are a wide-ranging, highly migratory species and globally distributed. The Panel considered this a low productivity species.

According to the stock assessments from the North Atlantic and North Pacific, the population numbers of shortfin mako sharks in these regions are in the millions. Given that the Expert Panel considered the productivity for the species as low, it follows that declines to 30 percent of historic levels (i.e. a decline of 70 percent) would meet the criteria for listing. In the North Atlantic, the population has declined to about 50 percent of historic levels and, based on projections from the stock assessments, may be at risk of dropping below 30 percent of historic levels in the next few decades if catches are not decreased well below recent levels. The Expert Panel noted that ICCAT has adopted a recommendation to reduce catches in the North Atlantic, which may in turn reduce further population decline. In the Mediterranean, the population has declined, but the extent of this decline is not well determined. For the South Atlantic, Indian, North Pacific and South Pacific oceans, the Expert Panel found no evidence that populations meet the CITES criteria, whether based on historical extent of decline or recent rates of decline. Mako sharks have lower productivity than other shark species; however, they are also relatively data-rich by comparison to other shark species. Viewed globally, and taking account of precautionary considerations (i.e. uncertainty, notably in terms of the precision of estimates), the available data do not provide evidence that the species meets the CITES Appendix II listing criteria.

Scientific assessment in accordance with CITES biological listing criteria

Species distribution

Shortfin mako sharks are a highly migratory species found throughout the world's oceans from 50°N to 50°S latitude (Figure 1). The population structure remains uncertain, most studies and applicable management measures are thus organized in line with the jurisdictional boundaries of the relevant scientific and management agencies. For this reason, the Expert Panel agreed to follow the geographic conventions of the proposal and assume populations are structured by ocean basin, i.e. North and South Atlantic, Mediterranean, Indian and North and South Pacific oceans.

Species productivity

LOW PRODUCTIVITY

There are numerous published estimates of life history parameters for shortfin mako sharks (Table 1). The methods used to age shortfin mako sharks, based on vertebral rings, were revised in the early 2000s and suggest that one band pair is deposited in vertebrae per year (Campana *et al*., 2005; Natanson *et al*., 2002). Validation studies based on radio-bomb carbon in the Atlantic also suggest that one band pair is deposited per year (Ardizzone *et al*., 2006). The Expert Panel therefore considered age and growth papers from the 1980s and 1990s to be unreliable.

New information about the periodicity of the formation of growth bands in the vertebrae of mako sharks (obtained from direct validation studies by tagging sharks with Oxytetracycline), indicated that at least in the northeastern Pacific two growth band pairs form annually in juvenile sharks, changing to a single growth band pair after perhaps five years of age (Wells *et al*., 2013, Kinney *et al*., 2016). However, data in the Western Pacific are inconsistent with a deposition rate of two pair of bands per year for a few years (Semba *et al*., 2009). Although age determination and related population parameters from this region are still uncertain, for stock assessment purposes a meta-analytical approach was used to combine several available data sets from the Pacific Ocean (Takahashi *et al*., 2017).

Despite such inconsistencies among ageing studies, nearly all the modern papers support a low productivity for this species in all ocean basins. In particular, recent ecological risk assessments in the Atlantic (Cortes *et al*., 2015) evaluated the available life history data and found that the shortfin mako shark is one of the least productive of the pelagic shark species. The Expert Panel thus confidently concluded that the species has a low productivity.

Population numbers

Estimates of population numbers of shortfin mako sharks are not available for all regions. However, the assessments available for the North Atlantic and North Pacific indicate current numbers of about 1 million and 8 million individuals respectively (the Expert Panel extracted these numbers from the full computer outputs available for the age-structured assessments conducted by ICCAT, 2017 and ICS, 2018).

Trends and application of the decline criterion

Fishing is believed to be the only anthropogenic source of mortality for mako shark (shortfin mako and longfin mako). Mako shark is a common bycatch species in tuna fisheries in all oceans, which is reported in tuna and swordfish longline fisheries in the Atlantic and in tuna longline and purse seine fisheries in the Pacific and Indian Oceans (proposal). They are also targeted in some fisheries in the North Atlantic and eastern North Pacific.

Under the CITES criteria for commercially exploited aquatic species (Res. Conf. 9.24 Rev. CoP16), a decline to 15–20 percent of the historical baseline for a low-productivity species might justify consideration for an Appendix I listing. Being “near” this level might justify consideration for a listing in Appendix II; for a low-productivity species this would mean 20–30 percent of the historical level (15–20 percent + 5–10 percent precautionary measure).

Where possible, the panel estimates the historical extent of decline from the unfished population level. Such estimation requires some form of defensible stock assessment to cover earlier historical periods for which abundance index data are not available.[1] More simplistic forms of retroactive extrapolation of trends are not considered by the Expert Panel to be defensible; this is because catch, effort and population dynamics (e.g. responses to environmental or density dependence) will have been different earlier in time, leading to differences in the rates of change.

The results given below for the recent rate of decline refer to the most recent ten-year period for the abundance index concerned, consistent with the preference stated in the CITES listing criteria, though results may also be given for longer periods in addition.

A number of abundance indices and two recent stock assessments are available from different parts of the range, but the indices are of varying reliability for this species. The Expert Panel noted that mako sharks have been under-reported in historical catch data. They noted that the two stock assessments discussed below have addressed historical under-reporting with catch reconstructions and trade data. However, the effect of under-reporting on catch rate series (if present) is more difficult to address because changes in reporting over time may introduce bias into some of the indices, as discussed below. The information evaluated by the Expert Panel regarding population trends in different oceanic regions is summarized below and in Table 2.

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[1] Example: the North Atlantic shortfin mako shark population assessment (ICCAT, 2017) provides examples of such approaches to estimate abundance prior to the commencement of fishing. The assessment approach used for North Pacific shortfin mako shark population (ISC 2018) provides another example.

Atlantic Ocean

In summary, in the Atlantic Ocean, the population has declined to about 50 percent of historic levels, and may be at risk of declining below 30 percent of historic levels in the next few decades if catches are not decreased well below current levels. In the South Atlantic there is no evidence that the population is depleted below 30 percent of the historic level. In the Mediterranean, abundance has decreased, but the extent of decline is not well determined.

North Atlantic

For the North Atlantic, population biomass trajectories have been estimated using several types of stock assessment models (ICCAT, 2017). These estimates vary between models in absolute terms (i.e. when expressed in tonnes), but the associated estimates of population trends over time (i.e. percentage changes over given period) are consistent among the models and well estimated, with better precision than estimates in absolute terms. Thus, the assessment models provide good estimates of historical extent and recent rate of population decline. The panel focused on the estimate of spawning stock fecundity from the age-structured stock assessment model (Stock Synthesis), because age-structured models are more accurate than surplus production models for long-lived species with a high age at maturity. From the age-structured model, the estimated historical decline in spawning stock fecundity from 1950 (which was the unfished level) to 2015 was 50 percent (i.e. to 50 percent of the historical, unfished level), while the recent decline (from 2006 to current in 2015) was 32 percent. All the assessment models were broadly consistent, finding historical declines in total biomass of 47 percent to 60 percent, i.e. to a current level of 40 percent –53 percent of the level in 1950, which corresponds to 34 percent to 50 percent of the estimated unfished level and recent declines of 23 percent –32 percent (Figure 2).

The mako shark proposal also estimated trends in abundance using standardized CPUE from the U.S. longline fishery ending in 2000 (Baum *et al*., 2003) or 2005 (Baum and Blanchard, 2010; Cortes *et al*., 2007). These older datasets are not appropriate for calculating recent rates of decline because they are now dated. The same U.S. longline dataset was reanalyzed in 2017 and used as one of the inputs for the ICCAT assessment (ICCAT 2017 Data Meeting Report). The trend in this dataset was consistent with the results of the ICCAT assessment, with a historical decline (1986–2015) of 53 percent (to 47 percent of the 1986 level) and a recent decline of 24 percent. The other indices used in the assessment were generally consistent in showing recent declines.

The proposal further cited a mark-recapture study in the Northeast Atlantic that estimated fishing mortality rates as five times greater than the maximum sustainable rate (Byrne *et al*., 2017). This study had also been discussed in the ICCAT stock assessment meeting, where it was noted that the results were for juvenile sharks in a limited spatial area (ICCAT, 2017). Nevertheless, the panel considered that this study provided evidence that fishing mortality rates are quite high for parts of the population, which adds support to the hypothesis that the stock is declining.

In general, the available data are consistent with a population that has decreased in abundance and is continuing to decline. Although the decrease in abundance up to 2015 does not fall below the threshold of 30 percent of the historical level, the panel considered whether it is likely that the population will fall below this threshold in the near future, if the recent trend continues. The projections calculated during the ICCAT assessment show that continued population decreases are likely, unless there is a substantial decrease in catches (ICCAT, 2017). Projections were computed by ICCAT for the Bayesian Surplus Production (BSP) model only, and these projections all showed that catches around the current level (about 3000 tonnes) would cause the population to decline, and that catches would need to be reduced below 1000 tonnes to prevent overfishing ($F > F_{MSY}$), and below 500 tonnes to allow rebuilding (ICCAT, 2017) (Figure 3). Catches at the current level or above about 2000 tonnes might cause a decline to 30 percent of the historical level in ten or more years. However, if catches declined with abundance (i.e. if the fishing mortality rate was constant), then the rate of decline would be slower. The ICCAT working group was unable to conduct projections for the age-structured model, but considered that that model would probably give more pessimistic outcomes because it incorporates a lag in population growth cause by the high age at maturity. The ICCAT working group plans to update and refine the age-structured model in May 2019, so that it can be used to make projections, which are expected to be more accurate than the production model projections. Because of these considerations, the panel considered that the projections conducted at the 2017 assessment are uncertain. Nevertheless, the projections provide the best available estimate of the expected future change in abundance.

Whether the population continues to decline depends on current and future catches. Beginning in mid-2018, ICCAT recommended that member nations release any shortfin mako sharks that are alive when caught (ICCAT Resolution 17-08 BYC). Because the survival of live-released shortfin mako sharks is thought to be around 70 percent (Campana *et al*., 2016; ICCAT 2017) in longlines, this recommendation is expected to reduce total mortality. However, this recommendation only came into effect in mid-2018. Thus, it will not be known whether this measure has been successful in reducing catches until catch data have been reported for several more years. Considering that the catches would have to be reduced by more than about 65 percent to stop the decline (which would in turn require nearly all sharks taken at present to be released alive, based on current best estimates for their subsequent survival rate), the population may be at risk of being depleted below 30 percent of the historic level at some time over the next few decades if catches are not reduced further. The extent of this risk cannot be quantified without knowing how catches will be affected by the new recommendation for live release.

South Atlantic

For the South Atlantic, the stock assessment is considered highly uncertain owing to the poor quality of the data (ICCAT 2017). The CPUE series generally show an increase over the last 15 years, while the catches and effort have also increased (Figure 4). Increasing catches are expected to cause the population to decline in most circumstances, so these data are unlikely to be consistent with the assumed population dynamics of the species. One explanation, which certainly accounts for some though not necessarily all of this effect, is an increasing efficiency in the reporting of these catches. The ICCAT working group therefore considered the assessment highly uncertain, and conducted no projections. Nevertheless, the assessment found that the population may be experiencing overfishing (fishing mortality higher than the target of Fmsy) and may be overfished (biomass below the target of Bmsy). Due to the uncertainty in the assessment, the known low productivity of shortfin mako sharks, and the chance that the population might be depleted, the ICCAT working group concluded that catches should not increase above current levels. There is no direct evidence that the population is depleted below 30 percent of the historic level.

