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

Bangkok, 7–11 July 2025 and Rome, 21–25 July 2025

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This is the report of the Eighth FAO Expert Advisory Expert Panel for the Assessment of Proposals to Amend Appendices I and II of CITES Concerning Commercially Exploited Aquatic Species (Expert Panel), held at the FAO Regional Office for Asia and the Pacific 7–11 July 2025 and FAO headquarters 21–25 July 2025.

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Abstract

The Eighth FAO Expert Advisory Expert Panel for the Assessment of Proposals to Amend Appendices I and II of CITES Concerning Commercially Exploited Aquatic Species was held at the FAO Regional Office for Asia and the Pacific 7–11 July 2025 and FAO headquarters 21–25 July 2025. 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:

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

The Expert Panel considered the following 11 proposals submitted to the Twentieth Conference of the Parties (CoP) to CITES:

- **Proposal 28.** Proposal to transfer oceanic whitetip shark (*Carcharhinus longimanus*) from Appendix II to Appendix I.
  Expert Panel decision: Does Not Meet Criteria

- **Proposal 29.** Proposal to include the school shark (*Galeorhinus galeus*), Patagonian or narrownose smoothhound (*Mustelus schmitti*), and the common smoothhound (*Mustelus mustelus*) in CITES Appendix II, plus other species in genus smoothhounds (*Mustelus*) as look alikes.
  Expert Panel decision: Does Not Meet Criteria

- **Proposal 30.** Proposal to transfer manta and devil rays (family Mobulidae) from Appendix II to Appendix I.
  Expert Panel decision: Does Not Meet Criteria[1]

- **Proposal 31.** Proposal to transfer the whale shark (*Rhincodon typus*) from Appendix II to Appendix I.
  Expert Panel decision: Does Not Meet Criteria

- **Proposal 32.** Proposal to add annotation stating zero annual export quota for wild taken specimens traded for commercial purposes to giant guitarfish (*Glaucostegus* spp.) in Appendix II.
  Expert Panel decision: Does Not Meet Criteria[1]

- **Proposal 33.** Proposal to add annotation stating zero annual export quota for wild taken specimens traded for commercial purposes to wedgefish (Family Rhinidae) in Appendix II.
  Expert Panel decision: Does Not Meet Criteria[1]

- **Proposal 34.** Proposal to include the dwarf gulper shark (*Centrophorus atromarginatus*) and the gulper shark (*C. granulosus*) in Appendix II, plus other species in the family Centrophoridae (gulper sharks) as look alikes.
  Expert Panel decision: Does Not Meet Criteria[1]
- **Proposal 35.** Proposal to include Japanese eel (*Anguilla japonica*) and American eel (*A. rostrata*) in CITES Appendix II, plus other species of the genus *Anguilla* as look alikes.
  Expert Panel decision: Does Not Meet Criteria
- **Proposal 36.** Proposal to include genus *Actinopyga* sea cucumbers (*A. echinites, A mauritiana, A. miliaris*, and *A. varians*) in Appendix II, plus *A. lecanora* and *A. palauensis* as look alikes.
  Expert Panel decision: Does Not Meet Criteria
- **Proposal 37.** Proposal to include golden sandfish (*Holothuria lessoni*) in CITES Appendix II.
  Expert Panel decision: Meets Criteria
- **Proposal 39.** Proposal to include South African abalone (*Haliotis midae*) in CITES Appendix II, with an annotation stating dried specimens only.
  Expert Panel decision: Does Not Meet Criteria

The report includes an assessment of each of the 11 proposals in line with the objectives outlined above, highlighting the Expert Panel's determination of whether information on the species in question meets the CITES Appendix criteria in addition to noting biology, ecology, trade and management issues as well as – to the extent possible – the likely effectiveness of a listing for conservation.

[1] Insufficient evidence of population declines.

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Abbreviations

ABNJ	area beyond national jurisdiction
AngHV1	Anguillid herpesvirus 1
ASFIS	Aquatic Sciences and Fisheries Information System
ASMFC	Atlantic States Marine Fisheries Commission
BFAR	Bureau of Fisheries and Aquatic Resources, Philippines
CEAS	Commercially-exploited aquatic species
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMFRI	Central Marine Fisheries Research Institute, Kochi, India
CMS	Convention on the Conservation of Migratory Species of Wild Animals
CODOPESCA	Dominican Council of Fishery and Aquaculture
COFI	Committee on Fisheries (FAO)
CoP	Conference of the Parties
COSEWIC	Committee on the Status of Endangered Wildlife
CPUE	catch per unit of effort
CTMFM	Joint Technical Commission of the Maritime Front (Fisheries management body under the Treaty of the Río de la Plata and its Maritime Front [1973])
DFFE	Department of Forestry, Fisheries and the Environment, South Africa
DGCF	Directorate General of Capture Fisheries, operating under the Ministry of Marine Affairs and Fisheries (MMAF) is a key governmental body in Indonesia
DW	disc width
EEZ	exclusive economic zone
EPBC	Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is Australia’s national environmental law
ESA	Endangered Species Act
EVE	Eel Virus European
F	fishery related mortality
FMP	fisheries management plan
FOC	Fisheries and Oceans Canada (also known as Department of Fisheries and Oceans)
G	generation time
GACC	General Administration of Customs of China
GFCM	General Fisheries Commission for the Mediterranean
GL	species generation length
HCR	harvest control rule
HS	harmonized system
IA	International Affairs
IATTC	Inter-American Tropical Tuna Commission

ICAR	Indian Council of Agricultural Research
ICCAT	International Commission for the Conservation of Atlantic Tuna
ICES	International Council for the Exploration of the Sea
IKASAVEA	Mobile application developed by the Pacific Community (SPC) to support fisheries data collection
IMARPE	Instituto del Mar del Perú (Marine Institute of Peru).
IOTC	Indian Ocean Tuna Commission
IPN	infectious pancreatic necrosis
IPOA-Sharks	International Plan of Action for Conservation and Management of Sharks
IUU	illegal, unreported and unregulated (fishing)
JARA	Just Another Red List Assessment
k	individual growth coefficient
LAF	legal acquisition findings
M	natural mortality
MARA	Ministry of Agriculture and Rural Affairs Regulations, Beijing, China
ME DMR	Maine Department of Marine Resources (United States of America)
MEDITS	Mediterranean International Trawl Survey
MINAL	Ministry of Food Industry, Cuba
MMA	Ministério do Meio Ambiente (Ministry of the Environment, Brazil)
MMAF	Ministry of Marine Affairs and Fisheries
MOU	memorandum of understanding
MPA	marine protected area
MSC	Marine Stewardship Council
MSY	maximum sustainable yield
NDF	non-detriment finding
Ne	effective population size
NEAFC	North East Atlantic Fisheries Commission
nei	not elsewhere included
NFA	National Fisheries Authority
NFC	Near Field Communication tokens
NPOA	national plan of action
PFAS	per- and polyfluoroalkyl substances
PVA	population vulnerability assessment
QR	Codes for digital reporting using the vessel (VESL) elver fishery App.
r	population intrinsic growth rate
REF	illegal trade volumes surged
RFMO	regional fisheries management organization

SAGARPA	Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación, Mexico (Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food)
SCUBA	Self-Contained Underwater Breathing Apparatus
SD	standard deviation
SE	standard error
SEAFDEC	Southeast Asian Fisheries Development Centre
SEAFO	South East Atlantic Fisheries Organization
SEAMAP	Southeast Area Monitoring and Assessment Program
SEDAR	Southeast Data, Assessment and Review
SIOFA	Southern Indian Ocean Fisheries Agreement
SNP	single nucleotide polymorphisms
SPA/BD	Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean
SPC	Pacific Community
SPRFMO	South Pacific Regional Fisheries Management Organisation
SSF	spawning stock fecundity
TAC	total allowable catch
TL	total length
t_{mat}	age at maturity
t_{max}	maximum age
UN COMTRADE	United Nations Commodity Trade Statistics Database
USFWS	United States Fish and Wildlife Service
VESL	Electronic reporting platform that enables fish harvesters to submit real-time catch data
VBGP	Von Bertalanffy growth parameters
VHS	viral haemorrhagic septicaemia
WCPFC	Western and Central Pacific Fisheries Commission
WOAH	World Organisation for Animal Health
WPAA	Wildlife Protection and Anti-Poaching Act
WTO	World Trade Organization

INTRODUCTION

BACKGROUND AND PURPOSE OF THE EXPERT PANEL

1. The Eighth FAO Expert Advisory Expert 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. Multiple meetings of the Sub Committee on Fish Trade of COFI acknowledge the positive contribution made by FAO in convening Expert Panels for the assessment of CITES proposals and unanimously supported the convening of the Expert Panel for the assessment of proposals to CITES CoP20, charged with listing or delisting commercially exploited aquatic species (CEAS).

2. The 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 the Terms of Reference, the Expert Panel was established by the FAO Secretariat according to its standard rules and procedures and observing the principles 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; and
(ii) comment, as appropriate, on technical aspects of each proposal in relation to biology, ecology, trade and management issues, as well as – to the extent possible – its likely effectiveness for conservation.

5. 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, and encouraged Parties to consult with FAO on submissions of proposals for marine species (CITES, 2017). At the Seventy-Fourth CITES Standing Committee meeting (7–11 March 2022 in France) (CITES, 2022), Parties asked the Secretariat to collaborate closely with FAO and consider information held by the FAO Secretariat and regional fisheries management organizations (RFMOs).

6. Given the limited time between the submission of proposals and the CoP, FAO convenes its Expert Panel on short notice and completes its technical review on a compressed schedule, which places considerable pressure on the Expert Panel to complete its assessments rapidly. As a result, incorporating or assessing the most recent data and consulting with relevant national experts becomes a challenge for the Panel.

7. The Expert Panel observes that the accelerated timeline inadvertently excludes many key fisheries stakeholders. In many countries, fisheries authorities, industry representatives and coastal communities are not systematically made aware of or engaged in the evaluation of CITES proposals. This can lead to a lack of integration between fisheries management objectives and trade-related conservation measures, potentially undermining the effectiveness and legitimacy of resulting decisions.

8. The Thirty Sixth COFI held in Rome, 8–12 July 2024 (see FAO, 2024) called for FAO to continue cooperating with CITES and to help ensure that decisions made in CITES and their implementation are based on the best scientific information available and relevant technical information. At the Seventy-Fourth CITES Standing Committee meeting (7–11 March 2022 in France) (CITES, 2022), the CITES Secretariat was encouraged to consider ways to further enhance the communication of the FAO Expert Panel report.

9. In communicating to CITES Parties, the CITES Secretariat and FAO acknowledged concerns expressed by Parties regarding divergences between the advice provided by the FAO Expert Advisory Expert Panel and that of the CITES Secretariat during the CoP19, held in Panama City, 14–25 November 2022.

10. In order to uphold the provisions of Article 15, Paragraphs 1(a) and 2(b) of the Convention text, as well as the terms outlined in the 2006 FAO CITES MoU – particularly paragraphs 5 and 6 – the Secretariats agreed to meet prior to the submission of CoP20 recommendations by the CITES Secretariat to the Parties. The aim of this meeting, which will also be attended by the Chair of the Expert Panel, is to assist CITES Members in their deliberations by providing explanations for any potential differences in the advice of the Expert Panel and that of the CITES Secretariat.

THE EXPERT PANEL MEETING

11. The Expert Panel met in Bangkok 7–11 July 2025 and in Rome 17–25 July 2025, hosted by FAO.

12. The Expert Panel consisted of 39 specialists on the species under consideration, as well as on fisheries management and international trade. In addition, the CITES Secretariat and fisheries assessment experts from FAO were invited to attend as observers. The list of participants at the meeting is included as Appendix B.

13. Jim Ellis was elected Chair of the Expert Panel, and informal working groups linked to the species taxa of proposals were formed to facilitate communication across participants reviewing proposals. Monica Barone, Marialuce Paladini and Tommaso Bertuzzi from FAO assisted as rapporteurs and facilitators. Kim Friedman convened the meeting and provided Secretariat support.

14. Following adoption of the agenda of the meeting, Kim Friedman, FAO Senior Fisheries Resources Officer, made a presentation on the Expert Panel Terms of Reference and FAO interpretation of the CITES criteria, and presented background and guidance on how the assessments and the logistics of the meeting might best proceed.

15. Thea H. Carroll, Hyeon Jeong Kim and Karen Gaynor from the CITES Secretariat gave their inputs on CITES provisions, Convention and Secretariat processes. The Secretariat, represented by Hyeon Jeong Kim, also attended the Rome meeting in person for the full week.

16. In accordance with the Expert Panel's Terms of Reference, FAO Members and RFMOs were notified of the proposals submitted that dealt with CEAS 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 Expert Panel. All information received from this call for datasets, scientific papers, reports and articles was held on a shared document drive for use by all the Expert Panel participants.

17. Proponents of the 11 CoP20 CEAS proposals were invited to connect with the Expert Panel. This offer was taken up by Brazil, the European Union, Maldives and South Africa, who presented their arguments on their proposals to the panel of experts and allowed questions and answer sessions to build a common vision of the task at hand.

18. Other relevant information sourced by the FAO and Expert Panel participants was shared among the Expert Panel on a shared drive.

19. Key presentations and Expert Panel plenary discussions were videoed and shared with all Expert Panel Members, allowing those on virtual service to access and view ongoing progress of proposal reviews at suitable hours within their own time zone.

LIST OF PROPOSALS OF COMMERCIAL AQUATIC SPECIES FOR COP20

20. The Expert Panel considered the following 11 proposals submitted to CITES Twentieth Conference of the Parties. The 11 proposals, that included over 100 commercially exploited aquatic species, can be downloaded from the CITES website, which also lists the Article, Paragraph and Criterion of Resolution Conf. 9.24 [Rev. CoP17] under which each petition is made (CITES, 2016).

Proposal 28. Proposal to transfer oceanic whitetip shark (*Carcharhinus longimanus*) from Appendix II to Appendix I.

Proposal 29. Proposal to include the school shark (*Galeorhinus galeus*), Patagonian narrownose smoothhound (*Mustelus schmitti*), and the common smoothhound (*Mustelus mustelus*) in CITES Appendix II, plus other species in genus *Mustelus* (smoothhounds) as look alikes.

Proposal 30. Proposal to transfer manta and devil rays (family Mobulidae) from Appendix II to Appendix I.

Proposal 31. Proposal to transfer the whale shark (*Rhincodon typus*) from Appendix II to Appendix I.

Proposal 32. Proposal to add annotation stating zero annual export quota for wild taken specimens traded for commercial purposes to giant guitarfish (*Glaucostegus* spp.) in Appendix II.

Proposal 33. Proposal to add annotation stating zero annual export quota for wild taken specimens traded for commercial purposes to wedgefish (family Rhinidae) in Appendix II.

Proposal 34. Proposal to include the dwarf gulper shark (*Centrophorus atromarginatus*) and the gulper shark (*Centrophorus granulosus*) in Appendix II, plus other species of gulper sharks (family Centrophoridae) as look alikes.