The panel also reviewed an analysis by Barreto *et al*. (2016b), which analysed CPUE data from multiple fishing fleets in the South Atlantic. Barreto *et al*. (2016b) found that standardized catch rates in a recent time period (2007–2012) were lower than separately standardized catches in the early time period (1978–1997). However, the conclusions that Barreto *et al*. (2016b) draw from these analyses of substantial decline is flawed; this is because the standardization analysis was applied to each of three time periods separately, with different standardization variables, so that the resultant abundance indices are not comparable between time periods and hence cannot be used to infer the extent of decline over the entirety of the period they cover. Thus, the panel did not consider these results informative in regard to estimation of either the historical extent or the recent rate of decline.

No other data on trends were available for the South Atlantic

Mediterranean

In summary, the abundance in the Mediterranean has decreased, but the extent of decline is not well determined.

There is no stock assessment for the Mediterranean. Ferretti *et al*. (2008) present a meta-analysis of time series of different indices of shark abundance in the Mediterranean, which in broad terms supports the existence of a decline. However, a number of these series comprise only catch or sightings information, and only the bycatch of pelagic longline fisheries for swordfish enable effort to be taken into account in developing the abundance index. Only two series (for the Ionian Sea and Spanish Mediterranean waters) provide information on lamnids with reasonable precision, and both do indeed clearly indicate declines of over 90 percent. However, only the latter case pertains to the shortfin mako shark species alone. Furthermore, for both cases the decline is not steady, but precipitous over a period of one or a few years only, which suggest that other factors have some influence on these data in addition to fishing.

IUCN lists the species as critically endangered in the Mediterranean in part because of reports that this previously common species is now rare. It is not known whether there is a distinct population in the Mediterranean or whether the Mediterranean is a nursery area for the North Atlantic population (Calliet *et al*. 2009). An experimental longline survey in the Gulf of Gabes in 2016 found that shortfin mako shark were the second most common shark species caught; this implies that the species is still present in Tunisia, although no information is available on trends (Bradai *et al*., 2017).

The panel concluded that the abundance of the species in the Mediterranean has decreased, but the extent of decline is not well determined.

Indian Ocean

In summary, based on the available information, the Panel found that there is insufficient evidence to justify that the Indian Ocean shortfin mako population meets the CITES historical extent of decline or recent rate of decline criteria.

The IOTC Scientific Committee has noted that considerable uncertainty remains over the relationship between abundance, the standardized CPUE series, and total catches over the past decade. The Expert Panel considered and discussed the estimated stock decline mentioned in the proposal. The first reference showed that historical data indicate an overall decline in nominal CPUE and mean weight of mako sharks (Romanov *et al*., 2008) (Figure 5). It noted that the Romanov study, shows a highly variable trend in average weight, while the hook rate trend is also relatively flat (apart from a peak in the late 1960s). Thus the result quoted in the proposal refers to a nominal CPUE which does not account for factors other than population abundance, which may be influencing catch rate.

Other CPUE series not considered by the proposal have also been presented to the Indian Ocean Tuna Commission (IOTC). The Japanese standardized CPUE series (Figure 6) suggest that the biomass declined from 1994 to 2003, but subsequently increased until 2010 though with substantial fluctuations (Kimoto *et al*., 2011). The standardized CPUE series of shortfin mako catches by the Portuguese longline fleet in the Indian Ocean shows substantial variability between 2000–2016, with a declining trend until 2004 and an increasing trend in more recent years (Coelho *et al*., 2017) (Figure 7).

No formal stock assessment has been conducted for species in the Indian Ocean. A preliminary study was presented to the 2018 IOTC Working Party on Ecosystems and Bycatch (WPEB) by Brunel *et al*. (2018), which is the second reference provided in the proposal to substantiate population declines in the Indian Ocean. The authors of that document state that: "Due to the considerable amount of uncertainty in the estimates, management advice is not clear from this preliminary work." The WPEB further noted that most assessments for data-limited species in the IOTC region have similar patterns of increasing catch and CPUE. These patterns persist even for species with varied life history strategies (low and high resilience to fisheries) which is biologically unlikely. Therefore, it is not suitable to consider this preliminary assessment as providing reliable indications of current or past stock status.

Pacific Ocean

In summary, the Panel found no evidence for either the North or South Pacific that shortfin mako populations meet the CITES historical extent of decline or recent rate of decline criteria. The Panel considers that this finding is robust both in terms of the uncertainties considered in the pertinent studies as well as with regard to other information sourced and assessed by the Panel. The rationale for reaching specific conclusions is described in more detail below.

The Expert Panel reviewed a number of studies (Table 2) including all of the primary studies referenced in Section 4.4 "Population Trends" of the proposal provided. As summarized in Table 2 and described below, some of these references were found to have been superseded by more recent analyses. The proposal references Nakano and Clarke (2006) as reporting a > 30 percent decline in reported catches from the Pacific; however, as this study is for the Atlantic, the Expert Panel concluded that they provide no information on population trends in the Pacific. In addition to the references cited in the proposal, the panel also reviewed other pertinent studies including working papers that contributed to the recent North Pacific shortfin mako assessment.

The Expert Panel followed the same approach as the proposal in considering North Pacific and South Pacific shortfin mako separately. Although the species is found throughout both temperate and tropical waters of both hemispheres, the panel noted that catch rates for this species are highest north of 20ºN and south of 20ºS, suggesting that the core habitat is in temperate and sub-tropical waters (Rice *et al*., 2015, Figure 21;

Kai *et al*., 2017, Figure 6). This resulted in the Expert Panel giving less weight to trends derived from data in tropical waters (i.e. between 20ºN and 20ºS).

North Pacific

The Expert Panel considered that the recent North Pacific shortfin mako assessment (ISC, 2018) provided the best available assessment of trends for the North Pacific population; it noted that this assessment aimed to account for the entire northern hemisphere population (i.e. both the Western and Central as well as the Eastern Pacific), considering biological data (prepared through dedicated workshops), catch data from 1975–2016, in addition to catch and size indices from 17 fisheries for integration into an age-structured population dynamics model. The assessment was undertaken collaboratively by scientists from Canada, Japan, the Republic of Korea, Mexico, Taiwan Province of China and the United States of America, and was presented to and endorsed by the Western and Central Pacific Fisheries Commission. It was considered by the Expert Panel to be spatially and temporally comprehensive, up-to-date and well-reviewed by scientists familiar with the fisheries.

The ISC (2018) assessment drew conclusions from a base case model which included five abundance indices, each assigned either high or medium [priority] on the basis of comprehensiveness, duration, relevance to core habitat and observer coverage (ISC, 2018, Figure ES2):

- Japan distant water and offshore shallow-set longline (high)
- Hawaii shallow-set longline (medium)
- Mexican Ensenada observer longline (medium)
- Japanese deep-set research and training vessel longline (medium)
- Taiwanese large-scale longline (medium)

In addition to the base case, six alternatives scenarios were also explored to examine key uncertainties. The Expert Panel agreed with the ISC abundance index selections and also examined ISC rationale for excluding the Hawaii deep-set longline fishery abundance index, which is based on observer data and was characterized as showing a stable trend (ISC, 2017). This rationale – that the deep-set fishery is outside the species' core habitat – was considered reasonable.

The age-structured model integrated the biological, catch and size information to produce a time series of spawning abundance from 1975–2016 (ISC, 2018, Figure ES4). The results indicated that the current spawning abundance relative to unfished levels is 58 percent [95 percent CI=30–86; range of 51–68 percent across alternative scenarios (ISC, 2018, Table ES3)]. The model accounted for the fact that the population had been fished for some time prior to 1975 (ISC, 2018, p. 32). Therefore, the panel considered that the assessment's best estimate of depletion to 58 percent (95 percent CI= 30 percent–86 percent) of its baseline represented the historical extent of decline. Based on these considerations, the Expert Panel was confident that the best available scientific evidence indicates that the North Pacific shortfin mako does not meet the CITES Appendix II criteria for historical extent of decline.

To consider the recent rate of decline, the Expert Panel applied a log-linear regression to spawning abundance estimates for 2007–2016, as given in ISC (2018). As noted in the assessment, this trend increases slightly, the Expert Panel considered this to be a likely consequence of the large decrease in catch levels from the 1980s to the present. The linear trend computed by the panel (Table 3) was an annual rate of increase of 0.16 percent (95 percent confidence interval of 0.09 to 0.23 percent). Based on these considerations, the Expert Panel was confident that the best available scientific evidence indicates that the North Pacific shortfin mako does not meet the CITES Appendix II criteria for recent rate of decline.

In considering the future condition of the population the Expert Panel noted the ISC (2018, Figure ES8) conclusions that the population will gradually increase if fishing mortality does not increase over recent levels (2013–2015). The Expert Panel noted that North Pacific fishing effort in the shortfin mako core habitat has been decreasing since 2008 (Figure 8), and considered the ISC (2018) prediction of a gradual stock increase to be reasonable, assuming that current levels of fishing effort do not increase.

The Expert Panel also reviewed other studies containing information on North Pacific shortfin mako population trends (Table 2). Clarke *et al*. (2013) and Rice *et al*. (2015) analysed data for the genus *Isurus* due to a lack of species-specific observer data in the early part of the time series and the possibility of misidentification. These two studies used the same observer-based dataset. Although the latter study's time series might appear to be longer and consequently preferred, the Expert Panel noted that in the case of the North Pacific, Rice *et al*. (2015) lacked data for Regions 1 and 2 (20ºN to 50ºN) from 2012 onwards. Hence, for recent years their study captured data from the tropical North Pacific only, which is not core habitat for shortfin mako. Furthermore, the majority of North Pacific data analysed by both Clarke *et al*. (2013) and Rice *et al*. (2015) derives from the Hawaii longline fishery observer programme. These data were reanalysed by US scientists in 2017, using an approach that the Expert Panel considered to be sound, and showed a stable trend from 1995–2016 (ISC, 2017). A portion of these data were included in the base case scenario for the ISC North Pacific assessment (ISC 2018) (see discussion above). Therefore, the Expert Panel considered that the information in Clarke *et al*. (2013) and Rice *et al*. (2015) was superseded by the ISC (2018) assessment.

The Expert Panel also reviewed three studies of North Pacific shortfin mako population trends based on data from the small-scale longline fishery based in Taiwan, Province of China: Chang and Liu, 2009; Tsai *et al*. (2011) and Tsai *et al*. (2014). The Expert Panel considered that these studies did not meaningfully contribute to the information in ISC (2018) for several reasons. First, the component of the North Pacific shortfin mako population considered in these three studies is a part only of the population considered in the ISC (2018) assessment (which considers the longline fleet operating on a large spatial scale, see Tsai *et al*. (2017)). Second, the Expert Panel noted that these studies were based on landings data, rather than catch per unit effort, as logbooks were not required to record sharks by species until 2005, and landings data are not reliable as indices of abundance. Third, some methodological questions arose concerning these studies. The Expert Panel noted that Chang and Liu (2009) and Tsai *et al*. (2011) used variants of VPA, but without any external "tuning" information as is customarily and additionally provided to such age-structured analyses in the form of independent survey estimates of abundance or CPUE series. Without such information, trends estimated from such analyses will be poorly determined and thus unreliable. The Tsai *et al*. (2014) study is a refined version of a Leslie matrix approach, which effectively estimates population growth rates from the difference between birth and death rates. While in this case there is good information on the former, estimates of the latter rely on general relationships with other life-history parameters, which typically yield values with poor precision when checked across species. As a result, the estimates of growth rate provided in this paper are unlikely to be reliable.