Proposal 35. Proposal to include Japanese eel (*Anguilla japonica*) and American eel (*Anguilla rostrata*) in CITES Appendix II, plus all other species of the genus *Anguilla* as look alikes.

Proposal 36. Proposal to include genus *Actinopyga* sea cucumbers (*A. echinites, A. mauritiana, A. miliaris,* and *A. varians*) in Appendix II, plus *A. lecanora* and *A. palauensis* as look alikes.

Proposal 37. Proposal to include golden sandfish (*Holothuria lessoni*) in Appendix II.

Proposal 39. Proposal to include South African abalone (*Haliotis midae*) in Appendix II, with an annotation stating dried specimens only.

INTERPRETATION OF ANNEX 2A CRITERIA FOR THE INCLUSION OF SPECIES IN APPENDIX II IN ACCORDANCE WITH ARTICLE II, PARAGRAPH 2(A) OF THE CONVENTION

21. The Expert Panel applied the CITES Resolution Conf. 9.24 [Rev. CoP17] criteria interpreted in accordance with the initial advice provided to CITES by FAO on criteria suitable for CEAS and as applied since the Second Meeting of the Expert Advisory Expert 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.

22. 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, 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 Resolution Conf. 9.24 [Rev. CoP17], including the "decline" criteria, apply for both criterion A and criterion B of Annex 2a. A broad range of key documentation on how the criteria evolved through time and discussions on that progress was also shared on a shared drive, along with a contexts page with descriptive annotations.

23. The Expert Panel was informed of the recommendations made by the CITES Animals Committee and Standing Committee in 2012 (CITES, 2012) 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. CoP15). 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. (CITES, 2012, p. 2).

24. Other relevant process guidance information sourced by FAO and Expert Panel participants was distributed among the Expert Panel on a shared drive, including templates and information on completing reviews of CoP20 CEAS proposals.

GENERAL COMMENTS AND OBSERVATIONS

25. A number of key points arose in reviewing the eleven proposals for listing CEAS in Appendix I or II. In addition to many of those repeated from the Seventh Expert Panel (FAO, 2022, paragraphs 19–57), new issues are listed and addressed in the following paragraphs:

- the practice of proposing annotations for a "zero annual export quota" for taxa listed in Appendix II;
- use of data trends from IUCN Red List assessments;
- selective use of data in listing proposals;
- recommendation on the use of supporting data and definition when defining inherent "productivity";
- interpreting trends in reported landings;
- reconciling "full utilization" of harvested fishery species with "significant trade";
- impact of CITES listings on scientific data collection, including the sharing of samples;
- ensuring effective data reporting and interpretation; and
- consideration of harmonization of approaches across Appendices of both CITES and CMS.

The practice of proposing annotations for a "zero annual export quota" for taxa listed in Appendix II

26. Two of the CoP20 CEAS proposals reviewed by the current Expert Panel (Proposal 32 for giant guitarfishes, and Proposal 33 for wedgefish) were submitted not to amend appendices, but for the addition of annotation to enforce a "zero annual export quota" for commercial purposes. The reader is referred to the relevant sections of the report for comments specific to each of those proposals.

27. Such annotations raised discussion at the Expert Panel meeting, and amongst fisheries stakeholders, on the theoretical basis of this approach (whether it is aligned with the spirit of the Convention's use of Appendix II), and practical implications for the review of proposals and actions Parties that would be required to satisfy the Convention's aims.

28. The Expert Panel notes Appendix I controls trade of species threatened with extinction, where trade is permitted only in exceptional circumstances, while Appendix II is a mechanism to mediate trade incompatible with a species' survival. The call in proposals 32 and 33 to remove the opportunity to mediate trade, if adopted, would place species into a trade control category analogous to Appendix I species, even if some requested level of trade was sustainable. Proposing a zero quota annotation for an Appendix II listed species effectively removes the Appendix II requirements applicable to the species, and the CITES Secretariat suggested the use of Appendix I criteria for the Expert Panel review.

29. The Expert Panel noted that there had been several recent proposals (and subsequent CITES listings) for higher taxonomic units (e.g. genus or family), which could often relate to taxa with broad, sometimes circumglobal distributions, including species with discrete and geographically separate stocks in different geographic regions. As such, the Expert Panel considered that annotations could be a useful mechanism for providing greater protection to any particular species–area combinations (e.g. discrete stocks of an ocean basin[s]) where a specific stock of a broadly distributed species was deemed to require greater protection and trade regulation.

30. Any annotation on species–area combinations may be perceived to be considered analogous to a "split listing", an approach not preferred in CITES. It was noted by the Expert Panel that customs and enforcement officers can be challenged by a risk of laundering of trade of a single species in such circumstances. Realizing this, CITES Resolution Conf. 9.24 [Rev. CoP17] recommends avoiding split listings unless there are compelling reasons. Instead, species should be listed in the highest appropriate appendix to ensure consistent protection.

Consideration of methods used in evaluating data trends from IUCN Red List assessments

31. CoP20 proposals often relied on information in IUCN Red List assessments to support their case for listing species under the CITES criteria. However, the criteria used by IUCN and CITES differ in important ways:

(i) CITES distinguishes between the historical extent of decline and the recent rate of change, and relies on the latter to assess "ongoing" trends and projected extents of decline in review of scientific data and technical information in consideration of Appendix II proposals. In contrast, IUCN focuses on overall population reduction – both past and projected – and these are evaluated over longer timescales.

(ii) IUCN assessments often use the approach known as JARA, acronym for "Just Another Red List Assessment" (Sherley *et al*., 2019), which was developed specifically to evaluate IUCN listing criteria related to population reductions over a period of three generation lengths (3 GL) or 10 years, whichever is longest.

(iii) The use of average rates of decline which are estimated based on long data series, as is done by JARA, can overestimate future declines, and more so when average rates are applied over long timeframes. This is especially problematic if recent data show stabilization or recovery.

32. Overestimation of future projected declines was noted by the Panel in the case of tope, or school shark, Galeorhinus galeus, a species that was proposed for listing in Appendix II (see the Expert Panel evaluation of Proposal 29 for further details). Proposal 29 referred to a global population decline of 70–99 percent over three generations (79 years), with a median value of 88 percent. This was estimated in the IUCN Red List evaluation (Walker *et al*., 2020) by fitting JARA models to data available for five regions spanning periods of 27–74 years. However, when recent rates were re estimated using the last 10 years of data, there was no evidence of an ongoing decline at a global level. Furthermore, these projections did not meet the CITES thresholds for a low medium productivity species.

33. In general, long-term historical rates of change may not represent current conditions accurately, especially when rebuilding plans and/or other management measures have been implemented, and the stocks are beginning to respond to reduced harvest rates. The FAO Expert Panel stresses the importance of considering recent data and the current management context when evaluating ongoing population trends and future extents of population decline, in line with the CITES criteria. Proposals should clearly distinguish between these approaches and present data transparently.

Selective use of data in listing proposals

34. Many of the proposals showed evidence of selective use of data to emphasize population declines. An explanatory example of this was Proposal 30 on mobulid rays, which used a subset of numbers of mobulid rays observed in the Peruvian purse seine fishery that was reported by Lezama Ochoa *et al.* (2019). The data time-series selected started from peak reported captures and ended in 2014, the year minimal mobulids were reported. The purported declines of 85–99 percent, not suggested by the authors of the original paper, result only when subsetting the data used and the times selected. If all data were used and analyses extended to 2016 for describing trends in mobulid rays, *Mobula munkiana* would instead – as per the logic of the approach used in the Proposal – indicate a 76 percent increase.

35. The Expert Panel recommends that future proponents include the underlying data used to infer population trends (in tabular form) in annexes to their proposals, identify from where more recent data can be accessed, and indicate what data and data approaches were used in the calculation of decline trends. Overall, this example of the selective use of data highlights the

importance that: (a) expert panels review the proposals, (b) proposals provide clarity on the data used to justify statements relating to population trends, and (c) the template for proposals usefully include examples of how to present data on temporal changes in catches, landings, observations, catch rates and indicators of population size.

Recommendations on the use of supporting data and definitions when defining inherent "productivity"

36. Productivity classifications (e.g. low, medium) were often used without clear justification.

37. As an example, the proposal to list oceanic whitetip in Appendix I included some language about the productivity of the species involved being "low" or "medium", but without providing a definition or justification for what constitutes "low" or "medium". To avoid an arbitrary characterization of productivity, which is ultimately used to identify the corresponding CITES population decline threshold, it is recommended that the proposals explicitly categorize productivity based on the guidelines for exploited fish species established by FAO (2002) or by Musick (1999).

38. In addition to the values of K, t_{mat}, and t_{max} shown in the summary tables, when calculated by the Expert Panel the computation of productivity (r) requires other biological inputs: female to male ratio at birth, litter size, breeding frequency and the (von Bertalanffy) growth function parameters L_{inf} and t_0 (or L_0 depending on how the growth curve is expressed). Furthermore, a weight to length relationship can be used (if available).

39. Natural mortality (M) – the rate at which fish die from natural causes – was estimated using seven different scientific methods[1]. These included:

- two methods based on growth rate and age at maturity;
- two updated methods based on growth and lifespan;
- one method based on a mathematical model of mortality; and
- two methods that use body weight (only if weight–length data were available).

To be cautious, the Panel used the lowest mortality value derived from these methods, resulting in a conservative – i.e. higher – estimate of productivity (rmax). They also calculated generation time (G), which is the average age of mothers in a population, using a standard life table approach.

Interpreting trends in reported landings

40. Landings data were often used in the proposals as proxies for abundance without adequate context. However, landings are known to be influenced by factors other than the in water status of the species. Indeed, reported landings can vary with changes in fishing patterns, management applied and a range of other factors. For example:

- Some fleet segments may have been impacted by the pandemic or other events.
- Prolonged periods of bad weather can affect fishing operations.
- The introduction of catch limits (or other management measures) can lead to a reduction in reported landings.

[1] 1) Jensen's (1996) K-based and 2) Jensen's (1996) age at maturity estimators, 3) a modified growth based Pauly (1980) estimator (Then *et al.*, 2015), 4) a modified longevity-based Hoenig (1983) estimator (Then *et al.*, 2015), 5) Chen and Yuan's (2006) estimator, and the mass-based estimators of 6) Peterson and Wroblewski (1984) and 7) Lorenzen (1996). If a weight–length relationship was not available the two mass-based estimators were not used. By taking the minimum value at age, the computation of r approximates rmax (a maximum value). Productivity (rmax) and generation time (G; computed as the average age of mothers for a given cohort of newborns) were calculated with a traditional life table/Euler Lotka age structured approach.

- Some fisheries may switch to different suites of species depending on local availability, market price, fuel price, etc.
- Some fleets or nations may not report catches consistently, and some landings may have been reported under a different ASFIS code.

41. While landings data may offer broad temporal and spatial coverage, their interpretation requires caution and, ideally, input from national experts familiar with local fisheries dynamics.

Reconciling "full utilization" of harvested fishery species with "significant trade"

42. The concept of "full utilization" – encouraged under FAO's International Plan of Action for Conservation and Management of Sharks – can complicate assessments of "significant trade" under CITES. The Panel recommends proposals clearly distinguish between primary and secondary drivers of exploitation, and assess the likely conservation impact of trade restrictions.

43. FAO (1999) developed an International Plan of Action for the Conservation and Management of Sharks, which encouraged relevant nations to develop, review and update National Plans of Actions (NPOAs) for sharks. Within this framework, in addition to ensuring that "shark catches from directed and non-directed fisheries are sustainable", NPOAs should aim to "encourage full use of dead sharks" (p. 14).

44. For example, if sharks are harvested for meat and largely for domestic consumption and trade, the "full utilization" of sharks would indicate that other products (livers, cartilage, jaws, fins and skins) should also be used. In some instances, such products may enter international trade. Restrictions on such trade (e.g. through CITES) may not provide conservation benefits to the species if the primary drivers for capture and exploitation are domestic use, including the provision of food.

45. Whilst an Appendix II listing may encourage more studies to better understand populations and their exploitation (to inform non-detriment findings, NDFs), developing countries may lack the resources to develop robust NDFs. As such, there could simply be an increase in illegal trade (and rendering it more lucrative). Furthermore, if fishing communities cannot sell byproducts (in terms of those that may go into international trade) from some of the sharks being utilized, then fishers may be incentivized to increase fishing effort in order to maintain their income.

Impact of CITES listings on scientific data collection, including the sharing of samples

46. The inclusion of species in CITES Appendix II, and even more so in CITES Appendix I, can unintentionally change both the opportunity and ability to collect scientific data and samples due to the perception of risks of species disturbance or injury, by funding and scientific institutions. Fishers themselves may be less inclined to report species interactions with highly regulated species. Furthermore, access to CITES certificates for broader scale surveys and sampling on vessels straddling EEZs and high seas areas can raise challenges for scientific work – it can also hamper international scientific cooperation through the exchange of scientific samples.

47. Whilst there are processes in place to provide the legal basis for such sample collection and sample sharing, the associated restrictions on the collection and transboundary exchange of samples will limit international collaborative research initiatives, which are essential for improving understanding of the status and population dynamics of these species.

48. The limitations on accessing biological materials, and the reluctance of fisheries stakeholders to report on these species due to a heightened public perception that comes

along with listing species on CITES Appendices, can lead to slowing of scientific research and ultimately compromise the development of sound, evidence-based conservation and management strategies.

49. Consequently, the Expert Panel suggested that the impact of new listings and "uplistings" on scientific work should also be considered, especially when there was little robust evidence that the listing or uplisting was required to provide additional conservation benefits.

Ensuring effective data reporting and interpretation

50. The Panel recommends proposals cite original data sources, not only secondary interpretations (e.g. IUCN summaries). All data used to infer population trends should be included in annexes, with clear metadata (e.g. years, units, values).

51. Some of the proposals amalgamated information from a range of studies when calculating population trends. Whilst the Expert Panel recognized the need to consider both peer-reviewed papers, online databases and other sources of information, the disparate and summarized nature of data used required the Expert Panel to access original information to assess its comparability.

52. Using summarized findings of IUCN Red List assessments was particularly time consuming. When accessing the original information used by the IUCN assessors, the Expert Panel found that some of the inferences drawn by the IUCN assessors were not appropriate for CITES assessments. Thus, the Panel recommends proponents supply original materials in proposals as this allows the Expert Panel access to the best scientific data and technical information.

53. To facilitate appropriate reviews of population trends, the Expert Panel highlighted the need for greater data transparency. Specifically, the Expert Panel recommended that proposals should:

- Make reference to original studies from which interpretations were made and not simply cite the interpretation (e.g. of an IUCN assessment); they should also include all relevant data pertaining to population trends in annexes to the proposal. This should include a table providing the years of the study as well as the annual units and values used for inferring trends in the population (e.g. landings, observations, catch rates, biomass estimates).
- Where studies are from several years prior to the proposal, contemporary data should be accessed wherever possible and the underlying source of the more contemporary data also be provided (e.g. website or report).
- In particular, for studies that are unpublished, in review or in press, please include the relevant data, for the purposes of transparency. Expert Panels cannot evaluate datasets that cannot be examined or substantiated.
- When using fishery dependent data (e.g. landings data or catch observations), the authors of proposals are strongly encouraged to more clearly consider temporal changes in fishing effort, changes in taxonomic classifications of reporting, the management applicable, the spatial extent of the data, and the representativeness of the study.
- The interpretation of population trends can often be skewed by a single high (or low) value at some point in the time-series. Such data points may require additional scrutiny. There can be a range of reasons for outliers being present in available datasets.
- Where longer term annual data sets (e.g. landings) are highly variable, it can sometimes be more informative to compare time blocks (e.g. of 3–5 years) or smoothed trends over the time-series, as such approaches are less influenced by outliers.

Consideration of harmonization of approaches across appendices of both CITES and CMS

54. Several of the species proposed for uplisting from Appendix II to Appendix I of CITES were those that are listed in Appendix I of the CMS, including mobulid rays and whale sharks. A listing in Appendix I of CMS indicates that the species should be strictly protected, so an Appendix II listing in CITES (which permits regulated trade) could be construed by some Parties as being somewhat "contradictory".

55. The Expert Panel noted however, the following:

- CITES Parties of various multilateral environmental agreements differ and hence, some of the Parties to CITES may not have had the opportunity to comment on any species proposed for listing in Appendix I of the CMS;
- listings in CITES can compromise the ability of the scientific community to collect and share relevant biological samples; and
- as CMS and CITES address different aspects of nature conservation, the review of information supporting this listing may have different objectives and thus lead to different conclusions.

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FAO EXPERT PANEL ASSESSMENT REPORT OF PROPOSAL 28: Oceanic whitetip shark, *Carcharhinus longimanus*

This proposal recommends transfer of oceanic whitetip shark, *Carcharhinus longimanus* from Appendix II to Appendix I in accordance with Annex 1, paragraph C.

EXPERT PANEL RECOMMENDATION

PROPOSAL 28	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
Oceanic whitetip shark, *C. longimanus*	–	X	–

	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
Global review	–	X	–
Western and Central Pacific	X	–	–

The Expert Panel concludes that the proposal to transfer oceanic whitetip shark from Appendix II to Appendix I does not meet the criteria for listing in CITES Appendix I globally. In contrast, the Western and Central Pacific population of the species meets the criteria for listing in Appendix I.

These conclusions are based on a comprehensive evaluation of the best available scientific data, which indicate that this species exhibits low-medium inherent productivity and does not reach the historical extent of decline thresholds required for listing in Appendix I globally, based on a reexamination and analysis of the available data by the Expert Panel. In contrast, the Western and Central Pacific population does meet the requirements for listing in Appendix I based on the results of a more recent stock assessment.

Importantly, management measures already in place at the national level and in tuna RFMOs are extensive and potentially effective in improving the recovery of this species. A concern with CITES listings, particularly the Introduction from the Sea provisions, is that they can affect the availability of samples and hinder research on the species. This can result in a lack of data and an increase in the uncertainty surrounding the reliability of future assessments. Additionally, while the proposal adequately explains the nature of international trade, the scale of this trade is difficult to interpret due to insufficient quantification of trade volumes. This results in a small amount of legal trade and a lack of information to substantiate the existence of "substantial" illegal trade.

MAIN SUPPORTING INFORMATION

Section 1. Fishery, trade and utilization

1.1. Is the nature and scale of international trade well described?

While there is no description of the fishery in the proposal, the oceanic whitetip shark is a circumglobal (Figure 1), epipelagic oceanic shark of tropical and subtropical waters, usually found between latitudes 41° north and 40° south and at temperatures above 21 °C (Compagno 1984; Fowler *et al.*, 2005). It is normally found offshore in oceanic waters or near oceanic islands. The species primarily occurs in surface waters at a depth of less than 180 m.

It is most abundant in tropical zones between 20° north and 20° south but sometimes follows warm bodies of water to higher latitudes (Compagno, 1984). Thus, its presence is less frequent in subtropical zones and it is rarely caught by pelagic longline fisheries operating south of 30° south (Domingo *et al.*, 2007; Petersen *et al.*, 2008; Mas Bervejillo, 2012). Although some researchers have suggested that it is present in the Mediterranean Sea, there does not appear to be any supporting evidence (Miller *et al.*, 2022). The oceanic whitetip shark is a frequent bycatch species in tuna fisheries in all oceans, being reported in tuna and swordfish longline fisheries in the Atlantic Ocean as well as in tuna longline and purse seine fisheries in the Pacific and Indian Oceans.

The main traded parts are meat, whole sharks, dressed carcasses (carcasses with head, tail and fins removed), and dried fins (wet frozen, dried unprocessed, and processed) (Young and Carlson, 2020).

Catches reported to FAO reveal that Sri Lanka, Brazil, China and French Polynesia had the largest catches for 1950–2023 (Figure 2); French Polynesia, Fiji, China, and the Islamic Republic of Iran reported the majority of catches for 2014–2023 (Figure 3); while French Polynesia, Fiji, and the Federated States of Micronesia had the highest catches for 2021–2023 – likely reflecting ongoing fisheries in coastal waters since 2020, when the inclusion of oceanic whitetip shark in Appendix I of the Convention on Migratory Species (CMS) went into effect.

1.2. How significant is the threat of international trade to species in the wild?

The nature of international trade is well described in the proposal, but the scale is harder to interpret because there is little quantification of the volume of international trade.

The proposal describes how there is a low volume of legal trade and "substantial" illegal trade. For example, there is direct evidence of recent illegal trade of oceanic whitetips from product seizures made in China, Hong Kong SAR and the United States of America alongside indirect evidence of substantial illegal trade of fins from a recent fin market survey in China, Hong Kong SAR (2014–2021) where oceanic whitetips averaged 0.71 percent (0.22–1.37 percent) of all trimmings sampled per year and were detected in 2.5–10 percent of monthly sampling events.

Data on the trade in fins derived from the CITES trade database shows that the recent average annual fin trade was 17 520 kg for 2020–2022, which is approximately 8.5 times higher than the average for 2014–2016 (Figure 4). The majority of trade volumes in 2021 and 2022 came from Yemen and Oman, accounting for about 98 percent of the total.

In all, while international trade is the main driver of exploitation, it is not possible to assess how substantial the level of (legal and illegal) trade is in relation to the abundance of the species based on the information provided in the proposal and available to the Expert Panel.

1.3. What is the importance of the species in local livelihoods and economies?

There is no explicit reference to the importance of international trade as it applies to livelihoods and economics in the proposal. However, trade is largely driven by fins, which are of cultural importance to some Asian cultures.

Section 2. Inherent biological productivity

2.1. Are inherent biological traits relevant to the species' productivity and resilience well described?

There is a brief paragraph in the proposal describing life history traits available from two populations of oceanic whitetip shark: Southwest Atlantic (SWA) and the Western Pacific (WP). The only characterization of productivity in the proposal is that they have "low to medium" productivity, but it does not explicitly categorize productivity based on the guidelines for exploited fish species established by FAO (2001) or by Musick (1999).

2.2. Is the species' inherent productivity appropriately categorized (low, medium, high) for the purpose of applying the CITES biological listing criteria?

The panel categorized the available life history information into productivity categories (Table 1). In addition to the values of K, t_{mat}, and t_{max} reported below, r was computed based on a litter size of 6 pups (SWA; Lessa *et al.*, 1999) or 10.5 pups (WP; Joung *et al.*, 2016) and a breeding frequency of 1 or 2 years (Tambourgi *et al.*, 2013; Seki *et al.*, 1998). Von Bertalanffy growth function parameters were L_∞ = 285 cm; K = 0.099 yr^{-1}, and t_0 = -3.391 yr^{-1} (SWA) and L_∞ = 309.4 cm; K = 0.085 yr^{-1}, and L_0 = 64 cm (WP). Natural mortality (M) was derived as the minimum value at age obtained from seven estimators, thus the computation of r approximates r_{max} (a maximum value).

Since r is, in essence, productivity, and uses the other four life history parameters (K, t_{mat}, t_{max}, M) in its calculation, this parameter should have more weight than the others. Based on these considerations the species would have a "low-medium" productivity, thus agreeing with the general statement given in the proposal.

Section 3. Evaluation of species status and trends in relation to CITES criteria

3.1. In application of the CITES biological listing criteria is the best available status and trend information considered, and is it sufficient to support a confident and well-substantiated determination?

Placing this species in the "low-medium" productivity category implies that a decrease of at least 80–90 percent is necessary for listing the species in CITES Appendix I.

The proposal relies on an IUCN Red List assessment (Rigby *et al.*, 2019) for population abundance trends. These included six indices which were believed to be the most representative of the relative abundance of the stock available at the time: five standardized CPUE series and the absolute biomass trend obtained from a stock assessment in the Pacific Ocean. A global population decline over three generations of 98 percent was obtained by using JARA on these series, weighted by area.

The six series included in the JARA analysis were:

1) standardized catch-per-unit effort (CPUE) in the Northwest Atlantic Ocean (Young *et al.*, 2017);
2) standardized CPUE in the Southwest Atlantic Ocean (Tolotti *et al.*, 2013);
3) standardized CPUE in Hawaii, United States of America (Brodziak and Walsh, 2013);
4) stock assessment biomass in the Western Central Pacific Ocean (WCPO) (Rice and Harley, 2012);
5) updated standardized CPUE in the WCPO (Rice *et al.*, 2015); and
6) standardized CPUE from the Spanish longline fishery in the Indian Ocean (Ramos-Cartelle *et al.* 2012).

Since the IUCN Red List assessments examine declines projected over three generations – past the final year of observed data in the time-series – and CITES criteria for listing in Appendix I focus on the historical extent of decline, the panel computed actual "observed" declines in the terminal year of data relative to the first year of data based on the annual rate of change (based on all years in the time-series) indicated in the JARA analysis. The calculation of these declines (Table 2), weighted by the proportional area covered by the different indices (Table 3), yielded a global decline of 69 percent, which falls short of the 80–85 percent (low productivity) and the 85–90 percent (medium productivity) required for listing in Appendix I. The index for the South Atlantic Ocean was left out of this computation because it showed an increase rather than a decrease.

Table 4 summarizes the declines listed in the proposal, including those used in the IUCN Red List assessment and some additional information available to the Expert Panel. Notably, a more recent stock assessment in the Western and Central Pacific Ocean estimated a population decline of 96 percent from virgin levels (Tremblay-Boyer *et al.*, 2019) which would qualify that population for Appendix I listing.

The values of the declines shown in Table 5 (from Young and Carlson, 2020) were extracted with WebPlot Digitizer (Rohatgi, 2025). The mean of the 16 time-series declines, which include 5 of the 6 time-series used in the IUCN Red List JARA analysis and the WCP time-series from the 2019 Tremblay-Boyer *et al.* stock assessment, was -59.8 percent (median = -77.2 percent) or mean = -66.7 percent (median = -77.2 percent) when excluding the five series used in the JARA analysis and the 2019 Tremblay-Boyer series.

There was insufficient information to draw any strong inference for any of the individual populations other than for the Western and Central Pacific Ocean population as stated above.

There are no global estimates of population size. For the Western and Central Pacific Ocean, the 2012 Expert Panel review indicated that the median estimate of biomass in 2010 was 7 295 tonnes (Rice and Harley, 2012), which would be equivalent to population numbers of the order of 200 000 sharks. However, the 2019 stock assessment (Tremblay-Boyer *et al.*, 2019) estimated a population size of 367 000 tonnes, which would correspond to approximately 7.6 million individuals (assuming an average weight of 49 kg derived from a stable age distribution of a demographic analysis). The estimated population size in the most recent stock assessment (2019) is almost 40 times higher than that obtained in the previous 2012 stock assessment.

3.2. Does the scientific data and technical information on historical extent of decline (Appendix I) meet the CITES biological listing criteria?

The global data on historical extent of decline do not meet the criteria for listing in Appendix I since the reanalysis of the JARA data shows only a 69 percent decline, below the required decline of at least 80 percent for a low productivity species and 85 percent for a medium productivity species. This determination is also supported by the examination of the other time-series presented in the proposal which showed an aggregated historical extent of decline of 60–67 percent.

In contrast, based on the stock assessment conducted in 2019, the population in the Western and Central Pacific Ocean meets the criteria for listing in Appendix I since it shows a 96 percent historical extent of decline.

3.3. What additional factors (e.g., vulnerability or resilience) should be considered in evaluating the species against the CITES biological listing criteria?

There are no particular intrinsic or extrinsic factors that apply specifically to oceanic whitetip sharks and would affect their susceptibility to extinction. For example, in the Atlantic Ocean, the population was ranked as having the seventh-highest productivity and the sixth-highest susceptibility to fisheries out of 20 stocks (Cortés *et al.*, 2015). Extrinsic factors such as habitat degradation and climate change are of course of concern for all marine organisms, including this highly migratory species.

Section 4. Management, conservation and potential impact of listing

4.1. Are national or regional management measures currently in place to conserve the species well described in the proposal?

Yes, the proposal describes the national measures in place to protect this species as well as international measures adopted by tuna RFMOs (summarized in part in Table 6).

4.2. Would a CITES listing likely enhance conservation outcomes for the species?

It is unclear whether a CITES listing would enhance conservation of the species since it is already protected by many nations and tuna RFMOs internationally.

4.3. Could a CITES listing lead to unintended positive or negative consequences for the species' conservation?

A concern with CITES listings, especially with the Introduction from the Sea provisions, is that they can interfere with sample availability and research on the species, making it even more data-limited in the future. This has been an ongoing issue especially since the 2013 and 2016 CITES listings of several highly migratory pelagic sharks. Many countries with high seas fisheries have onboard scientific observer programs that routinely collect biological samples on the high seas (ABNJ – areas beyond national jurisdictions) in areas of competency of tuna RFMOs. In addition, RFMOs often have joint international research programmes and initiatives and therefore the biological samples have to be transferred from the country that collected and holds the samples to other countries that conduct specific analyses. While there are processes in CITES to deal with Introductions from the Sea and transfers, the processes are complex and most scientists or laboratories simply do not have the time, legal knowledge or precedent on how to do this in a simple and effective manner. As such, usually when a highly migratory species is listed in CITES, one immediate negative consequence is stopping scientific sampling in the high seas for that species.

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TABLES AND FIGURES

Table 1. Expert Panel assessment of inherent productivity of *C. longimanus* populations in Southwest Atlantic (top) and Western Pacific (bottom)

Source	Parameters	Values	Productivity
this panel	M	0.098	Low
this panel	r	0.139	Low
Lessa *et al.*, 1999	K	0.099	Low
Lessa *et al.*, 1999	t_{mat}	6.5	Medium
Rodrigues *et al.*, 2015	t_{max}	19	Low
this panel	G	11	Low

Source	Parameters	Values	Productivity
this panel	M	0.090	Low
this panel	r	0.174	Medium
Joung *et al.*, 2016	K	0.095	Low
Joung *et al.*, 2016	t_{mat}	8.65	Low
Joung *et al.*, 2016	t_{max}	12	Low
this panel	G	12	Low

Note: Overall the Expert Panel set the productivity at low-medium, agreeing with what was stated in the proposal. Even if the productivity were to be set as low taking a more precautionary approach, the threshold of decline was not reached (see Table 2 and Table 5).