In summary, the Expert Panel considered that the ISC assessment offered a more robust methodology to account for the trends in the proportion of the shortfin mako population referenced in these three studies, by incorporating standardized catch rates and broader and more recent (2005–2016) data coverage; as such the ISC assessment was considered to provide much more reliable outputs.

South Pacific

The Expert Panel noted that there is no existing stock assessment for the South Pacific shortfin mako and therefore catch rate indicators provide the best available information to estimate the extent of any stock decline. Similar to the North Pacific, the core habitat for the South Pacific shortfin mako was considered to be south of 20ºS (see Rice *et al*., 2015; Figure 21). Three studies were reviewed by the panel: Clarke *et al*., 2013; Rice *et al*., 2015 and Francis *et al*., 2014 (Table 2).

As explained above, Clarke *et al*. (2013) was found to have been superseded by Rice *et al*. (2015), which uses the same dataset with a longer time series. The Expert Panel considered that Rice *et al*. (2015) offers a useful broad-scale view of the population trends in the South Pacific. However, the panel noted some issues with the methodology, which may have failed to account properly for the influence of area in the catch rate standardization (see Rice *et al*., 2015; Table 8). Another shortcoming is that the study lacked data for a large portion of the region of interest (Region 6) in the final year of the analysis (2014) (see Rice *et al*., 2015; Table 2 and Figure 91) and the panel noted the authors' caution that data for 2014 were incomplete (see Rice *et al*., 2015; Executive Summary). Taken together with the absence of an area factor in the analysis, this means that the standardized estimate for 2014 is not reliable. When computing historic and recent rates of decline the Expert Panel decided to exclude the 2014 data point for these reasons. The Expert Panel found that the entire time series (1996–2013) showed an increasing trend of 1.3 percent per annum (95 percent CI of -0.01 percent to 3.6 percent), with the most recent and reliable ten years (2004–2013, i.e. 2014 excluded) an increasing trend of 2.2 percent p.a. (95% CI of -1.7% to 6.0%) (Table 3). Although the confidence interval for both trends includes negative values indicating some possibility that the population may in fact be decreasing, this is considered to be small and an insufficient basis for concluding that the South Pacific shortfin mako population meets the CITES Appendix II listing criteria for either the historical extent or recent rate of decline.

The Expert Panel also reviewed data from Francis *et al*. (2014) on catch rate indicators for the shortfin mako population in New Zealand waters. Although the area covered by this study is small relative to Rice *et al*. (2015), it was considered important to contrast the two results because: a) while Rice *et al*. (2015) included some data from New Zealand in their study, the coverage by area and year are different; and b) the Francis *et al*. (2014) study provides a very consistent time series focused on specific fisheries which is advantageous insofar as it allows for greater confidence in relation to its comparability over time when determining a population trend. Francis *et al*. (2014) provides four population trends based on logbooks from the domestic fishery (north and south), logbooks from the Japanese fishery in the south, and observer data (Figure 9). The authors characterize three of the time series as having a "nil" trend, whereas the northern domestic fishery is characterized as having an increasing trend. The Expert Panel fit log-linear regressions to all years for all four series; in addition, it computed a trend for the whole of the observer series (1993–2013) as well as the last ten years (2004–2013) (Table 3). Only the domestic southern fishery showed a median negative trend (-9.1 percent per year), although the confidence interval is large and the fit is not statistically significant. The fit to the entire length of the observer series is also not significant, although it does show some possibility that the trend may be decreasing (median of 1.2 percent with 95 percent CI of -1.3 percent to 3.6 percent). Each of the other fits is significant and indicates an increasing population trend (Table 3). The Expert Panel considered that the data in Francis *et al*. (2014) supports that from Rice *et al*. (2015) in concluding that the South Pacific shortfin mako population does not meet the CITES Appendix II listing criteria for either the historical extent or recent rate of decline.

As a final consideration to address extent of decline, the Expert Panel examined whether the identified population trends are consistent with trends in overall longline fishing effort in the South Pacific. Figure 10 shows the overall longline effort trend south of 20ºS (i.e. the core habitat for South Pacific shortfin mako) and indicates that average fishing effort in the most recent ten years has been considerably higher than in the past. As available data thus indicate that South Pacific shortfin mako have been able to increase slightly under current levels of fishing effort, it seems unlikely that the population would have been severely depleted by the lower level of fishing effort in previous years.

With regard to shortfin mako population trends in the southern hemisphere of the Eastern Pacific, the Expert Panel noted a paper by Bustamante and Bennett (2013) which provides some information on the Chilean fishery but does not contain information on population trends. The Expert Panel was thus unable to draw any conclusions about shortfin mako population trends from this study.

Modifying risk factors

The Expert Panel considered whether there were any biological characteristics of shortfin mako sharks that would modify their probability of being depleted to the point where they would meet the criteria for listing. The low productivity of the species is considered in the species productivity section above. That the species is circumglobal and wide-ranging is a positive modifying factor; a study in the southern hemisphere by Corrigan *et al*. (2018) found that genetic and telemetry data together suggest that shortfin mako populations may be genetically homogenous across large geographical areas as a consequence of few reproductively active migrants, although spatial partitioning exists.

Shortfin mako sharks are commonly caught as bycatch on longline sets targeting swordfish or tunas, so it is not likely that longline vessels could avoid catching the species. However, preliminary studies in the Atlantic Ocean have indicated that releasing animals brought to the vessel alive could be a potentially effective measure to reduce fishing mortality, owing to a relatively high post-release survival of about 70 percent (Campana *et al*., 2016, Coehlo *et al*., 2017).

The ecological risk assessment (ERA) conducted for the Indian Ocean by the WPEB and SC in 2018 (Murua *et al*., 2018) consisted of a semi-quantitative risk assessment analysis to evaluate the resilience of shark species to the impact of a given fishery by combining the biological productivity of the species and its susceptibility to each fishing gear type. Shortfin mako sharks received the highest vulnerability ranking (No. 1) in the ERA rank for longline gear because it was characterised as one of the least productive shark species, and has a high susceptibility to longline gear. Shortfin mako sharks were estimated to be the fourth most vulnerable shark species in the ERA ranking for purse seine gear, but had lower levels of vulnerability than to longline gear because of the lower susceptibility of the species to purse seine gear.

The ecological risk assessment (ERA) conducted for the Atlantic Ocean (Cortes *et al*. 2015), which was based on the arithmetic mean vulnerability index (this did not show preferential correlation with the productivity or susceptibility indices), concluded that both longfin and shortfin mako sharks were among the most vulnerable shark species in the Atlantic, with the highest susceptibility values corresponding to shortfin mako (*I. oxyrinchus*).

Summary of evaluation and assessment of biological listing criteria

According to the stock assessments from the North Atlantic and North Pacific, the population numbers of shortfin mako sharks in these regions are in the millions. Given that the Expert Panel considered the productivity for the species as low, it follows that declines to 30 percent of historic levels (i.e. a decline of 70 percent) would meet the criteria for listing. In the North Atlantic, the population has declined to about 50 percent of historic levels and, based on projections from the stock assessments, may be at risk of declining below 30 percent of historic levels in the next few decades if catches are not decreased well below recent levels. The Expert Panel noted that ICCAT has adopted a recommendation to reduce catches in the North Atlantic, which may in turn reduce further population decline. In the Mediterranean, the population has declined, but the extent of decline is not well determined. For the South Atlantic, Indian Ocean, North Pacific and South Pacific, the Expert Panel found no evidence that populations meet the CITES criteria for either historical extent of decline or recent rate of decline. Mako sharks have lower productivity than other shark species; however, they are also relatively data-rich compared to other shark species. Viewed globally, and taking account of precautionary considerations (i.e. uncertainty, including precision, of estimates), the available data do not provide evidence that the species meets the CITES Appendix II listing criteria.

Comments on technical aspects relating to management, trade and likely effectiveness of implementation of a CITES listing

Management comment

Management regimes/measures related to governance, population monitoring and compliance, currently adopted

International/Regional:

- The FAO IPOA-Sharks underscores the responsibilities of fishing and coastal states in sustaining shark populations, ensuring the full utilization of sharks that are retained and improving shark data collection and monitoring (see Appendix G, especially points 3).
- The formally adopted FAO Port State Measures Agreement sets out port state measures to prevent, deter and eliminate Illegal, Unreported and Unregulated (IUU) fishing. This agreement requires that any inspections conducted on fishing vessels entering ports should include verification that all species exploited have been taken in compliance with international law, international conventions and measures adopted by RFMOs (see Appendix G, especially points 5i).
- All Tuna RFMOs have adopted certain management measures. These include measures such as prohibitions on finning, encouraging the live release of sharks (in non-targeting fisheries) to reduce fishing mortality, as well as the mandatory collection and submission of data for these species. Management measures for shortfin mako sharks specifically, which include requirements for live release if possible, have been adopted by ICCAT in the North Atlantic as that stock is currently declining as a result of excessive fishing mortality (see Appendix G, especially points 5ii).
- Some Tuna-RFMOs have already included oceanic, pelagic and highly migratory elasmobranchs in the scope of their Conventions, while ICCAT is amending the scope of its Convention so that they are included (see Appendix G, especially points 4, 5i).
- ICCAT plans to conduct a future assessment with; projections based on the Stock Synthesis model; this approach is likely to provide improved advice as it takes into account the biological characteristics of shortfin mako sharks, such as a distinctive growth by sex (which the production model fails to do).

- With reference to the lack of species-specific management action for shortfin mako shark by tuna regional fisheries management organizations stated in the proposal, the Expert Panel noted that their evaluation of the available datad in the Western and Central Pacific, found that there is no evidence of a steady decline over the past decade in catch rates of mako sharks in either the North or South Pacific. The Western and Central Pacific Fisheries Commission has considered these studies, but given the results, no party has raised the need for management action for the Commission's consideration. A stock assessment for the South Pacific has been scheduled in the WCPFC Shark Research Plan for 2021. To the best of the Expert Panel's knowledge, management action for the shortfin mako has not yet been considered necessary for debate in CCSBT or IATTC. In the Indian Ocean, the IOTC Scientific Committee has stated that despite the absence of stock assessment information, the Commission should consider taking a cautious approach by implementing some management actions for shortfin mako sharks. ICCAT has considered and adopted a management measure for shortfin mako in the North Atlantic on the basis of recent stock assessment results, as described in Sections of this report related to population trends.
- In 2010 and 2011, the General Fisheries Commission for the Mediterranean (GFCM) adopted ad-hoc measures to reduce the bycatch of pelagic sharks, including mako sharks. In 2012, the GFCM banned finning in the Mediterranean and Black Sea and also prohibited the capture and sale of mako and other sharks listed in Annex II of the SPA/BD Protocol of the Barcelona Convention concerning specially protected areas and biological diversity in the Mediterranean.
- Some tuna RFMOs require that catches of sharks are recorded and reported annually at the species level. This is complemented by observer programmes and the reporting of discards (see Appendix G, especially points 5ii, iii).
- There are research programmes on sharks at regional and national levels; these include shortfin mako sharks.

National measures:

- Some states implement regional management measures (see above) through national plans of action and or finning controls, which may include requiring fins to be attached and/or the prohibition of finning. Mako shark is generally fully utilized when caught (see Appendix G, especially points 3).
- Some states have fully protected shortfin mako sharks throughout their EEZs (see Appendix G, especially points 3).
- Some States require catches of shortfin mako sharks, as an individual species, to be recorded and reported annually (see Appendix G, especially points 3).
- Some states limit shortfin mako mortality through annual total allowable catches (TACs) as well as placing a limit on the number or size of mako sharks caught in non-commercial, including recreational fisheries (see Appendix G, especially points 3, 5ii).
- MPAs and other spatial measures to protect sharks and their critical habitats have been established in several EEZs.
- Temporal management measures, such as periods when no fishing is permitted (e.g. three months every year in Mexico and some Central American countries) have also been established to protect sharks, largely during their reproductive periods. They are more susceptible to being caught in coastal areas in such periods, as in the case of the shortfin mako shark in northwestern Mexico.
- Catches of specifically shortfin mako sharks are reported to FAO by a small number of states only; others include shortfin mako shark catches within their reports of shark and ray catches.

Comment on anticipated change (positive and negative) in these management measures (and requirement for additional management), if species were listed under App II of CITES

- A requirement for conducting non-detriment findings (NDFs) would address the need to determine and take all sources of mortality into account (see Appendix G, especially points 4).

- An Appendix II listing may generate additional information such as trade data that can assist fisheries managers to assess fishing mortality rates. The reporting of shortfin mako shark catches, where landing is permitted, would be improved in some cases (see Appendix G, especially points 5iii).
- Appendix II listing could assist in improving compliance by providing an impediment to the trade of shortfin mako shark products illegally obtained from fisheries in which retention bans are in place, owing to the requirement to supply CITES documentation (see Appendix G, especially points 4).
- All catches landed from the high seas would require Introduction from the Sea Certification or Export Permits which require NDFs and legal acquisition findings, or the corresponding requirements under Introduction from the Sea. This applies not only to landings for commercial purposes but also to the movement of samples collected for scientific purposes (see Appendix G, especially points 4, 5i).
- Ongoing work by FAO and CITES on the implementation and effect of listing is described in Annex G of this report.

Trade comment

Shortfin mako shark is utilized in a variety of product forms in domestic markets and international trade, including as meat for human and animal (domestic pet) consumption, livers, cartilage, fins and skin (Clarke *et al*., 2013; Appendix G, especially points 5iii).

The Expert Panel noted that the presence of shortfin mako fins and meat in international trade is well documented based on the references cited in the proposal. The Panel acknowledges that shark fin continues to be a highly valued commodity primarily amongst Asian consumers both in Asia and elsewhere. Additional information available to the Expert Panel noted that total global trade quantities are traditionally gauged by means of quantities imported by Hong Kong SAR; on this basis the market declined rapidly from a peak in 2003, falling sharply again after 2011 (Shea and To, 2017). A number of factors may have contributed to this second drop (Dent and Clarke, 2015), but it appears likely that new austerity regulations aimed at curbing conspicuous consumption by mainland Chinese government officials is a major factor (Jeffreys 2016, Fabinyi 2017). Quantities imported into Hong Kong SAR appear to have settled at 2012 levels, i.e. nominally at about half of the post-2003 volumes, through 2016 (Shea and To, 2017; HKCSD, unpublished data).

At the same time as the Chinese market has apparently been suppressed, Southeast Asian markets appear to be gaining influence either as processors, traders and/or consumers (Dent and Clarke 2015; Eriksson and Clarke 2015). The ongoing complexity and dynamism of the trade, along with traditional and continuing lack of transparency issues, make it difficult to quantify market sizes and shares which means that more precise trend information is unavailable.

Currently there is no culturing of mako sharks in aquaculture and it is unlikely that as a species they are suitable for aquaculture in currently developed aquaculture systems.

Trade (market transparency, documentation and level of IUU)

- In general, there are no specific catch or trade documentation schemes for sharks. Existing general catch documentation systems in some countries could facilitate the issuing of legal acquisition findings (e.g. EU Catch Certification requirements).
- Identifying sharks and shark products at a species level in international trade is severely constrained. There is finite capacity in the commonly used World Customs Organization (WCO) harmonized system (HS) of tariff classification which means that only a limited range of products derived from mako sharks, such as dried shark fin, could be identified in future amendments to the harmonized system. The earliest that such amendments might be implemented, assuming adoption in the World Customs Organization, would be 2027.
- Trade in mako shark either as fresh or frozen whole fish or the meat of mako shark cannot be identified at a species level, owing to limitations in the numerical structure of the harmonized system.[2]

[2] http://www.wcoomd.org/en/faq/harmonized_system_faq.aspx#q9.

- There are historical and current efforts by authorities and organizations other than Customs administrations to monitor the species composition of the shark fin trade and these may continue to provide insights. Other regulatory requirements related to traceability and transparency in the trade and marketing of fisheries products in certain countries require species and fisheries' origin identification of fish at the point of sale to consumers (see Appendix G, especially points 5ii).
- A CITES Appendix II listing applies only to international trade in listed species and their products. Domestic trade in mako sharks and their products would be unaffected by listing in CITES Appendix II. Landing and selling mako sharks could therefore continue in domestic markets without any changes to current practices.

Comment on anticipated change (positive and negative) in trade related issues, if species were listed under Appendix II of CITES

- The CITES provisions on trade in specimens of species listed in Appendix II require an export permit by the exporting country, which shall only be granted if the national CITES authorities are satisfied that: 1) the export is not detrimental to the survival of the species in the wild; and 2) the specimens were not obtained in contravention of the national laws of that state.
- Should shortfin mako be listed in Appendix II, the extension of the listing to longfin mako shark on the basis of the 'look-alike' provision in the proposal will require the same considerations and export permitting permissions for that species.
- The trade will be recorded in the CITES trade database, and this will improve overall trade information (see Appendix G, especially points 5iii).
- States' abilities to make NDFs for highly migratory species is limited in the absence of region-wide assessments, as evidenced by difficulties encountered in making NDFs for shark species that have already been listed. Under these conditions the following outcomes can occur.
  - trade in the species and its products ceases;
  - trade continues without proper CITES documentation (also known as "illegal trade"); and/or
  - trade continues with inadequate NDFs.
- There may be specific challenges for some long line fleets trans-shipping in port or at sea because non-target species, including mako sharks, are often not separated from target tuna catches until final landing at the destination port. CITES export certification – including Introduction from the Sea certification – for mako sharks caught in the high seas beyond national jurisdiction would require cargo separation to ensure that the product consigned can be reconciled against certificates.
- The implementation of previous listing decisions for sharks has taken some time. Some of the delays are a result of legislative processes, while there can be a lag of three or more years in the collection and transmission of trade data to the CITES Secretariat. Some administrations are having to implement new administrative procedures to provide and manage Introduction from the Sea certification to permit the landing of listed species from high-seas fisheries.

Basis for Article II paragraph (2b) ('look-alike') Appendix II listing of I. paucus

As indicated in the CITES listing criteria (Resolution Conf. 9.24 Rev. CoP15), the listing of *I. paucus* could be justified if the parts and derivatives of these species in trade resemble those of the listed Appendix II species *(I. oxyrinchus*) to such an extent that enforcement officers were unable to distinguish them.

The proposal cites Clarke *et al*. (2006) to argue that longfin mako sharks should be listed alongside shortfin mako sharks as look-alikes because, "most traders reported that they placed these fins in the same category as shortfin mako". In fact, Clarke *et al*. (2006) states that "some traders mentioned infrequent mixing [of shortfin mako] with the less abundant longfin mako". Of 69 Qing Lian samples collected, 6 were genetically identified as longfin mako. Traders also mentioned that longfin mako fins are sometimes mixed with thresher shark fins (Clarke *et al*., 2006). The Expert Panel understands the situation to be that the majority of traders, though perhaps not all, can distinguish between shortfin and longfin mako fins and that there is in fact a market name for low-quality Laminid fins potentially including longfin mako (Qing Hua). However, they will not always treat these fins separately as commodities, particularly when there is no difference in commercial value. For example, the longfin mako pectoral and thresher pectoral fins have similar value and are co-mingled; in contrast, the longfin mako dorsal and shortfin mako dorsal fins may have similar values and thus may be combined. The condition and quality (e.g. size) of the fins may also determine whether traders consider shortfin and longfin mako fins as separate products (Clarke, pers. comm.). The proposal does not clearly address the question of whether shortfin and longfin mako can be easily distinguished by enforcement officials, but the Expert Panel deems that the difficulties for enforcement officials' identification would be similar to those for fins of other species already listed on Appendix II of CITES: in other words, with the proper tools the species can be distinguished.

The Expert Panel found no evidence that longfin mako meat appears in international trade. However, some of the scientific studies reviewed noted that some data sets (e.g. observer data in the early years of observer programmes) did not reliably distinguish between shortfin and longfin mako catches (Clarke *et al*., 2013; Rice *et al*., 2015). Although these species in whole form are quite distinctive due to the difference in pectoral fin length, processed carcasses would likely to be difficult to separate. Again, this is similar to issues associated with shark species already listed on CITES Appendix II.

Likely effectiveness for conservation of a CITES Appendix II listing: summary comment in relation to technical aspects of biology, ecology, management and trade.

Shortfin mako shark (and by virtue of being a look-alike species, longfin mako shark) is being proposed for CITES Appendix II listing in accordance with Article II paragraph 2(a) of the Convention, on the basis of meeting Criterion A in Annex 2a of Resolution Conf. 9.24 (Rev. CoP16), which states: 'It is known, or can be inferred or projected, that the regulation of trade in the species is necessary to avoid it becoming eligible for inclusion in Appendix I in the near future'.

It is difficult to draw clear conclusions regarding the effectiveness of existing and future management and trade measures owing to the lack of data available to assess these measures (see Appendix G, especially points 5iv). However, it is noted that if properly implemented, a CITES Appendix II listing would be expected to result in better monitoring and reporting of catches entering international trade from shortfin mako shark populations. Improved monitoring should enable new or enhanced assessments of stock status and the subsequent adoption of management measures that ensure the sustainability of harvests where these are still permitted. Harvests from international waters would fall under the 'Introduction from the Sea' (IFS) provisions of the CITES Convention. These would require CITES documentation at the species level for specimens entering the jurisdiction of a state from international waters, along with a NDFs indicating that the harvest was sustainable and consistent with relevant measures under international law.

Listing would also provide an additional control to ensure that products entering international trade are derived from legal and sustainable fisheries. A CITES Appendix II listing, if implemented effectively, could also act as a complementary measure for regulations implemented by fishery management authorities; in particular, where RFMOs have adopted measures encouraging the live release of shortfin mako sharks. It should be noted that states' abilities to make NDFs for highly migratory species is limited in the absence of region-wide assessments, as evidenced by difficulties encountered in making NDFs for shark species that have already been listed. Under these conditions the following outcomes can occur: previous trade ceases, trade continues without proper CITES documentation (i.e. illegal trade) and/or trade continues with inadequate NDFs.

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Tables and figures

Table 1. Information for assessing productivity of shortfin Mako shark. M: male; F: female.