Sources: Joung, S.J., Chen, N.F., Hsu, H.H. & Liu, K.M. 2016. Estimates of life history parameters of the oceanic whitetip shark, *Carcharhinus longimanus*, in the Western North Pacific Ocean. *Marine Biology Research*, 12(7): 758–768; Lessa, R., Santana, F.M. & Paglerani, R. 1999. Age, growth and stock structure of the oceanic whitetip shark, *Carcharhinus longimanus*, from the southwestern equatorial Atlantic. *Fisheries Research*, 42: 21–30; Rodrigues, L., Madigan, D.J., Brooks, E.J., Bond, M.E., Gelsleichter, J., Howey, L.A., Abercrombie, D.L., Brooks, A. & Chapman, D.D. 2015. Diet shift and site fidelity of oceanic whitetip sharks *Carcharhinus longimanus* along the Great Bahama Bank. *Marine Ecology Progress Series*, 529: 185–197. https://doi.org/10.3354/meps11302

Table 2. JARA analysis table extracted from the IUCN Red List assessment

Region	GL (years)	Data length (years)	PA weighting	Median change	LC	NT	VU	EN	CR	Likely Status
N. Atlantic[1]	20.4	24	0.15	−93.1	0	0	0.2	4.4	**95.4**	**CR**
S. Atlantic[2]	20.4	7	0.08	+150.9	**90.1**	0.4	0.8	2	6.8	**LC**
N. Pacific (H.)[3]	20.4	16	-	−100	0	0	0	0	**100**	**CR**
Pacific 1 (WC.)[4]	20.4	15	0.57	−100	0	0	0	0	**100**	**CR**
Pacific 2 (WC.)[5]	20.4	19	0.57	−98.6	0	0	0	0.3	**99.7**	**CR**
Indian[6]	20.4	14	0.20	−92.9	12.6	1.4	3.8	13.6	**68.7**	**CR**
Global 1	–	–	–	**−100**	9.3	0.2	0.5	2.1	**87.8**	**CR**
Global 2	–	–	–	**−98.0**	9.3	0.2	0.6	2.3	**87.7**	**CR**

Source: Adapted from Rigby, C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W., Liu, K.M., Marshall, A., Pacoureau, N., Romanov, E., Sherley, R.B. & Winker, H. 2019. Oceanic whitetip shark: *Carcharhinus longimanus*. In: *The IUCN Red List of Threatened Species 2019*. Gland, Switzerland. [Cited 2 August 2025]. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T39374A2911619.en

Data sources:

1. Young, C.N., Carlson, J., Hutchinson, M., Hutt, C., Kobayashi, D., McCandless, C.T. & Wraith, J. 2017. *Status review report: Oceanic whitetip shark (Carcharhinus longimanus). Final Report to the National Marine Fisheries Service, Office of Protected Resources. December 2017*. Maryland, USA, NOAA Fisheries. https://repository.library.noaa.gov/view/noaa/17097: Figure 26, page 36.
2. Tolotti, M.T., Travassos, P., Fredou, F.L., Wor, C., Andrade, H.A. & Hazin, F. 2013. Size, distribution and catch rates of the oceanic whitetip shark caught by the Brazilian tuna longline fleet. *Fisheries Research*, 143: 136–142.: Figure 3, page 138;
3. Brodziak, J. & Walsh, W.A. 2013. Model selection and multimodel inference for standardizing catch rates of bycatch species: A case study of oceanic whitetip shark in the Hawaii-based longline fishery. Canadian *Journal of Fisheries and Aquatic Sciences*, 70: 1723–1740.): Figure 2, zero-inflated negative binomial (ZINB), page 1730, *(not used in global weighted trend).
4. Rice, J. & Harley, S. 2012. *Stock assessment of oceanic whitetip sharks in the western and central Pacific Ocean*. WCPFC-SC8-2012/SA-WP-06. Kolonia, the Federated States of Micronesia, Western and Central Pacific Fisheries Commission. https://meetings.wcpfc.int/node/7795: Figure 13, biomass, page 39.
5. Rice, J., Tremblay-Boyer, L., Scott, R., Hare, S. & Tidd, A. 2015. *Analysis of stock status and related indicators for key shark species of the Western Central Pacific Fisheries Commission*. WCPFC-SC11-2015/EB-WP-04. Kolonia, the Federated States of Micronesia, Western and Central Pacific Fisheries Commission. https://meetings.wcpfc.int/node/9137: Figure 41, page 88.
6. Ramos-Cartelle, A., García-Cortés, B., Ortíz de Urbina, J., Fernández-Costa, J., GonzálezGonzález, I. & Mejuto, J. 2012. *Standardized catch rates of the oceanic whitetip shark (Carcharhinus longimanus) from observations of the Spanish longline fishery targeting swordfish in the Indian Ocean during the 1998–2011 period*. IOTC2012WPEB0827. Victoria, IOTC. https://openknowledge.fao.org/handle/20.500.14283/bi295e: Figure 5, page 15.

Table 3. Global historical extent of decline of *C. longimanus* based on a recalculation of the JARA analysis using actual rates

Reanalysis of population change for oceanic whitetip shark	Years	Annual rate of decline[1]	Depletion over observed period [2]	Decline [3]	Projected depletion over 3 GL[4]	Decline[5]	JARA decline estimate[6]	Proportional area weighting[7]	Ongoing decline?[8]	Decline[9]	Area weight[10]
North Atlantic	24	0.0434	0.345	0.655	0.066	-93.4	-93.1	0.15	Yes	0.655	0.10
South Atlantic	7	-0.1391	2.488	-1.488	0.000	100.0	150.9	0.08	No	–	0.05
North Pacific	16	0.1627	0.058	0.942	0.000	-100.0	-100	–	No	0.942	–
Western Central Pacific[1]	15	0.1414	0.102	0.898	0.000	-100.0	-100	0.57	Yes	0.898	0.36
Western Central Pacific[2]	19	0.0529	0.356	0.644	0.036	-96.4	-98.6	0.57	Yes	0.644	0.36
Indian Ocean	14	0.0503	0.486	0.514	0.042	-95.8	-92.9	0.20	No	0.514	0.13
GLOBAL	–	–	0.609	–	–	–	-98	1.57	–	0.688	1.000

Sources: Rigby, C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W., Liu, K.M., Marshall, A., Pacoureau, N., Romanov, E., Sherley, R.B. & Winker, H. 2019. Oceanic whitetip shark: *Carcharhinus longimanus*. In: *The IUCN Red List of Threatened Species 2019*. Gland, Switzerland. [Cited 2 August 2025]. (https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T39374A2911619.en); author's own elaboration.

Notes:

[1] Extracted from Rigby, C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W., Liu, K.M., Marshall, A., Pacoureau, N., Romanov, E., Sherley, R.B. & Winker, H. 2019. Oceanic whitetip shark: *Carcharhinus longimanus*. In: *The IUCN Red List of Threatened Species 2019*. Gland, Switzerland. [Cited 2 August 2025]. (https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T39374A2911619.en); Supplementary material from Figures (b) for annual rate of change over all years.

[2] Remaining abundance at the end of the time-series = (1 - annual rate of decline) ^ Years

[3] Historical extent of decline = 1 - remaining abundance

[4] Projected depletion over three generations: (1 - annual rate of decline)^(3*GL); GL=20.4 years

[5] Corresponding extent of decline over three generations = -100 × (1 - projected depletion over three generations)

[6] Median change from JARA (Rigby, C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W., Liu, K.M., Marshall, A., Pacoureau, N., Romanov, E., Sherley, R.B. & Winker, H. 2019. Oceanic whitetip shark: *Carcharhinus longimanus*. In: *The IUCN Red List of Threatened Species 2019*. Gland, Switzerland. [Cited 2 August 2025]. (https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T39374A2911619.en); Supplementary material).

[7] Proportional area weighting from JARA (Rigby, C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W., Liu, K.M., Marshall, A., Pacoureau, N., Romanov, E., Sherley, R.B. & Winker, H. 2019. Oceanic whitetip shark: *Carcharhinus longimanus*. In: *The IUCN Red List of Threatened Species 2019*. Gland, Switzerland. [Cited 2 August 2025]. (https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T39374A2911619.en); Supplementary material).

[8] A qualitative statement about the trend of the abundance index in the most recent years of data.

[9] Same as "Decline" column excluding the increasing index of abundance for the South Atlantic. Green highlight is the global decline.

[10] Normalized column 7.

Table 4. Summary of *C. longimanus* declines listed in the proposal

AREA	PERIOD		POPULATION DECLINE	SOURCE	REMARK
	begin	end			
EPO	1993	2009	80–95 percent	Hall and Roman, 2013	IATTC analysis
WCPO	1995	2009	86 percent	Rice and Harley, 2012	SS3 stock assessment; used in JARA analysis
	1995	2010	90 percent	Brodziak and Walsh 2013	Around Hawaii; used in JARA analysis
				Rice *et al*., 2015	Used in JARA analysis
	1995	2016	< 5 percent of B_0	Tremblay-Boyer *et al*., 2019	SS3 WCPFC-CA
IO	1998	2011	Decline by 5 percent annually	Ramos-Cartelle *et al*., 2012	CPUE analysis; Used in JARA analysis
	2000	2010	25–40 percent	Yokawa and Semba, 2013	CPUE analysis
	1980	2000	90 percent	Anderson and Waheed, 1999	Around Maldives
	Three generations		> 80 percent	Jabado *et al*., 2017	Arabian Sea
AO	1990s	2000s	Large decline	Young *et al*., 2017	US observer data;
	2000	2015	Stable (4 percent decline annually)		Limited area of NW US water; Used in JARA analysis
	Mid1950s	Late1990s	> 88 percent	FAO, 2013	US Gulf of Mexico
	2004	2010	Slight increase	Tolotti *et al*., 2013	Used in JARA analysis

Notes: Areas: Atlantic Ocean (AO); Eastern Pacific Ocean (EPO); Indian Ocean (IO); Western Central Pacific Ocean (WCPO).
Sources: See References (p.20).

Table 5. Summary of *C. longimanus* population declines by area, listed in the proposal and extracted from Young and Carlson (2020)

DECLINE	AREA	SOURCE
-89.1	EP	Hall & Roman, 2013
-89.6	WP	Brodziak *et al.*, 2013
-95.5	WCP	Tremblay-Boyer *et al.*, 2019
-92.4	WP	Rice *et al.*,2016
-89.6	WP	Clarke *et al.*, 2012
-86.1	WP	Rice and Harley, 2012
15.2	SWA	Tolotti *et al.*, 2013
-84.6	SWA	Madigan *et al.*, 2015
-56.4	NWA	Cortés *et al.*, 2007
-3.2	NWA	Young *et al.*, 2017
-49.8	NWA	Baum & Blanchard, 2010
-8.3	NWA	Cortés *et al.*, 2017
-69.8	NWA	Baum *et al.*, 2003
-87.6	NWA	Baum & Myers, 2004
-39.4	IO	Yokawa & Semba, 2013
-30.1	IO	Ramos-Cartelle *et al.*, 2012

ALL - JARA - 2019		
mean	-66.7	
median	-77.2	
ALL		
mean	-59.8	
median	-77.2	

Notes: Areas: Atlantic Ocean (AO); Eastern Pacific (EP); Indian Ocean (IO).North West Atlantic (NWA); South West Atlantic (SWA); Western Central Pacific (WCP); Western Pacific (WP).

Sources: See References (p. 21).

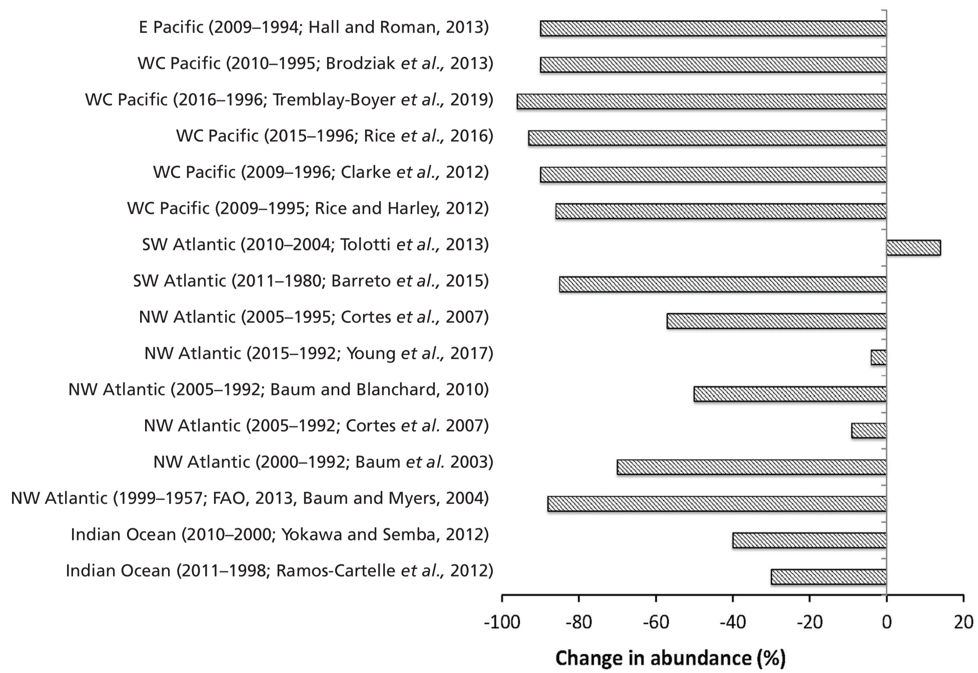
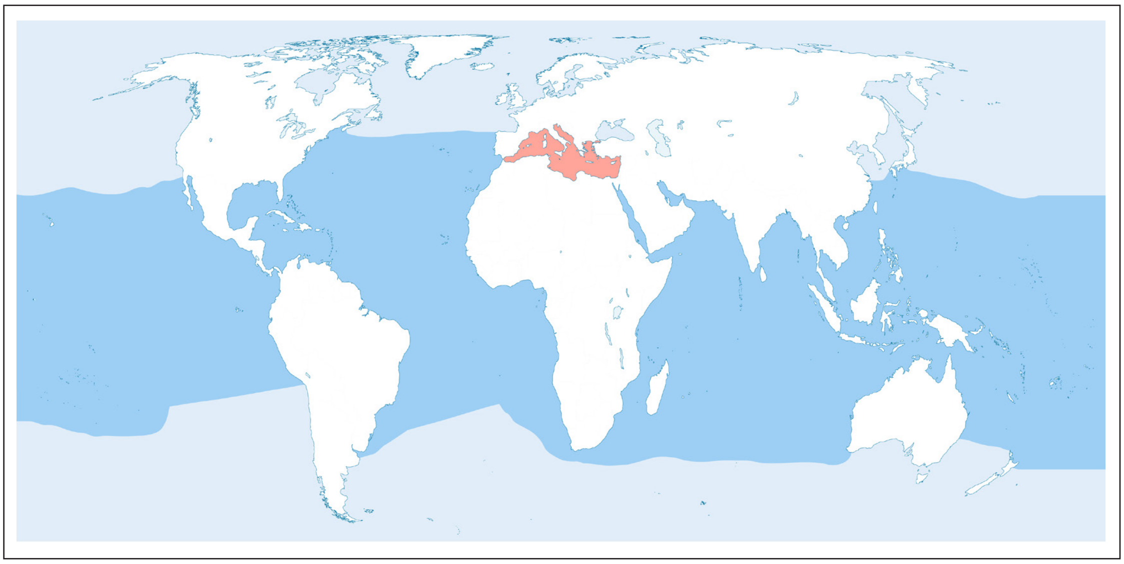