PARAMETER	STATUS	INFORMATION	AREA	SOURCE	COMMENTS
Natural mortality	Low	0.128	North Pacific	ISC-SWG, 2018	Estimated from an empirical equation based on the maximum age for cetaceans (Hoenig, 1983) and the maximum age is given based on the method of bomb-radiocarbon (Ardizzone, 2006) that is a robust methodology.
Natural mortality	Low	0.072	North Pacific	Calliet *et al.*, 1983	Study based on methodology of age reading on vertebrae that underestimated ages. The methodology has been revised in recent years.
Natural mortality	Low	0.089–0.203 (M), 0.077–0.244 (F)	North Pacific	Chang and Liu, 2009	Four empirical equations (Hoenig, 1983; two equations: Jensen 1996; Peterson and Wroblewski, 1984) were used to estimate the values. However, the key biological parameters used to estimate the values were estimated based on the biological data collected from the limited area in the water near Taiwan, Province of China.
Growth	Low	K: 0.05	North Pacific	Ribot-Carballal *et al.*, 2005	Study based on overestimated amount of growth band pairs. Sampling covers also a low range of the artisanal fisheries in the northwestern Mexican Pacific.
Growth	Low	K:0.128 (F), 0.174 (M)	North Pacific	ISC-SWG 2018; ISC-SWG, 2018; Takahashi *et al.*, 2017	Due to the uncertainties in the age determination, a meta-analytic approach for estimating growth was adopted by the SHARKWG (Takahashi *et al.*, 2017). This approach treated data from the western north Pacific as having a constant band pair deposition rate and data from the eastern Pacific as having a band pair deposition rate that changes from 2 to 1 band pairs per year after age 5. This approach allowed to produce a single growth model for the northern stock that included data collected from across the basin.
Growth	Medium	K: 0.215 (M), 0.158 (F)	North Pacific	Calliet *et al.*, 1983	Study based on methodology of age reading on vertebrae that underestimated ages. The methodology has been revised in recent years.
Growth	Low	K: 0.05 (F), 0.056 (M)	North Pacific	Chang and Liu, 2009	Same comments as that for K in Chinese Taipei estimated by Chang and Liu (2009)
Growth	Low	K: 0.09 (F), 0.16 (M)	North Pacific (Western and Central North)	Semba *et al.*, 2009	Same comments as that for K in North Pacific estimated by ISC (2018)
Time to maturity	Medium	7 to 8 (M)	North Pacific	Calliet *et al.*, 1983	Study based on methodology of age reading on vertebrae that underestimated ages. The methodology has been adjusted in recent years.
Time to maturity	Low	12 (M), 18 (F)	North Pacific	Chang and Liu, 2009	The weak point is that the values were estimated based on the biological data collected from the limited area in the water near Taiwan, Province of China.
Longevity	Low	31	North Pacific	ISC-SWG, 2018	The method of bomb-radiocarbon (Ardizzone, 2006) that is the robust methodology to estimate the longevity.
Longevity	Low	45	North Pacific	Caillet *et al.*, 1983	Study based on methodology of age reading on vertebrae that underestimated ages. The methodology has been revised in recent years.

Table 1. (continued).

PARAMETER	STATUS	INFORMATION	AREA	SOURCE	COMMENTS
Natural mortality	Low	0.1–0.24 (M), 0.09–0.16 (F)	South Pacific	Bishop *et al*., 2006	The inherent difficulty in estimating M, author suggested that M is most likely in the range 0.1–0.15, indicating a low level of natural mortality and productivity.
Growth	Low	K: 0.09	South Pacific	Bustamante and Bennet, 2013	No value in the paper.
Growth	Low	K: 0.076–0.087	South Pacific	Cerna and Licandeo, 2009	The results for both sexes showed that the $L\infty$ was close to the maximum size observed (Lmax) off Chilean waters (330 and 285 cm TL, for females and males respectively), indicating that the VBGM well represented the growth of this species in the study area.
Growth	Low	K: 0.013– 0.052	South Pacific	Bishop *et al*., 2006	The author mentioned that there are several possible reasons for the poor fit of the Von-Beltalanffy model to young age classes.
Time to maturity	Low	9 to 10 (M), 20 to 21 (F)	South Pacific	Francis, 2016	The output of Bishop *et al*. (2006) is superseded by this study. However, there is still large uncertainty in the aging remained.
Time to maturity	Low	7 (M), 19 (F)	South Pacific	Bishop *et al*., 2006	Differences in growth rates calculated using differences assumed band deposition rates are large uncertainties.
Longevity	Low	29– 32	South Pacific	Bishop *et al*., 2006	Longevity is reasonable because the value is the almost same as that estimated from the Bomb Radiocarbon (Ardizzone 2006).
Intrinsic rate of population growth (r)	Low	0.031 – 0.06	North Atlantic	Cortés, 2017	Methodology is likely reasonable, however, the values are likely too small because the BSPM provided a higher values than these values (ICCAT, 2017).
Growth	Low	K: 0.054	North Atlantic	Cortés *et al*., 2017	The data has an issue because the original paper referred by Cortes *et al*., 2017 is inaccessible.
Growth	Low	K: 0.087 (M), 0.125 (F)	North Atlantic	Natanson *et al*., 2006	Multiple types of data was used. Vertebral centra of 258 specimens (118 males, 140 females), ranging in size from 64 to 340 cm fork length (FL) were compared with data from 22 tag–recaptured individuals (74–193 cm FL) and length–frequency data from 1822 individuals (1035 males, 787 females; 65–215 cm FL). Annual bandpair deposition, confirmed by a concurrent bomb radiocarbon validation study, was used as the basis for band interpretation.
Growth	Medium	K: 0.266 (M), 0.203 (F)	North Atlantic	Pratt and Casey, 1983	Study based on methodology of age reading on vertebrae that underestimated ages. The methodology has been revised in recent years.
Time to maturity	Low	18 (average age at maturity)	North Atlantic	Cortés *et al*., 2017	The methodology is uncertain because the original paper referred by Cortes *et al*., 2017 is inaccessible.
Time to maturity	Low	8 (M), 18 (F)	North Atlantic	Natanson *et al*., 2006	Same comments as that for K (Natanson *et al*., 2006)

Table 1. (continued).

PARAMETER	STATUS	INFORMATION	AREA	SOURCE	COMMENTS
Longevity	Low	21 (M), 38 (F)	North Atlantic	Natanson *et al*., 2006	Same comments as that for K (Natanson *et al*., 2006)
Longevity	Low	32 (F)	North Atlantic	Cortés *et al* 2017	The methodology is uncertain because the original paper referred by Cortes *et al*., 2017 is inaccessible.
Longevity	Medium	4.5 (M), 11.5 (F)	North Atlantic	Pratt and Casey, 1983	Study based on methodology of age reading on vertebrae that underestimated ages. The methodology has been revised in recent years.
Longevity	Medium	16 (M), 19 (F)	North Atlantic	Cliff *et al*., 1990	This information could not be found in the paper.
Growth	Low	K: 0.04–0.13 (M), 0.04– 0.13 (F)	South Atlantic	Barreto *et al*., 2016a	The ranges of estimates are wide due to the different assumptions of the band pair deposition.
Time to maturity	Low-Medium	3–6 (M), 7 - >12 (F)	South Atlantic (Western Central Atlantic, off Northeast Brazil)	Barreto *et. al*, 2016a	Just referred to the maturity at size by Natanson (2006) and estimated the value using the growth curve estimated in this paper.
Longevity	Low-Medium	19–28 (F), 16–23 (M)	South Atlantic (Western Central Atlantic, off Northeast Brazil)	Barreto *et. al*, 2016a	Just referred to the maturity at size by Natanson (2006) and estimated the value using the growth curve estimated in this paper.
Intrinsic rate of population growth	Low	0.066–0.123	South Atlantic	Cortés, 2017	The data has an issue because the original paper referred by Cortes *et al*., 2017 is inaccessible.
Growth	Low	K: 0.113	Indian Ocean	Groeneveld *et al*., 2014	
Time to maturity	Low	7 (M), 15 (F)	Indian Ocean	Groeneveld *et al.,* 2014	
Generation time		25	Indian Ocean	Jabado *et al*., 2017)	

Table 2. Information on shortfin mako shark trends from different oceanic regions (also see Figure 11).

AREA	COVERAGE	INDICATOR	FISHERY	EXTENT OF DECLINE (%)	REFERENCE PERIOD	CONFIDENCE	COMMENT	SOURCE
Pacific Ocean	North Pacific, including Western, Central and Eastern Pacific	Spawning abundance	longline	Depleted to 58% (CI: 30~86%) of unfished. Recent (2007–2016): Increasing by 0.16% per year	1975–2016	5	Best available information on population trends.	ISC, 2018
Pacific Ocean	North Pacific	CPUE	longline	NA	1996–2009	NA	Superceded by ISC, 2017 – see text	Clarke *et al*., 2013
Pacific Ocean	North Pacific	CPUE	longline	NA	2000–2010	NA	Superceded by ISC, 2017 – see text	Rice *et al*., 2013
Pacific Ocean	North Pacific	Spawning potential ratio	Small-scale longline fishery based in Taiwan, Province of China	NA	1990–2003	NA	Methodological issues when determining a population trend, superceded by ISC (Tsai *et al*., 2017; ISC, 2017; 2018)	Chang and Liu, 2009
Pacific Ocean	North Pacific	Population growth rate	Small-scale longline fishery based in Taiwan, Province of China	NA	NA	NA	Methodological issues when determining a population trend, superceded by ISC (Tsai *et al*. 2017; ISC, 2017; 2018)	Tsai *et al*., 2011
Pacific Ocean	North Pacific	Population growth rate	Small-scale longline fishery based in Taiwan, Province of China	NA	NA	NA	Methodological issues when determining a population trend, superceded by ISC (Tsai *et al*., 2017; ISC, 2017; 2018)	Tsai *et al*., 2014
Pacific Ocean	South Pacific	CPUE	longline	NA	1996–2009	NA	Superceded by Rice *et al*., 2015 – see text	Clarke *et al*., 2013

Table 2. (continued).

AREA	COVERAGE	INDICATOR	FISHERY	EXTENT OF DECLINE (%)	REFERENCE PERIOD	CONFIDENCE	COMMENT	SOURCE
Pacific Ocean	South Pacific	CPUE	longline	Historical: Increasing by 1.3% (95% CI of -0.01% to 3.6%) per year (but not statistically significant) Recent (2004–2013): Increasing by 2.2% (95% CI of -1.7% to 6.0%) per year (but not statistically significant)	1996–2013	4	Despite data gaps provides a reasonable large-scale indicator of population trends	Rice *et al*., 2015
Pacific Ocean	South Pacific, New Zealand waters	CPUE	longline	Historical: Increasing by 0.09% (95% CI of -0.14% to 0.32%) (but not statistically significant) Recent (2004–2013): Decreasing in one fishery by 7.3% per year (but not statistically significant) and increasing in three other fisheries (statistically significant)	1993–2013	4	Provides a very consistent time series focused on specific fisheries which is advantageous when determining a population trend	Francis *et al*., 2014

Table 2. (continued).

AREA	COVERAGE	INDICATOR	FISHERY	EXTENT OF DECLINE (%)	REFERENCE PERIOD	CONFIDENCE	COMMENT	SOURCE
Atlantic Ocean	North Atlantic	Spawning stock fecundity	longline	Historical: 50% Recent (2006–2015): 32%	1950–2015	5	The panel focused on the estimate of spawning stock fecundity from the age structured stock assessment model (Stock Synthesis), because age structured models are more accurate than surplus production models for long-lived species with a high age at maturity.	ICCAT, 2017
Atlantic Ocean	North Atlantic	CPUE	longline	NA	1986–2000	NA	Older datasets are not appropriate for calculating recent rates of decline because they are now dated. Same U.S. longline dataset was re-analyzed in 2017 and used as one of the inputs to the ICCAT assessment.	Baum *et al*., 2003
Atlantic Ocean	North Atlantic	CPUE	longline	NA	1992–2005	NA	Older datasets are not appropriate for calculating recent rates of decline because they are now dated. Same U.S. longline dataset was re-analyzed in 2017 and used as one of the inputs to the ICCAT assessment.	Baum and Blanchard, 2010
Atlantic Ocean	North Atlantic, Gulf of Mexico	CPUE	longline	NA	1986–2005	NA	Older datasets are not appropriate for calculating recent rates of decline because they are now dated. Same U.S. longline dataset was re-analyzed in 2017 and used as one of the inputs to the ICCAT assessment.	Cortes *et al*., 2007

Table 2. (continued).

AREA	COVERAGE	INDICATOR	FISHERY	EXTENT OF DECLINE (%)	REFERENCE PERIOD	CONFIDENCE	COMMENT	SOURCE
Atlantic Ocean	South Atlantic	Biomass	longline	Uncertain	1950–2015	3	Assessment highly uncertain due to issues with data quality	ICCAT, 2017
Atlantic Ocean	South Atlantic	CPUE	Longline, multiple fishing fleets	NA	Comparison 1978–1997 and 2007–2012	2	Abundance indices are not comparable between these time periods	Barreto *et al*., 2016b
Mediterranean	Ionian Sea and Western Mediterranean (Spain)	Different indices of shark abundance	longline	Historical: declines to over 90%	Different time periods, ranging from 22 to 55 years	3	Decline not steady but precipitous over few years; other factors may be having influence on data	Ferretti *et al*., 2008
Indian Ocean	Indian Ocean	CPUE and mean weight		Declining abundance	1964–1988	2	Nominal CPUE which does not account for factors, other than population abundance, that may be influencing catch rate	Romanov *et al*., 2008
Indian Ocean	Indian Ocean	CPUE	Longline	Decline from 1994 – 2003 and subsequent increase until 2010	1994–2010	4	Standardized CPUE could be useful for assessment	Kimoto *et al*., 2011
Indian Ocean	Indian Ocean	CPUE	longline	Decline until 2004 and increase in more recent years	2000–2016	2	Authors say data not representative because of fleet movement	Coelho *et al*., 2017

Table 3. Trends estimated from graphics presented in various studies of North and South Pacific mako population indices digitized using a web–based tool, then checked and fit with a log–linear regression using Excel. Those for which the 95 percent confidence interval of the slope does not fall below zero are shaded in yellow.

Reference	Time Series	Slope	SE	95% CI	P value	Statistically Significant?
North Pacific						
ISC (2018) Table ES1	2007–2016	0.0016	0.0003	0.0009 to 0.0023	0.0008	Yes
South Pacific						
Rice *et al.*, 2015 Figure 40	1996–2013	0.013	0.011	-0.001 to 0.036	0.244	No
Rice *et al.*, 2015 Figure 40	2004–2013	0.022	0.017	-0.017 to 0.060	0.233	No
Francis *et al.*, 2014 TLCER Japan South Figure 22	2006–2013	0.201	0.060	0.054 to 0.349	0.016	Yes
Francis *et al.*, 2014 TLCER Domestic South Figure 23	2006–2013	-0.091	0.087	-0.304 to 0.121	0.338	No
Francis *et al.*, 2014 TLCER Domestic North Figure 24	2006–2013	0.205	0.034	0.122 to 0.289	0.001	Yes
Francis *et al.*, 2014 Observer Data Figure 25	1993–2013	0.012	0.012	-0.013 to 0.036	0.337	No
Francis *et al.*, 2014 Observer Data Figure 25	2004–2013	0.059	0.016	0.023 to 0.096	0.006	Yes

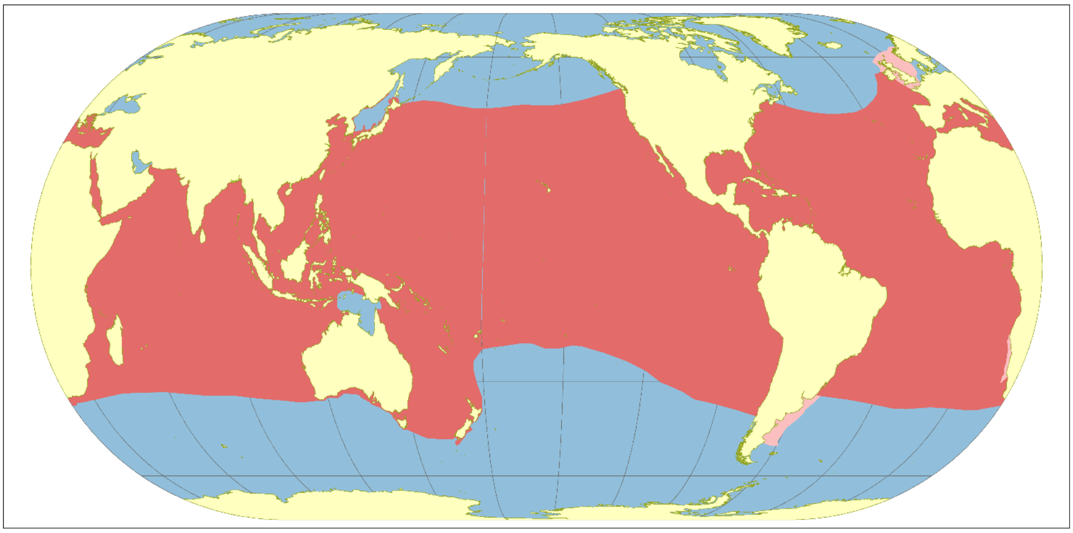
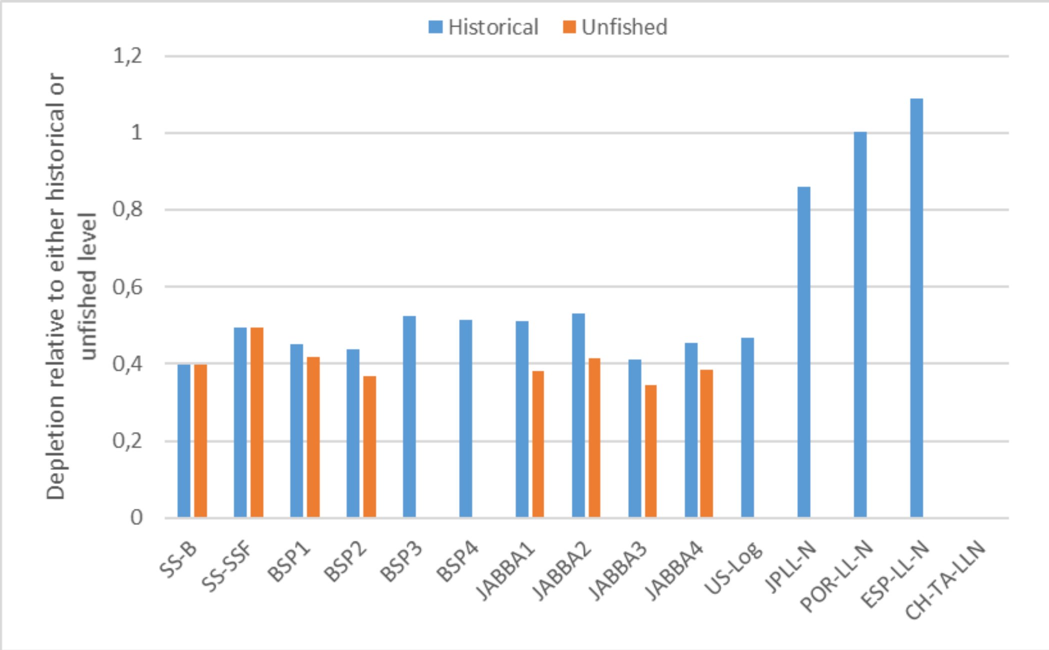
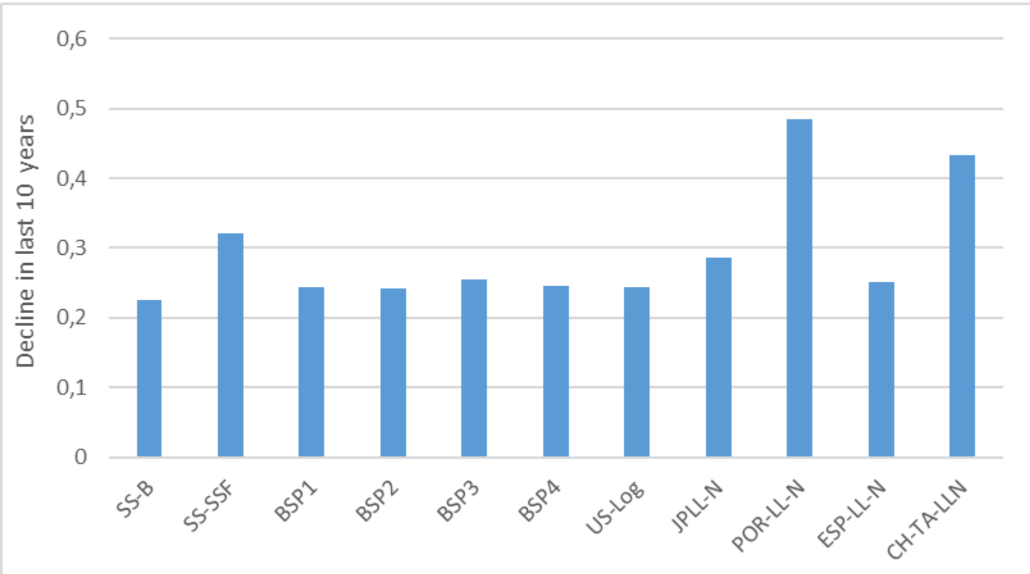


Figure 1. Distribution of *Isurus oxyrhincus*.



2a) Current depletion relative to beginning of time series (historical) or relative to unfished levels.



2b) Decline in last 10 years.

Figure 2. Depletion (a) and decline over the last 10 years (b) in the North Atlantic (ICCAT, 2017) calculated from the age-structured model (biomass (tons):SS-B, spawning stock fecundity (number):SS-SSF), the Bayesian Surplus Production Model (biomass (tons): BSP1-4), the JABBA model (biomass (tons):JABBA1-4), and the indices used in the assessment (ICCAT, 2017 data report, US-Log, JPLL-N, POR-LL-N, ESP-LL-N and CH-TA-LL-N). Recent depletion could not be calculated for the JABBA models. The Ch-TA-LL-N series was not used to calculate historical depletion because it extends for less than 10 years. Depletion relative to unfished could not be calculated for two of the BSP models, or for any of the CPUE series.

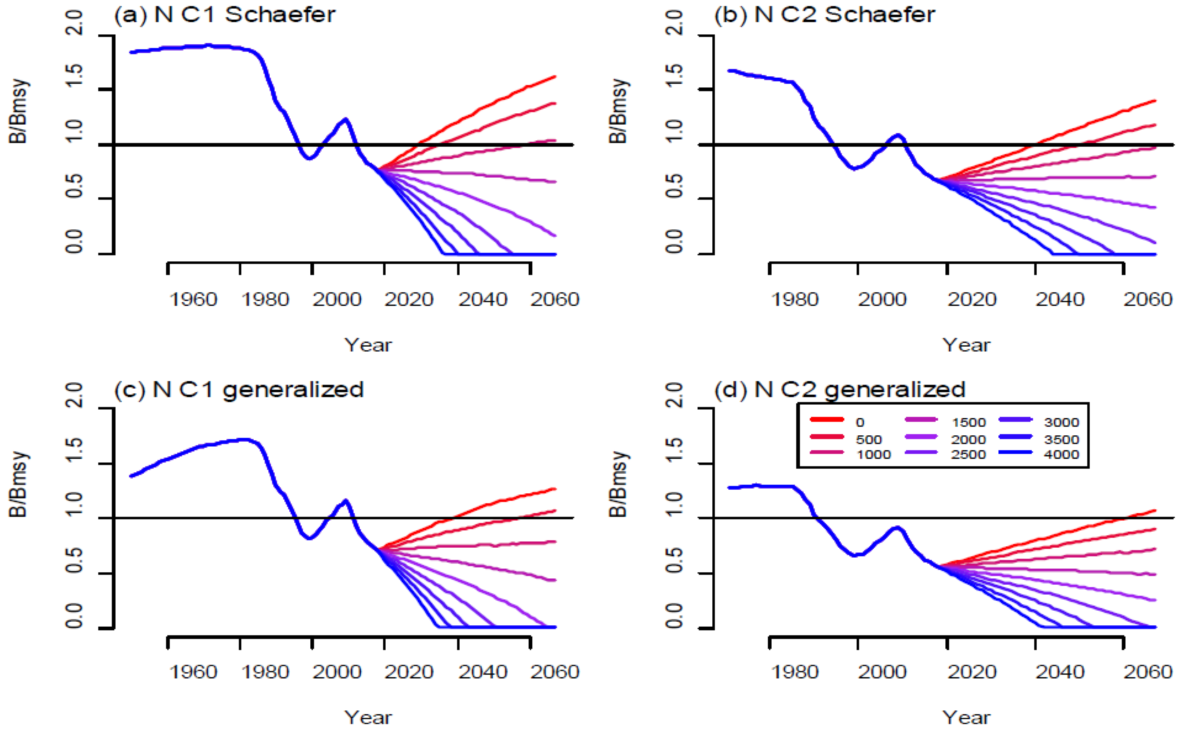


Figure 3. Projections from the Bayesian Surplus Production models for the North Atlantic (ICCAT, 2017) for different future annual catches given in tonnes. The four panels are alternative scenarios with slightly different input assumptions (ICCAT, 2017).