Table 6. Management recommendations for oceanic whitetip shark, *C. longimanus* in effect across tuna RFMOs

Area	Management measure	Brief descriptions
ICCAT	Recommendation 10-07 https://www.iccat.int/Documents/Recs/compendiopdf-e/2010-07-e.pdf https://www.iccat.int/Documents/Recs/compendiopdf-e/2019-01-e.pdf	Prohibit retaining onboard, transshipping, landing, storing, selling, or offering for sale any part or whole carcass of oceanic whitetip sharks in any fishery. The term "elasmobranchs that are oceanic, pelagic, and highly migratory" includes *C. longimanus*
WCPFC	Conservation and Management Measure 2024-05 https://cmm.wcpfc.int/measure/cmm-2024-05 The WCPFC adopted supplementary information on CMM2024-05 in the form of non-binding guidelines on best handling practices for sharks in purse seine and longline fisheries.	Prohibit vessels flying their flag and vessels under charter arrangements to the CCM from retaining on board, transshipping, storing on a fishing vessel or landing any oceanic whitetip shark, or silky shark, in whole or in part, in the fisheries covered by the Convention
IATTC	Resolution C11-10 https://www.fao.org/faolex/results/details/en/c/LEX-FAOC166402/	Prohibit retaining onboard, transhipping, landing, storing, selling, or offering for sale any part or whole carcass of oceanic whitetip sharks in the fisheries covered by the Antigua Convention.
IOTC	Resolution 13/06 (Objection [India]: Not binding on India) https://iotc.org/sites/default/files/documents/compliance/cmm/iotc_cmm_13-06_en.pdf Resolution 15/01	To promptly release unharmed, to the extent practicable, of oceanic whitetip sharks when brought alongside for taking onboard the vessel. However, CPCs should encourage their fishers to release this species if recognized on the line before bringing them onboard the vessels. *C. longimanus* subject to a data recording system for longlines, purse seine and gillnet fisheries

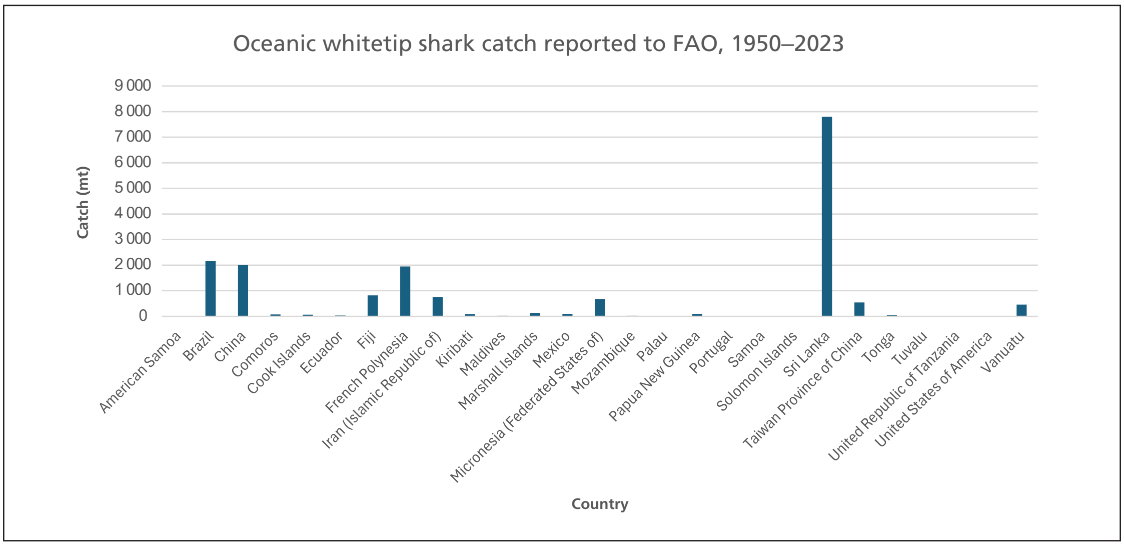
Note: See https://www.fao.org/ipoa-sharks/database-of-measures/en/

Figure 1. Geographical distribution of oceanic whitetip shark, *C. longimanus*



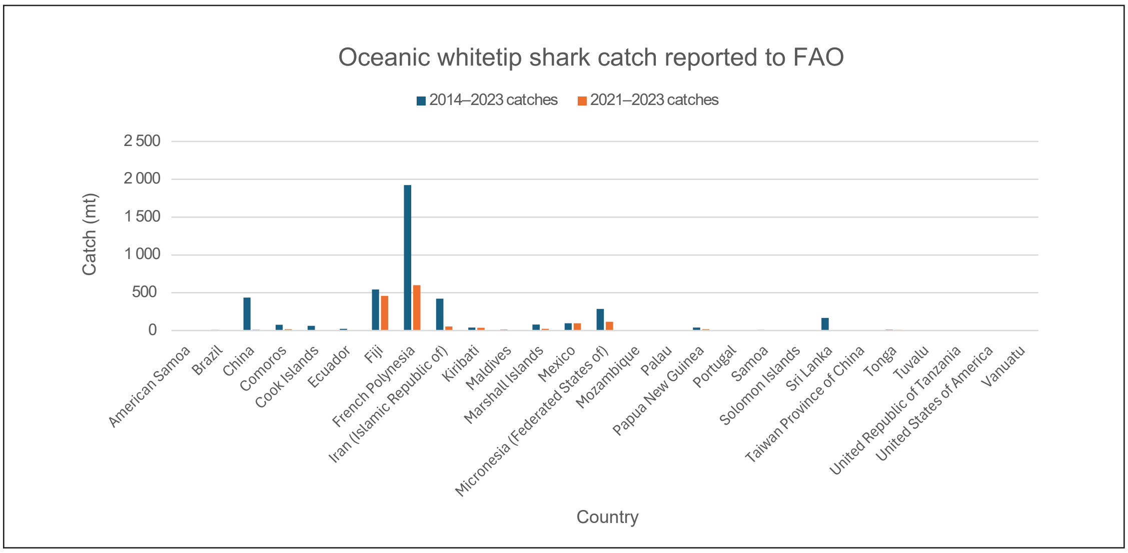
Source: Modified from Miller, P., Domingo, A., Forselledo, R. & Mas Bervejillo, F. 2022. Chapter 22.1.6. Oceanic whitetip sharks. In: *ICCAT Manual*. Madrid, ICCAT using UN Map No. 4651 Rev. 3. [Cited 01 March 2025].
Note: Refer to the disclaimer on page [ii] for the names and boundaries used in this map.

Figure 2. Catches of *C. longimanus* from FAO database (FishStat), 1950–2023



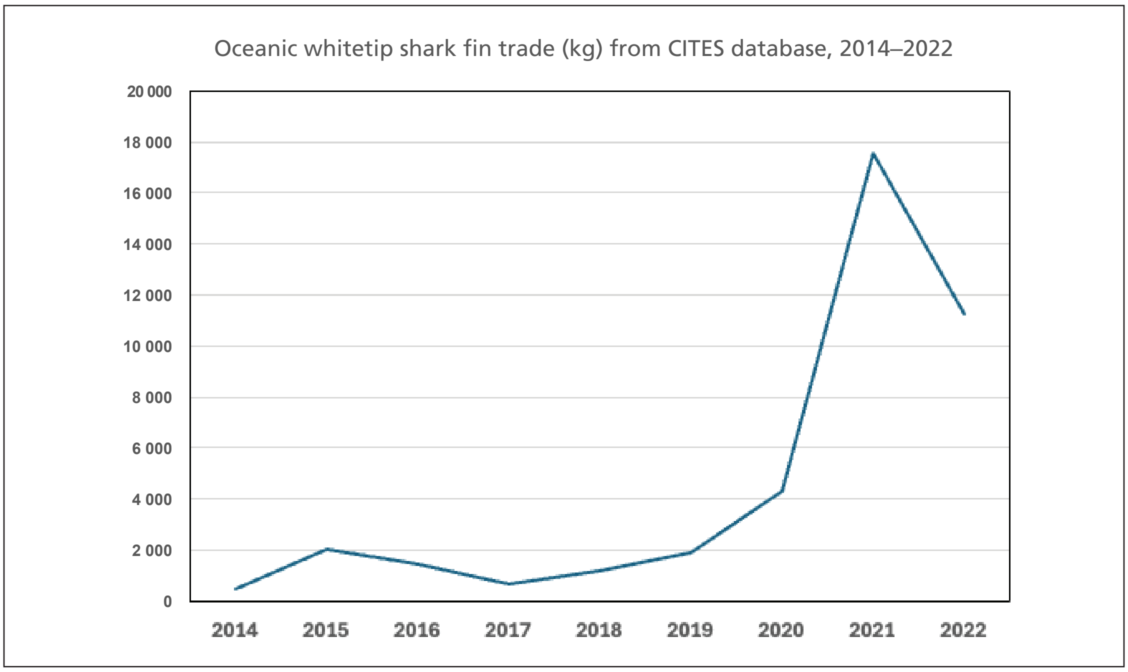
Source: FAO. 2025. FishStat: Oceanic whitetip shark catch reported to FAO, 1950–2023. [Accessed on 25 July 2025]. In: *FishStatJ*. Available at https://www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

Figure 3. Catches of *C. longimanus* from FAO database (FishStat), 2014–2023 and 2021–2023



Source: FAO. 2025. FishStat: Oceanic whitetip shark catch reported to FAO, 1950–2023. [Accessed on 25 July 2025]. In: *FishStatJ*. Available at https://www.fao.org/fishery/en/statistics/software/fishstatj. Licence: CC-BY-4.0.

Figure 4. Trade in *C. longimanus* fins from CITES database, 2014–2022



Source: CITES. 2025. Export of *C. longimanus* fins from CITES Trade Database for wild specimens between 2014–2022 as reported by exporting Parties. [Accessed on 25 July 2025]. In: *CITES Trade Database*. Available at https://trade.cites. org

FAO EXPERT PANEL ASSESSMENT REPORT OF PROPOSAL 29: School Shark (*Galeorhinus galeus*), and smoothhounds (*Mustelus schmitti*; *Mustelus mustelus*)

This proposal recommends the inclusion in Appendix II of school shark (*Galeorhinus galeus*), Patagonian narrownose smoothhound (*Mustelus schmitti*) and the common smoothhound (*Mustelus mustelus*) under Annex 2 (a), and for reasons of similarity, inclusion of all other species in the genus *Mustelus* satisfying Annex 2b of the Convention.

EXPERT PANEL RECOMMENDATION

PROPOSAL 29	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
G. galeus; *M. schmitti* and *M. mustelus*	–	X	–

SPECIES PROPOSED	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
G. galeus	–	X	–
M. schmitti	–	X	–
M. mustelus	–	–	X*

LOOK ALIKE SPECIES	
26 spp. of genus *Mustelus* not assessed against CITES criteria**	

* Insufficient evidence of declines to make a judgement in relation to CITES criteria (CITES Res. Conf. 9.24. Rev. CoP17).
** Total number of *Mustelus* species in the genus varies depending on the source record referenced.

The Expert Panel concludes on the basis of the best available scientific data and technical information presented in CoP 20 Proposal 29 that *Galorhinus galeus* and *Mustelus schmitti* do not meet the CITES criteria for inclusion in Appendix II.

While *G. galeus* is heavily depleted in many of the regions for which abundance indicators are available, the global extent of decline appears not to exceed the CITES threshold for a low-medium productivity species, furthermore the Expert Panel noted that its abundance appears to be increasing in some areas.

While *M. schmitti* is estimated to be highly depleted and below the CITES extent of decline threshold for a low-medium productivity species, abundance trends have stabilized and have shown an increase over the last 10 years.

For *M. mustelus* there is insufficient evidence at the global level to support listing in Appendix II. Data are incomplete and, where available, trends and extent of depletion are highly variable across regions.

MAIN SUPPORTING INFORMATION

Section 1. Fishery, trade and utilization

1.1. Is the nature and scale of international trade well described?

School shark or tope (*G. galeus*) is widespread in temperate waters in most oceans. It is present across the Northeast, Eastern Central, Southwest, and Southeast Atlantic Ocean; the Mediterranean Sea; the Eastern Indian Ocean; and in various parts of the Pacific Ocean, with occasional records in the Northwest Pacific Ocean (Ebert *et al.*, 2013).

It is a demerso-pelagic species caught using different fishing methods, mainly in artisanal and recreational fisheries. Its meat is in demand in domestic markets and contributes significantly to the protein needs of coastal communities.

The history of *G. galeus* fisheries is broadly similar across most regions of the world, with the notable exception of the Northeast Atlantic, where the species has primarily been taken as bycatch in other fisheries. The earliest documented exploitation of this shark dates back to the late nineteenth or early twentieth century, when it was harvested for use as fertilizer and for sharkfin soup.

In southeastern Australia, targeted fishing for *G. galeus* began in the 1920s, primarily using bottom-set longlines to supply meat for human consumption. By the 1930s, the species was also being caught in South Africa and California, valued both for its meat and fins. During World War II, catches increased significantly across all these regions – as well as in southern Brazil, Uruguay, and northern Argentina – driven by rising demand for shark liver oil, a key source of vitamin A. However, this demand declined rapidly after the war, initially due to the return of cod liver oil as the preferred source of vitamin A and later due to the development of synthetic alternatives in the 1950s (Walker, 1999).

The main international trade is for meat and, to a lesser extent, for fins. Despite this, it has been detected that the trade in *G. galeus* fins occupies an important place in the Southeast Asian markets (Murillo Rengifo *et al*., 2024). Because it is often combined with other species, mainly species of the genus *Mustelus*, there are deficiencies in trade information. This has also been observed in studies that have detected mislabeling or fraudulent labeling where these species were marketed locally under another name (Delpiani *et al.*, 2020).

M. schmitti is a species endemic to the coastal area of the southwestern Atlantic and is caught primarily in small-scale fisheries and, to a lesser extent, as bycatch in industrial trawl fisheries and targeted by recreational fisheries. Its main product is meat, which is consumed primarily on the domestic market.