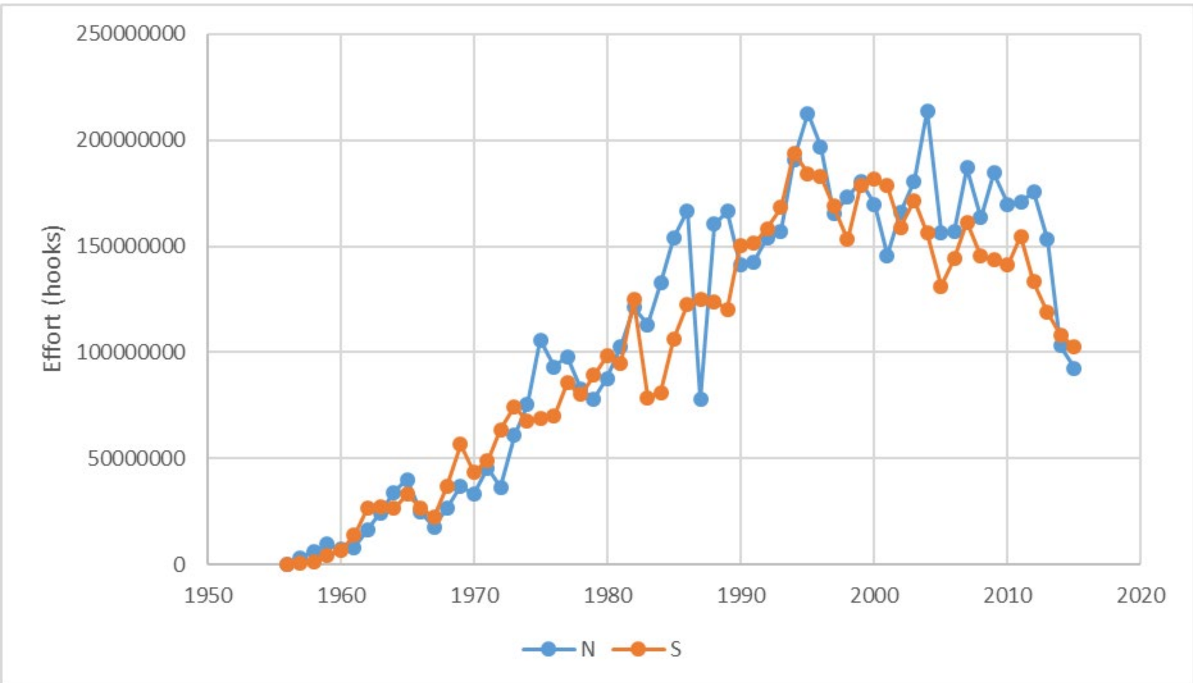


Figure 4. Total fishing effort in the Atlantic, from ICCAT task II data (Accessed online January 22, 2019).

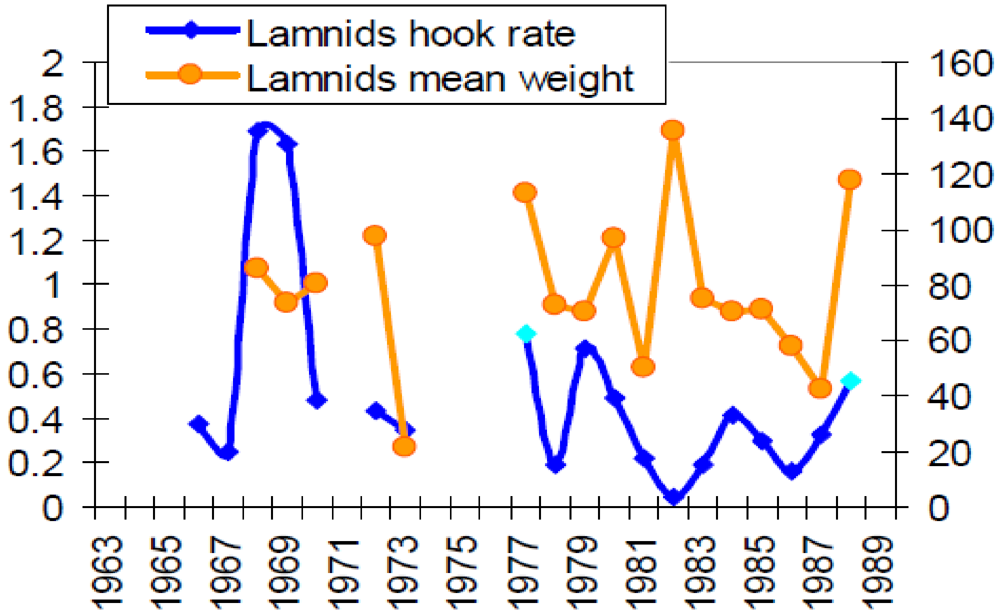


Figure 5. Nominal CPUE (hook rate, ind. per 1000 hooks) and mean weight of individuals caught for lamnid shark (*Isurus* spp.) (Source: Romanov *et al*., 2008).

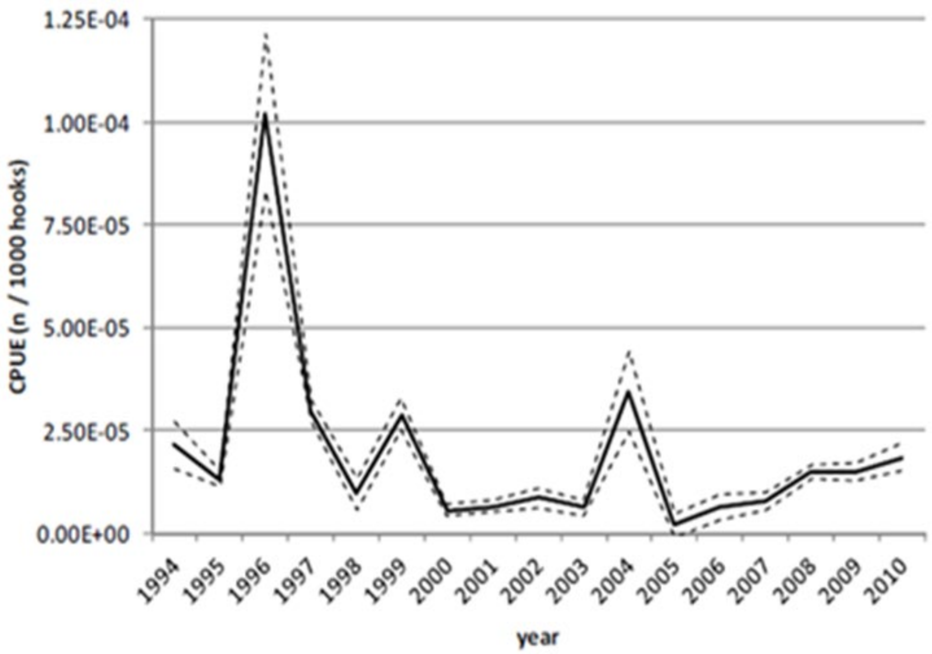


Figure 6. Shortfin mako shark: Standardized longline CPUE series for shortfin mako shark in the Indian Ocean for the Japanese fleet (1994–2010). The dotted line represents the confidence intervals (Source: Kimoto *et al*., 2011).

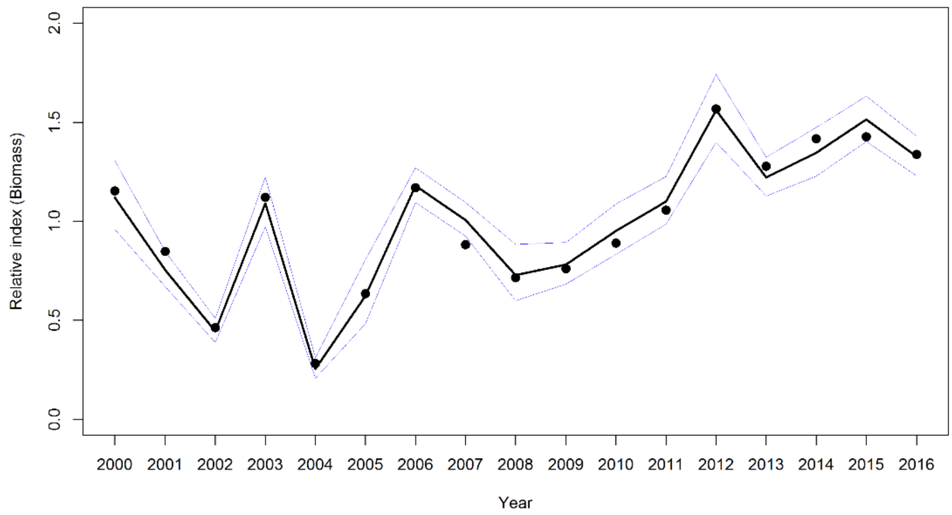


Figure 7. Shortfin mako shark: Standardized longline CPUE series for shortfin mako shark in the Indian Ocean for the EU-Portugal fleets (2000–2016). The solid line refers to the standardized index and the black dots to the nominal CPUE series (Source: Coelho *et al*., 2017).

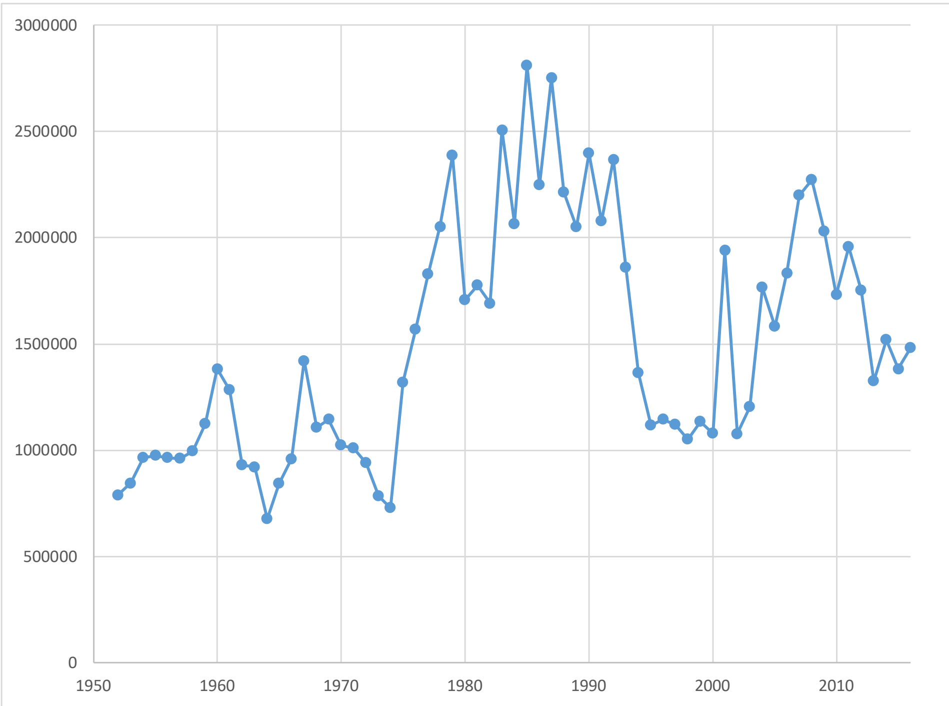


Figure 8. Pacific longline effort north of 20ºN in hundred hooks, 1952–2016 (SPC, 2019).