M. mustelus is distributed in the coastal area of the eastern Atlantic (north and south) and the Mediterranean Sea. Like *M. schmitti*, it is caught by artisanal and industrial coastal fisheries and its meat is important for the food and economic security of many coastal communities.

1.2. How significant is the threat of international trade to species in the wild?

Most of the data presented in the proposal to emphasize the significance of the species in the international market were derived from estimates of landings and global trade based on an unpublished study, cited as in preparation, whose details cannot be assessed.

With the exception of a international trade in meat from South Africa, Australia and New Zealand, most consumption of *G. galeus* occurs domestically. Overall, international trade is difficult to identify as exports are carried out under a generic name that encompasses other similar species. Over the last 10 years and presently, the largest landings of *G. galeus* have occurred in the Australasia, which account for between 75–84 percent of global landings, and for which international trade is likely occurring. The other regions in order of largest landings were the Northeast Atlantic, Southeast Atlantic, and Southwest Atlantic, which together generate less than 20 percent of total reported annual landings (~800 tonnes). CITES regulations on most regions that have had marginal international trade over such a long period would not, in principle, lead to improvements in management and conservation.

On the other hand, the fishery in New Zealand, which accounts for the majority of the *G. galeus* trade, is strictly managed by quotas and regular stock assessments have indicated both that catches have been sustainable and that the stock has been varying around management targets associated with producing maximum sustainable yield.

As stated in the proposal, *Mustelus* species are often aggregated under common fishery names and species-specific trade data are limited, making it challenging to assess the extent and impact of international trade. *M. schmitti* meat is consumed almost entirely in the region's domestic markets and its reported international trade is very limited. Furthermore, the fishery for the species in the region is monitored and regulated with extraction limits and a management plan, and there is ongoing research. Therefore, CITES regulations on international trade are unlikely to affect the management and conservation of this species.

1.3. What is the importance of the species in local livelihoods and economies?

There is no explicit reference in the proposal to the importance of international trade as it applies to livelihoods and economics.

Section 2. Inherent biological productivity

2.1. Are inherent biological traits relevant to the species' productivity and resilience well described?

The proposal characterizes the three species as having "low" productivity, but it does not explicitly categorize productivity based on the guidelines for exploited fish species established by FAO or by Musick (1999).

The Expert Panel categorized the available life history information into productivity categories (see Table 7). The Expert Panel's categorization differs from the proposal in that *G. galeus* was classified as low-medium productivity, and *M. schmitti* and *M. mustelus* as medium.

2.2. Is the species' inherent productivity appropriately categorized (low, medium, high) for the purpose of applying the CITES biological listing criteria?

Biological traits (e.g., natural mortality (M), individual growth coefficient (k), population intrinsic growth rate (r), age at maturity (t_{mat}), maximum age (t_{max}) and population generation length (GL) were considered well selected and described to explain inherent productivity.

For *G. galeus*, productivity estimates were only obtained for the Southwest Atlantic and Pacific, resulting in low-medium productivity.

For *M. schmitti* and *M. mustelus*, the inherent medium productivity is appropriately categorized.

Analyses were also conducted for six other *Mustelus* species, which resulted in high (*M lenticulatus*), medium-high (*M. antarcticus, M. canis*), low-high (*M. californicus*), medium (*M. manazo*), and low (*M. henlei*) productivity categorizations (CITES, 2024).

Section 3. Evaluation of species status and trends in relation to CITES criteria

3.1. and 3.2. In application of the CITES biological listing criteria, is the best available status and trend information considered and is it sufficient to support a confident and well-substantiated determination. Additionally, does the scientific data and technical information on historical extent of decline and the recent rate of decline in conjunction (Appendix App II), meet the CITES biological listing criteria?

The proposal is for the inclusion of the school shark (*G. galeus*), Patagonian narrownose smoothhound (*M. schmitti*), and the common smoothhound (*M. mustelus*) in CITES Appendix II in accordance with Article II paragraph 2(a) of the Convention. The quality of the evidence provided in support of the listing under CITES Appendix II varies depending on the species.

G. galeus

The proposal states that *G. galeus* is severely depleted and has already met the Appendix I biological decline criterion, exceeding the 80 percent reduction threshold for a species classified in the proposal as having low productivity. The main support provided for this statement is the recent IUCN Red List assessment, leading to the listing of the species as Critically Endangered (globally). The IUCN assessment (Walker *et al.*, 2020) concluded that this species had experienced a global population decline of 70–99 percent over the past three generations (79 years), with a median estimate of 88 percent and the highest probability exceeding 80 percent.

This global extent of decline was calculated as a weighted average of regional rates of change estimated for the following regions: Northeast Atlantic; Mediterranean Sea; Southwest Atlantic; Southern Africa; Australia, and New Zealand. The JARA software (Sherley *et al.*, 2019) was utilized to estimate regional rates of change, by fitting an exponential model to the available indices of abundance. The estimated annual rates of change, averaged over the years covered by the indices, were used to project the population declines over a period of 78.9 years which corresponds to three times the species' generation length (*GL*). The regional rates of decline were combined by weighting each region by an estimate of its relative area, used as a proxy for the relative unfished biomass of the region.

As discussed previously in this report, this methodology developed for evaluations related to the IUCN Red List criteria is inadequate for evaluations under the CITES criteria. Two main problems were identified in the *G. galeus* application.

First, the average annual rates of decline used for projections were estimated for periods that ranged between 24 and 74 years (i.e., the periods covered by the data available for the different regions) and therefore do not reflect the recent rates of decline as required by the CITES criteria.

In several regions, biomass has recently stabilized or is still declining but more slowly, often in response to management measures introduced to prevent directed targeting, implementation of closed areas, etc. For example, in Australia, there has been no directed targeting of school sharks for more than a decade and measures such as bycatch TACs and move-on rules have been implemented since 2008. As a result, long-term historical trends and harvesting context are not representative of current and future contexts. Hence, the application of an overall rate of decline overestimates future projected declines.

Second, the time frame of three GL used to calculate the overall rate of change is much longer than the 10 years to be considered in the evaluation of recent and projected change according to the CITES criteria for Appendix II listing.

An illustrative example (see Figure 5) of both problems is provided by the projected decline for the Northeast Atlantic and Mediterranean stocks estimated by the IUCN assessment using JARA. While a recent positive trend is apparent in the selected indicators of abundance, an average annual rate of decline of -1.66 percent, estimated based on 29 years of data, was used to project another 50 years of decline into the future. The result was a 76.6 percent decline over three GLs. If the most recent 10-year average trend was used instead, these stocks would be predicted to increase.

An additional problem in the evidence provided is that the data used for the IUCN analysis covered years until the period 2015–2018. However, updated assessments are available for some of the regions, which were not considered in the proposal.

To evaluate the impact of these problems on the estimates of stock trends, the FAO Expert Panel used updated information from various sources to estimate the historical extent of decline and the recent rates of decline by region. In terms of historical extent of decline, analytical estimates of depletion (i.e. biomass relative to unfished level, B/B_0) were available from stock assessments for Australia, New Zealand and South Africa. For the Atlantic and Mediterranean regions, the Expert Panel reanalyzed the JARA estimates provided in the IUCN assessment. No quantitative information was available for the Pacific regions.

For Australia, a highly depleted stock (B/B_0 = 0.12) was estimated for 2008 by Thomson and Punt (2009). The most recent stock assessment (Thompson *et al.*, 2020), conducted using closekin mark recapture techniques, estimated a very low abundance of adults but did not update the estimates of depletion. A population dynamics model assuming a single stock could not sustain the high catches observed in the 1990s. Hence, the authors concluded that school sharks likely consist of a number of stocks, some of which have been severely depleted, and that those that remain are small, but are most likely increasing – indicating that current catches are allowing recovery, at least of the stock(s) sampled.

The New Zealand stock assessment (New Zealand Fisheries, 2025) indicates that the stock is managed sustainably and has been stable around a target consistent with the level producing maximum sustainable yields. Therefore, a default of 50 percent of the unfished level was assumed for the purpose of calculating the historical extent of decline.

For South Africa, the most recent analytical stock assessment (Winker *et al.*, 2019) estimated that for 2016, the B/B_0 ranged between 0.10 and 0.14 depending on the model scenario. In that assessment, population models were fitted to historical catches and trawl survey indices available for 1991–2016.

No analytical assessments are available for the Northeast Atlantic and Mediterranean region, nor for the Southwest Atlantic region. Therefore, for these two regions the Expert Panel used the stock trends estimated based on selected abundance indicators for the IUCN evaluation (Walker *et al.*, 2020). The average annual rates of change estimated using JARA for the entire period covered by data (1990–2018 for the Northeast Atlantic and Mediterranean, and 1991–2015 for the Southwest Atlantic regions) were used to calculate an initial proxy for the overall extent of decline. The Expert Panel acknowledges that this approach likely underestimates the historical extent of decline as it ignores stock reduction prior to the start of the data series. Therefore, a range of initial levels of depletion (B/B_0 = 0.1–1) were considered for evaluating sensitivity for both the Northeast Atlantic and Southwest Atlantic regions.

The resulting estimates of depletion obtained for the five regions were outdated to varying degrees. Hence, they were first extrapolated to a common year (2025) using recent rates of population change by region, estimated based on abundance trends for the last 10 years of available information from various sources:

- Northeast Atlantic Ocean and Mediterranean: JARA estimates for 2009–2018 digitized from Figure 1(a) of the IUCN assessment report (Walker *et al.* 2020, supplementary information). No ongoing decline was estimated for the period covered.
- Southwest Atlantic Ocean: JARA estimates for 2006–2015 digitized from Figure 2(a) of IUCN report. Decline slowed towards the end of the period covered.
- South Africa: an extended time-series of abundance indices up to 2021 indicating ongoing decline, but at a slower rate than estimated in the IUCN assessment (data made available by Charlene da Silva, South Africa Department of Forestry, Fisheries and the Environment).
- Australia: most recent base-case model estimates of relative abundance indicating a slow recovery over the last 10 years, digitized from Thomson *et al.* (2020, Figure 4.18).
- New Zealand: most recent stock assessment (Fisheries New Zealand, 2025) indicates that abundance has been stable around an empirical management target. A stable population was assumed for calculating future global projections.

An exponential model was fitted to each of the 10-year series (except for New Zealand) to estimate the average annual rate of change for each region used to extrapolate the extent of decline to 2025. Next, these 2025 estimates of depletion were extrapolated both backwards to 2015 and also forward 10 more years into the future. The current (2025), past (2015) and projected (2035) global depletion estimates were calculated as a weighted average of the respective regional depletion estimates, using the same area-based relative weights used in the IUCN assessment (Walker *et al.*, 2020). The assumption underlying this calculation is that area of each region is proportional to its pristine biomass. Finally, the global 10-year rate of change was calculated from the ratio of global depletion estimates for 2015 and 2025.

The extents of decline calculated using this approach, for each region and globally, were lower than those quoted in the proposal corresponding to the IUCN assessment (Table 8). While the calculated extent of decline exceeded 80 percent in three of the regions (Southwest Atlantic Ocean, Australia and South Africa), the trends in Australia indicate a very slow recovery, there is no information about recent trends for the Southwest Atlantic Ocean (the indicator used in the IUCN assessment cover until 2015), and only for South Africa is there an ongoing declining trend which is well informed by trawl survey data.

The global decline was estimated at 58.9 percent when stock decreases prior to the start of the indices available for the Northeast Atlantic and Southwest Atlantic regions were ignored (Table 8). Larger declines were obtained when those stocks were assumed to be already reduced to varying degrees at the start of the series (Figure 6). That sensitivity analysis indicated that only when the stocks were assumed to be below 0.40 of the unexploited level at the start of the series did the global extent of decline exceed the 80 percent threshold corresponding to a low-productivity species. The Expert Panel noted that:

- Eighty percent is a conservative threshold given that school shark is considered a low-medium productivity species, and
- In the absence of any documented major fishery targeting school shark in the Northeast Atlantic region, an initial depletion of = 0.40 is considered unlikely for that region.

Therefore, the Expert Panel concludes that there is no evidence that at the global level the species has declined by more than 80–90 percent, the threshold levels corresponding to a low-medium productivity species.

The annual rates of change estimated by the Expert Panel for the most recent period were either still negative but lower in magnitude than estimated in the IUCN assessment, or they indicated stability or slow recovery (Table 8). Two of the five regions show ongoing declining trends, although the information for the Southwest Atlantic Ocean is outdated and very sparse, being available for only a single site. The South African population, on the other hand, is still decreasing at an annual rate of close to -2 percent. The resulting global estimates of abundance show a 11.1 percent increase over the last 10 years.

Therefore, the Expert Panel concludes that there is no evidence of an ongoing declining trend at the global level.

M. schmitti
The proposal fails to present existing information on the regional stock status and its management, particularly for the Argentinean–Uruguayan Common Fishing Zone, which has a long history of stock assessments and management measures, as well as a joint research plan relevant in the context of the species' conservation.

Stock assessments of *M. schmitti* have been conducted annually since 2011 by the Joint Technical Commission of the Maritime Front (CTMFM) of Uruguay and Argentina. The most recent stock assessment covering the entire area of distribution in Argentina, Uruguay and adjacent waters (CTMFM, 2025), including data up to 2024, indicates that the stock declined sharply during the 1990s until 2013, reaching a minimum level close to 15 percent of unfished biomass. Trends in estimated biomass stabilized since then following major reductions in catches, and have shown a small increase.

Projections indicate that, if catch levels remain constant at around 4 000 tonnes – as observed in 2024 – the biomass is expected to exceed 0.25 B_0 within 7 years. Furthermore, maintaining annual catches near 3 000 tonnes would allow the population to achieve B_{MSY} within 15 years. According to this regional analysis, the stock of *M. schmitti* is estimated to have declined below 20 percent B_0, which meets the historical extent of decline criterion for a medium productivity species. However, the stock decline is not ongoing and future projections indicate that the recovery plan will achieve a 25 percent B_0 threshold in less than 10 years (CTMFM, 2025).

M. mustelus
The proposal states that *M. mustelus* has declined severely due to unsustainable fisheries, largely driven by international trade demand for their meat and fins. It refers to its recent IUCN Red List assessment (Jabado *et al*., 2021), which classified the species as Endangered due to a suspected global population reduction of 50–79 percent over the last three generations (53 years). The proposal states that

> "historic and continuing misidentification of *Mustelus* with other sympatric smoothhounds (and vice versa) limits the quality of catch data and stock assessments across most of its eastern Atlantic/Mediterranean range". (p. 3)

Although population trend data for *M. mustelus* are inconsistent, large and intensive fisheries operate in many regions within its range. The Mediterranean range of *M. mustelus* has contracted, with some genetically distinct populations in the Mediterranean – and possibly in West Africa – having been extirpated.

The IUCN assessment for *M. mustelus* contains abundance data for two regions, South Africa and Mauritania, both of which were analyzed using the same JARA approach used for school shark.

The most recent stock assessment conducted for South Africa (da Silva *et al*., 2019) estimated a depletion for 2016 in the range 0.58–0.64 of the unexploited biomass, depending on the model scenario. Updated trawl survey estimates covering up to 2021 (Charlene da Silva pers. comm. South Africa Department of Forestry, Fisheries and the Environment), indicates that the stock has increased since then. This recent evidence does not support the long-term negative trend projected by the JARA analysis, which estimated an overall projected decline of -59 percent over a period of 17.8 years corresponding to 3 *GL*.

In contrast, the decline estimated for the Mauritania stock over the entire period covered by the trawl survey data (1982–2015) indicated a depletion (*B/B0*) of 0.19 in 2015. When the recent rate of change estimated from the JARA outputs is used to extrapolate the extent of decline to 2025, a depletion equal to 0.11 is obtained. These results indicate that the Mauritanian stock would meet the extent of decline criteria for listing under CITES Appendix I corresponding to a medium productivity species.

Maioli *et al.* (2023) report results from the Mediterranean International Trawl Survey (MEDITS) which indicate increasing trends for smoothhound in the Adriatic Sea. However, two species –*M. mustelus* and *M. punctulatus* – were grouped together under this common name.

The disparity of the estimated trends among some of the regions, coupled with the uncertainty about trends due to taxonomic grouping in some important parts of the species distributional range prevented the Expert Panel from reaching definitive conclusions about the global extent of decline and recent rates of decline of *M. mustelus*.

For *G. galeus* and *M. schmitti*, the proposal fails to provide updated information for parts of the Southwestern Atlantic region (Brazil), and much of the data presented are from more than 20 years ago. It is evident from the proposal that the technical staff of fisheries management agencies of Argentina and Uruguay were not consulted. Furthermore, Uruguay has not decided on its position on this matter. The data presented do not allow for an assessment of the importance, in terms of both volume and value of the international trade of these species in the Southwest Atlantic.

It is evident from the proposal that Argentina was not consulted. Furthermore, neither has Uruguay has not decided on its position on this matter. The data presented do not allow for an assessment of the importance, in terms of both volume and value of the international trade of these species in the Southwest Atlantic.

3.3. What additional factors (e.g. vulnerability or resilience) should be considered in evaluating the species against the CITES biological listing criteria?

The Proposal acknowledges that the species are threatened by habitat loss and deterioration, including of shallow water pupping grounds and nurseries which are vulnerable to a range of other anthropogenic pressures (e.g., coastal developments), and climate change.

Modelling work conducted on *G. galeus* in Australia (Thomson *et al*., 2020) suggests that the population may consist of a number of substocks, many of which were severely depleted, as the current population was unable to sustain the larger catches in the 1990s and appears incompatible with the large historical catches from the 1960s and the late 1980s. The authors also mention that productivity may have been reduced due to habitat degradation, so that even if fishing were completely stopped, the stock might not recover to "pristine" levels. They also mentioned that ocean warming of south-eastern Australia has been much higher than the global average, which may also have adverse impacts on temperate species such as *G. galeus.*

Section 4. Management, conservation and potential impact of listing

4.1. Are national or regional management measures currently in place to conserve the species well described in the proposal?

While the proposal describes some of the national measures in place to protect these species, there are significant gaps for some species and regions.

G. galeus – Australasia
School shark is listed as "Conservation Dependent" under Australia's EPBC Act (2009). Targeted commercial fishing for this species was banned in 2001. Management measures include gear restrictions, net mesh size limits, length-based size limits, seasonal closures, and a bycatch quota intended to reduce catch. Increasingly stringent management measures were introduced in Australia from 1997 onwards to protect the stock, including a rebuilding strategy which was implemented in 2008, and targeting the species is not permitted. Catches have dropped to low levels and the most recent stock assessment (Thomson *et al.*, 2020) predicts slow recovery of the stock.

In New Zealand, *G. galeus* is managed under the Quota Management System, which issues vessels Individual Transferable Quotas (Finucci *et al.*, 2019). The species is also subject to recreational bag limits of 20–30 fish per day (Walker *et al.*, 2020).

G. galeus – Southeast Atlantic
G. galeus and *M. mustelus* are protected in Cape Verde by Decree Law No. 8/2022. South Africa employs various management measures for these and other shark species. For example, a minimum net mesh size was established in 1948 to reduce the capture of pregnant females. More recently, a harvest slot size of 70–130 cm total length (TL) was introduced in line fisheries to protect juveniles and larger females, and a Total Allowable Effort of one vessel was established in the only target fishery. In addition, recreational fisheries have a catch limit of one shark/day. In South Africa, the national plan of action for Sharks (2013) was reviewed and updated in 2022, creating greater protection measures aligned with scientific recommendations underpinned by stock assessment outputs.

G. galeus – Southwest Atlantic
Regarding *G. galeus* there are various conservation and management measures in the Southwestern Atlantic. Both Argentina and Uruguay have regulations that imply closures and prohibitions on increasing directed effort on *G. galeus.* In turn, there are prohibitions on finning and the implementation of onboard management practices to minimize mortality. Within the scope of the CTMFM, closures have been established in reproductive areas for both *G. galeus* and *M. schmitti*. MMA (2011) establishes the general rules for access to and sustainable use of fishery resources in Brazil. Both species are listed in the regulation as incidental catch in various fishing modalities. Additionally, these species are classified as critically endangered in the MMA Ordinance No. 445, dated 17 December 2014, which recognizes them as species of the Brazilian fauna threatened with extinction. According to this ordinance, species classified as critically endangered have their capture, transport, storage, custody, handling, processing, and commercialization prohibited. The MMA Normative Instruction No. 5, Annex I, dated 21 May 2004, indicates that their capture by fishing activities has been prohibited since 2014.

G. galeus – Northeast Atlantic and Mediterranean
Conservation measures for the school shark have been introduced by the European Union, including restrictions on fishing and trade since 2010 to safeguard the species (Council Regulation (EU) No 40/2013). European Union regulations prohibit the capture of *G. galeus* by longline throughout much of its northern European range, and ICES provides quota advice. In the United Kingdom, the Tope (Prohibition of Fishing) Order of 2008 was adopted, allowing targeted fisheries only by rod (for which landings are prohibited, and captured tope must be released), with other commercial gears restricted to a bycatch limit of 45 kg per day.

This species was included in Annex II of the List of Threatened or Endangered Species of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean of the Barcelona Convention (SPA/BD). The GFCM adopted a measure related to shark species included in Annex II of the SPA/BD Protocol, according to which *G. galeus* may not be retained on board, transshipped, landed, transferred, stored, sold, *exhibited, or offered for sale.*

G. galeus – Northeast Pacific
In Canada there are various protection measures for *G. galeus*, including a prohibition on their capture and retention (both in commercial and recreational fisheries) in British Columbia.

In the United States of America, *G. galeus* is currently undergoing a status review to determine if it warrants protection under the Endangered Species Act (ESA) (NOAA, 2023).

In Mexico, the Federal Regulation for Responsible Fishing of Sharks and Rays, along with several SAGARPA agreements, establishes seasonal and permanent closure zones and imposes fishing gear restrictions that provide incidental protection for the tope shark.

M. schmitti
The proposal states that there is a total allowable catch for the Common Fishing Zone of Argentina and Uruguay but does not provide details of the management framework under the *Comisión Técnica Mixta del Frente Marítimo* (CTMFM) of Uruguay and Argentina, and the activities this Commission carries out in a very important area of the distributional range of this species. This also includes one of the few Regional Shark Conservation Plans that exist (CTMFM, 2018).

In 2020, the CTMFM recognized the need to implement a Management Plan aimed at restoring the species' abundance to a level of biomass producing maximum sustainable yields (B_{MSY}). The rebuilding plan sets B_{MSY} as a long-term target to be achieved over approximately 14 years, and an intermediate objective to exceed the limit reference point equal to 0.5 B_{MSY}, equivalent to 0.25 B_0 within the first 7 years.

Regarding *G. galeus* and *M. schmitti*, there are various conservation and management measures in the Southwestern Atlantic. Both Argentina and Uruguay have regulations that imply closures and prohibitions on increasing directed effort in the case of *G. galeus*: There are prohibitions on finning and the implementation of onboard management practices to minimize mortality; and within the scope of the CTMFM, closures have been established in reproductive areas for both species.

M. mustelus
Regulations for *M. mustelus* fisheries throughout its range are largely nonspecific and limited to gear restrictions, size limits and regulations on catches for the group of smoothhounds.

4.2. Would a CITES listing likely enhance conservation outcomes for the species?

It is unclear whether a CITES listing would enhance conservation outcomes of the species which are already subject to a suite of regulations, both at the national and international levels, aimed at their recovery in regions where stocks have been depleted. In the case of *M. schmitti*, only a small fraction of the catch is traded internationally; therefore, a listing is not expected to improve recovery rates for the regional stock.

4.3. Could a CITES listing lead to unintended positive or negative consequences for the species' conservation?

The decline of some triakid shark populations is currently not primarily driven by trade, whether legal or illegal. Instead, these species are frequently taken as bycatch in multispecies fisheries employing a variety of gear types. In such contexts, both the catch volumes and economic value of triakid sharks are generally low relative to those of the target species. As a result, listing these sharks under regulatory frameworks could inadvertently lead to underreporting and increased discards, as fishers may prioritize the retention of higher-value target species.

If all species of *Mustelus* were listed under the look alike provision, countries that are fishing any *Mustelus* sustainably, even those where *M. mustelus* is not present, would need to prepare LAFs and NDFs for all trade. This would represent a large global footprint, and a significant administrative burden (Figure 7). Listing *M. mustelus* could have a potential negative impact by reducing international trade in importing countries, thereby increasing pressure on local resources to meet local demand.

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TABLES AND FIGURES

Table 7. Expert Panel assessment of inherent productivity of *Galeorhinus galeus* (low-medium) and of the genus *Mustelus* spp. ("low-medium to medium")

Source	Parameters	*G. galeus* (SW Atlantic)	Productivity
CITES, 2024	*M*	0.104	Low
CITES, 2024	*r*	0.074–0.206	Low-Medium
CITES, 2024	*K*	0.075	Low
CITES, 2024	t_{mat}	15.8	Low
CITES, 2024	t_{max}	36.2	Low
CITES, 2024	*G*	22	Low
		G. galeus (SW Pacific)	
CITES, 2024	*M*	0.069	Low
CITES, 2024	*r*	0.148–0.206	Medium
CITES, 2024	*K*	0.086	Low
CITES, 2024	t_{mat}	12	Low
CITES, 2024	t_{max}	40	Low
	G	18	Low
		M. schmitti	
this panel	*M*	0.091–0.262	Low-Medium
this panel	*r*	0.142–0.173	Medium
Molina *et al*., 2017; Tanuz *et al*., 1999	*K*	0.061–0.253	Low-Medium
Hozbor *et al*., 2010; Novoa *et al*., 2024	t_{mat}	4.4–8.9	Low-Medium
Molina *et al*., 2017; Tanuz *et al*., 1999	t_{max}	11–21	Medium-High
this panel	*G*	8–13	Low-Medium
		M. mustelus	
CITES, 2024	*M*	0.045	Low
CITES, 2024	*r*	0.148–0.173	Medium
CITES, 2024	*K*	0.03	Low
CITES, 2024	t_{mat}	13.5	Low
CITES, 2024	t_{max}	24	Medium
this panel	*G*	18	Low

Note: Assessments of *M. antarcticus; M. californicus; M. canis; M. henlei; M. manazo;* and *M. lenticulatus* also available on request.

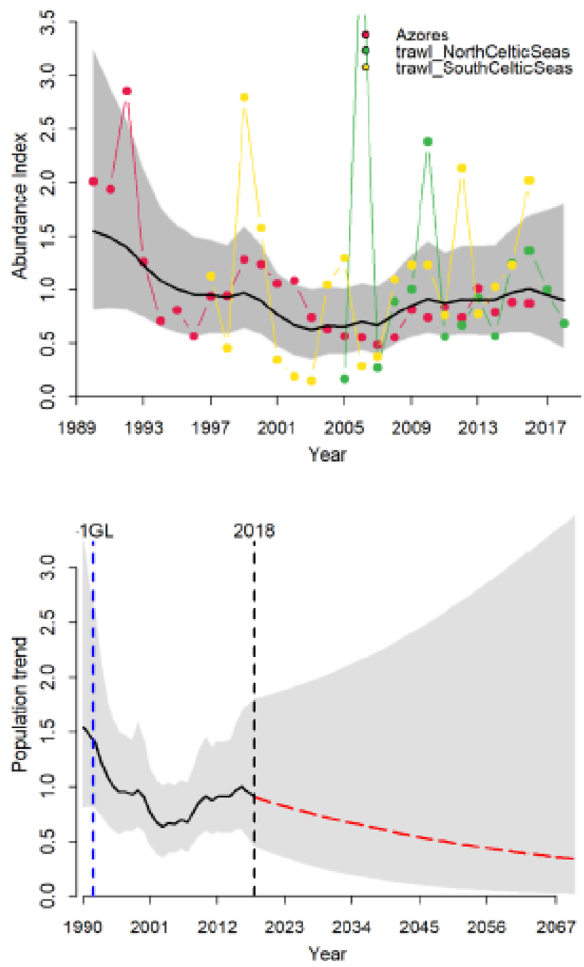
Sources: CITES. 2024. Variability of life history parameters and productivity in elasmobranchs and other commercially exploited aquatic species – Background document to the technical workshop on Aquatic species listed in the CITES Appendices (Geneva, April 2024). CITES Secretariat, Geneva, Switzerland; Hozbor, N.M., Sáez . y Massa A. M., 2010. *Edad y crecimiento de Mustelus schmitti (gatuzo), en la región costera bonaerense y uruguaya*. INIDEP, Informe de Investigación 49. 15 pp; Molina, J.M., Blasina, G.E. & López Cazorla, A.C. 2017. Age and growth of the highly exploited narrownose smooth-hound (*Mustelus schmitti*) (Pisces: Elasmobranchii). *Fishery Bulletin*, 115(3): 365–379. https://doi.org/10.7755/FB.115.3.7 (also available at https://spo.nmfs.noaa.gov/sites/default/files/pdf-content/fish-bull/molina.pdf); Novoa, C., Paez, W.L., Somoza, G.M., Macchi, G.J. & Elisio, M. 2024. The potential influence of photoperiod and temperature on the male reproductive physiology of the narrownose smooth-hound shark, *Mustelus schmitti*. *Marine Biology*, 171: 209. https://doi.org/10.1007/s00227-024-04537-9[1] (https://link.springer.com/article/10.1007/s00227-024-04537-9); Tanuz, L.I., Menni, R.C. & Gosztonyi, A.E. 1999. Biología del gatuzo *Mustelus schmitti* en aguas uruguayas. *Frente Marítimo*, Vol. 19: 71–82. Comisión Técnica Mixta del Frente Marítimo (CTMFM), Montevideo. (also available at https://ctmfm.org).