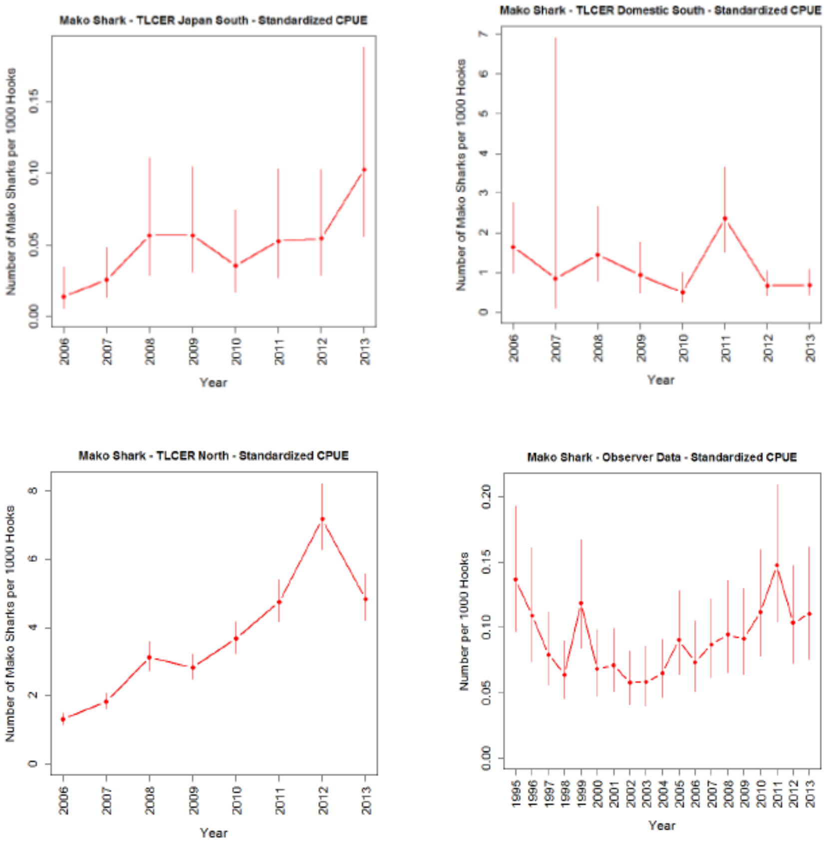


Figure 9. Abundance indices for shortfin mako for four fisheries in New Zealand (Francis *et al*., 2014).

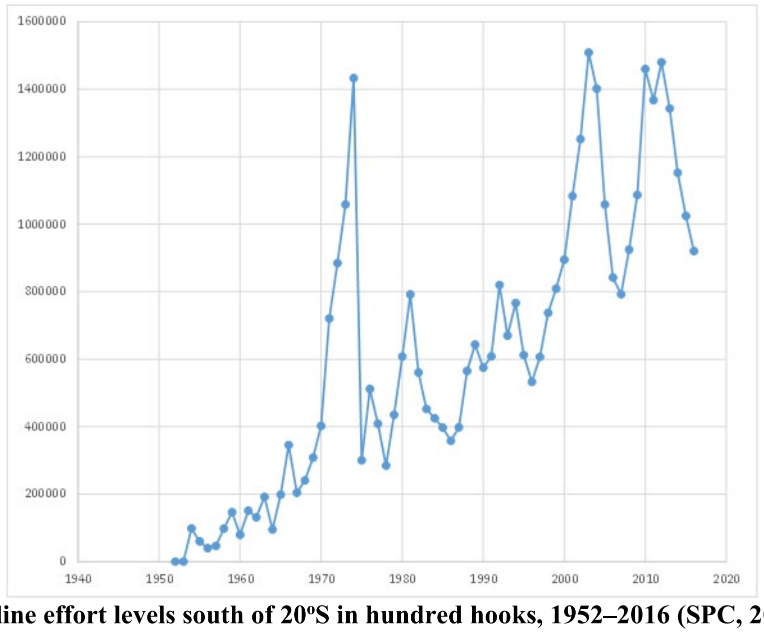


Figure 10. Pacific longline effort levels south of 20ºS in hundred hooks, 1952–2016 (SPC, 2019).

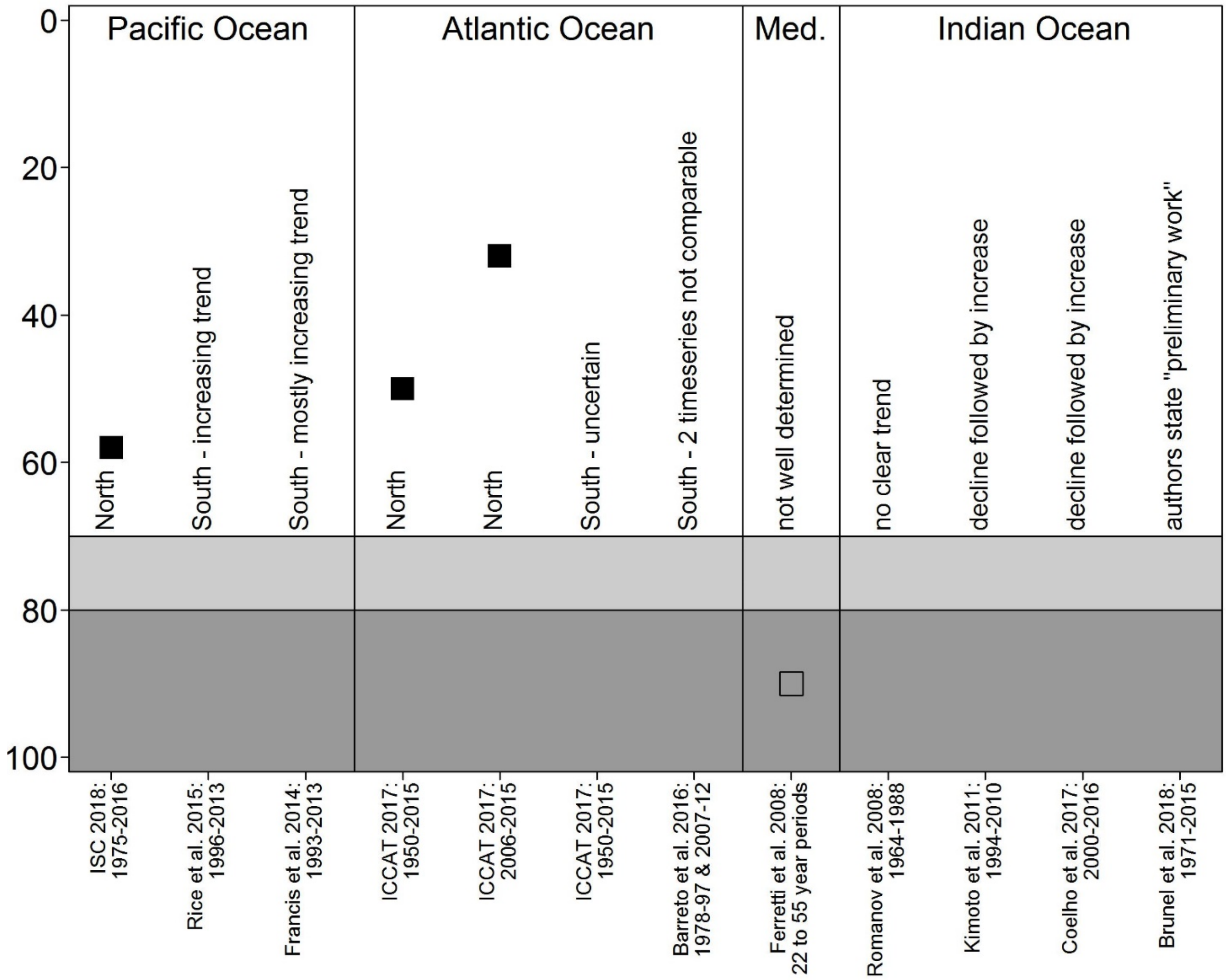


Figure 11. Estimated percentage declines from available survey information for shortfin mako. Dark band is a marked decline for a species of low productivity (80 percent of baseline), with 5–10 percent subtracted as a precautionary buffer (light band). The graph shows a filled square where the Expert Panel determined the information was reliable and quantifiable. Other studies are shown with comments or an unfilled square. See Table 2 for further information on all of these sources of information.

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The sixth FAO Expert Advisory Panel for the Assessment of Proposals to Amend Appendices I and II of CITES Concerning Commercially-exploited Aquatic Species was held at FAO headquarters from 21 to 25 January 2019. The Panel was convened in response to the agreement by the twenty-fifth session of the FAO Committee on Fisheries (COFI) on the terms of reference for an expert advisory panel for assessment of proposals to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and to the endorsement of the twenty-sixth session of COFI to convene the Panel for relevant proposals to future CITES Conference of the Parties. The objectives of the Panel were to: i. assess each proposal from a scientific perspective in accordance with the CITES biological listing criteria (Resolution Conf. 9.24 [Rev. CoP17]; ii. comment, as appropriate, on technical aspects of the proposal in relation to biology, ecology, trade and management issues, as well as, to the extent possible, the likely effectiveness for conservation. The Panel considered the following four proposals submitted to the eighteenth Conference of the Parties to CITES: CoP18 Prop. 42 to include mako shark, *Isurus oxyrinchus* in Appendix II in accordance with Article II paragraph 2(a) and Isurus paucus in Appendix II in accordance with Article II paragraph 2(b). The FAO Expert Panel assessment of proposal 42 concluded that the available data do not provide evidence that the species meets the CITES Appendix II listing criteria. CoP18 Prop. 43 to include blackchin guitarfish *Glaucostegus cemiculus* and the sharpnose guitarfish, *Glaucostegus granulatus* in Appendix II in accordance with Article II paragraph 2(a) and inclusion of all other giant guitarfish, *Glaugostegus* spp. in accordance with Article II paragraph 2(b). The FAO Expert Panel assessment of proposal 43 concluded that there was insufficient evidence to make a determination against the CITES criteria. CoP18 Prop. 44 to include white-spotted wedgefish, *Rhynchobatus australiae* and *Rhynchobatus djiddensis* in Appendix II in accordance with Article II paragraph 2(a). The FAO Expert Panel assessment of proposal 44 concluded that there was insufficient evidence to make a determination against the CITES criteria. CoP18 Prop. 45 to include the subgenus *Holothuria (Microthele)*: *Holothuria fuscogilva*, *Holothuria nobilis* and *Holothuria whitmaei* in Appendix II in accordance with Article II paragraph 2(a). The FAO Expert Panel assessment of proposal 45 concluded that the available data for *Holothuria fuscogilva* does not meet, there was insufficient evidence to make a determination for *Holothuria nobilis* and *Holothuria whitmaei* does meet the CITES Appendix II listing criteria.

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