Table 8. Estimates of regional and global declines in abundance of school shark reported in the 2020 IUCN assessment, and also calculated applying a methodology considered more appropriate for evaluating CITES criteria

Region	Relative area-based weight**	Long-term average annual rate of change estimated in the IUCN assessment (percent)	Ten–year average annual rate of change (percent)	Percent change projected over a 3 GL timeframe in the IUCN assessment	Extent of decline projected to 2025 (percent)	Extent of decline projected to 2035 (percent)
Northeast Atlantic	0.46	-1.66	1.06	76.6	33.3—66.6	25.0—62.9
Southwest Atlantic	0.18	-5.89	3–3.57	99.3	84.0—92.0	88.9—94.4
Australia	0.20	-2.82	2.18	90.1	82.7	78.5
South Africa	0.10	-3.10	2.09	91.4	90.1	92.0
New Zealand	0.07	-0.49	4.06	29.8	50.0	50.0
Global	**1**	–	**1.10**	**88.0**	**58.9–75.6**	**55.8–73.7**

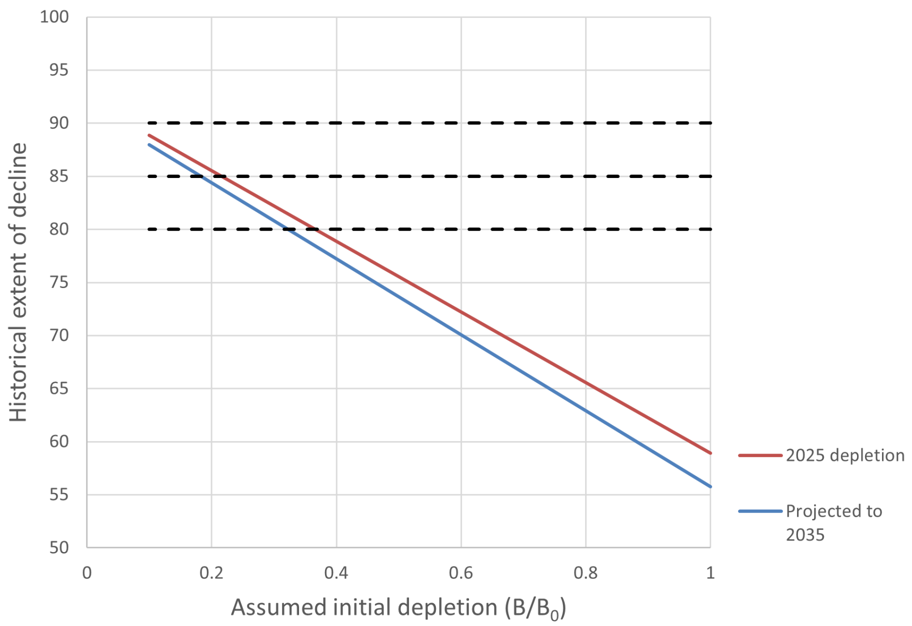
Notes: The reported range in the projected extent of declines for the Northeast Atlantic and Southwest Atlantic regions corresponds to a range of initial depletion values from 0.5 to 1 assumed for 1990 and 1992, respectively, at the start of the time-series of abundance indicators (details provided in the text of the report). ** Walker, T.I., Rigby, C.L., Pacoureau, N., Ellis, J., Kulka, D.W., Chiaramonte, G.E. & Herman, K. 2020. *Galeorhinus galeus*. The IUCN Red List of Threatened Species 2020: e.T39352A2907336. https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T39352A2907336.en

Figure 5. JARA results for *G. galeus* in the Northeast Atlantic and Mediterranean, showing JARA fit to the selected abundance indices (top), and the estimated historical (black line) and predicted (red line) population trajectory (bottom)



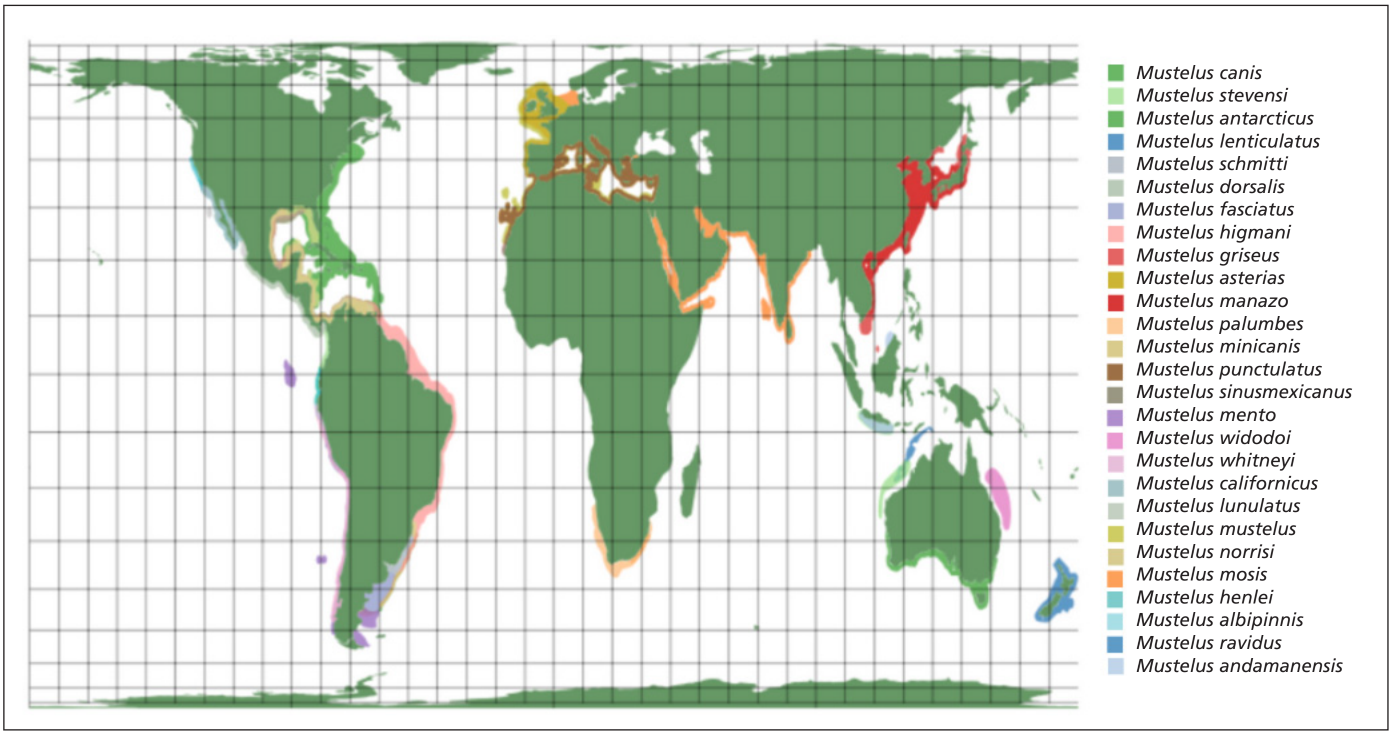
Note: Trajectory in low graph is over three generations (78.9 years).

Figure 6. Historical extent of decline of *G. galeus*



Notes: Calculated as a function of the initial level of depletion (i.e. biomass as a proportion of the unexploited level, B/B_0) assumed for the Northeast Atlantic Ocean and Mediterranean region, in 1990, and for the Southwest Atlantic region, in 1992, at the start of the period covered by abundance indices. Estimates of depletion from analytical stock assessments were used for Australia, New Zealand and South Africa. Regional declines were projected to 2025 and 2035 using recent rates of change in stock abundance. Horizontal dashed lines correspond to decline thresholds corresponding to medium and low-productivity species.
Source: Expert Panel.

Figure 7. Geographic distribution of family Mustelids. Distribution ranges of species, with the exception of *M. andamanensis* (not included in the Tree of Life) and *M. mangalorensis* (not part of the species list analyzed). Colours represent the distribution of individual species; in areas where ranges overlap, colours blend and may not allow for clear visual separation of species



Source: Sharks and Rays Atlas corresponding to those presented in the "Tree of Life" section of the website (https://sharksrays.org/).
Note: Refer to the disclaimer on page [ii] for the names and boundaries used in this map.

FAO EXPERT PANEL ASSESSMENT REPORT OF PROPOSAL 30: Manta and devil rays (family Mobulidae)

This proposal recommends transfer of the manta and devil rays (monogeneric family Mobulidae), which includes (according to the nomenclature recommended by the AC33 Doc.48 that is to be proposed for adoption at CoP20): *Mobula alfredi, M. birostris, M. tarapacana*, *M. mobular, M. thurstoni, M. eregoodoo, M. kuhlii, M. hypostoma* and *M. munkiana*, from Appendix II to Appendix I in accordance with Article II, paragraph 1 of the Convention and satisfying Criterion C.

EXPERT PANEL RECOMMENDATION

PROPOSAL	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
Manta and devil rays (family Mobulidae)	–	–	X*

* Insufficient evidence of declines to make a judgement in relation to CITES criteria (CITES Res. Conf. 9.24. Rev. CoP17).

After reviewing the scientific data and technical information the Expert Panel considered that mobulid rays had declined, but it was not possible to determine if the extent of decline would meet the criteria for listing in Appendix I of CITES.

The Expert Panel reiterated that mobulid rays have a low productivity. In terms of population data, there was a wide variation in the quality and representativeness of the scientific data presented in Proposal 30. Some of the listed declines in landings of mobulid rays were due to management measures. Temporal changes in oceanographic conditions can also limit the utility of abundance data from surveys at localised sites.

MAIN SUPPORTING INFORMATION

Section 1. Fishery, trade and utilization

1.1. Is the nature and scale of international trade well described?

Mobulid rays (family Mobulidae) are found worldwide in tropical to warm temperate seas. As surface-dwelling species, they may interact with various fisheries, including driftnet, longline and purse seine. There have also been some target fisheries using harpoons. Mobulid rays have been listed as prohibited species that should not be retained by various tuna RFMOs, which should reduce exploitation in these fisheries, and safe handling and release guidelines have been developed. Manta rays are, however, taken in some national fisheries.

Whilst mobulid rays have been utilized for their meat in several parts of the world, there is international trade in their gill plates. Recent data collated by CITES indicate that there have been reported exports of gill plates from Sri Lanka and India, with these primarily exported to China, Hong Kong SAR. The trade in gill plates is ongoing, although the extent of the illegal trade is uncertain.

Given that an earlier Expert Panel had evaluated the original proposal (FAO, 2016), and that CITES Parties considered that it was appropriate to list mobulid rays in Appendix II, this evaluation focuses on recent information provided in the proposal with regards whether the population of any mobulid species would meet the criteria for listing in Appendix I.

1.2 How significant is the threat of international trade to species in the wild?

The dried gill plates can attain a high-value in south-east Asia, with O'Malley *et al.* (2017) reporting market prices equivalent to USD 141–472/kg over the period 2011–2015. The market demand (Table 9) and value of this product is expected to result in continued trade.

1.3. What is the importance of the species in local livelihoods and economies?

Mobulid rays provide income to some nations and communities through wildlife tourism (wildlife watching, snorkeling, diving). Mobulid rays may also provide income to fishing communities, through the domestic consumption of meat and the sale (and export) of dried gill plates.

Section 2. Inherent biological productivity

2.1. Are inherent biological traits relevant to the species' productivity and resilience well described?

An earlier Expert Panel reviewed the earlier proposal to list sicklefin devil ray *M. tarapacana* and spinetail devil ray *M. japanica* (=*M. mobular*) in Appendix II (with other mobulids being listed in accordance with Article II Paragraph 2(b). That panel concluded that mobulid rays would be of low productivity (FAO, 2016).

Whilst relevant life history data are lacking for many mobulid species, all species have similar life histories and the data available for the better studied species indicate that mobulids should be considered to have a low productivity.

2.2. Is the species' inherent productivity appropriately categorized (low, medium, high) for the purpose of applying the CITES biological listing criteria?

Mobulid rays are of low productivity.

Section 3. Evaluation of species status and trends in relation to CITES criteria

3.1. In application of the CITES biological listing criteria is the best available status and trend information considered, and is it sufficient to support a confident and well-substantiated determination?

The previous Expert Panel reported that "no global population estimates are available and there is little known about their stock structure" (FAO, 2016, p. 36). Whilst there have been some subsequent estimates of the numbers of mobulids in certain areas (see below), there are still no reliable estimates for the global populations of any of the mobulid species.

The previous Expert Panel (FAO, 2016) also noted that:

> "based on the "best available evidence" suggested the data on decline meets the CITES Appendix II listing criteria. However, the Expert Panel recognised that most of the available data was of low reliability, and limited to the eastern Pacific and Indo-Pacific regions, so the panel could not determine the status across other areas" (p. 36).

The current Expert Panel also noted that much of the more recent data were of variable quality.

3.2. Does the scientific data and technical information on historical extent of decline (Appendix I), meet the CITES biological listing criteria?

The Expert Panel reviewed much of the data contained in the Proposal that alluded to population declines (Table 10). There was a wide variation in the quality and representativeness of the scientific data presented. Some of the listed declines in landings were due to management measures and are so inappropriate for commenting on population trends. Other studies were from relatively small sampling sites for which changing oceanographic conditions may have impacted on the utility of data for informing on broadscale population trends.

From some of the other data presented, the Expert Panel considered that mobulid rays had declined, but it was not possible to determine if the extent of decline would meet the criteria for listing in Appendix I of CITES.

3.3. What additional factors (e.g. vulnerability or resilience) should be considered in evaluating the species against the CITES biological listing criteria?

There are a range of notable risk factors associated with mobulids generally that may increase the risk of extinction or offer resilience. The Expert Panel considered that mobulids are not only of low productivity but that their aggregating nature (including time at surface) meant that they could easily be subject to localized target fisheries. In addition to interactions with fisheries, a range of other factors (including vessel strike, pollution, wildlife tourism, climate change and habitat degradation) could also potentially impact populations and life history processes of mobulid rays.

Section 4. Management, conservation and potential impact of listing

4.1. Are national or regional management measures currently in place to conserve the species well described in the proposal?

A range of national and international measures are in place for mobulid rays. Some countries have already designated manta rays as protected species, restricting their use to non-consumptive purposes such as wildlife tourism.

Whilst mobulid rays are now listed as prohibited species by the main tuna RFMOs, there will be some (unavoidable) bycatch in these fisheries. Guidelines for the safe handling and release of mobulids have been developed within the RFMOs, notably for purse seines.

Other national or regional legislation or management regulations might also be in place that would reduce fisheries interactions with mobulids. Given the circumglobal distribution of mobulids in tropical to warm temperate seas, a detailed review could not be undertaken in the time available to the Expert Panel.

4.2. Would a CITES listing likely enhance conservation outcomes for the species?

Whilst mobulid rays may be a utilized bycatch in some fisheries (with domestic consumption of meat and potential trade in other products), an Appendix I listing would stop the (legal) trade in gill plates. This would be expected to make any “target” fisheries less lucrative and so enhance conservation outcomes.

4.3. Could a CITES listing lead to unintended positive or negative consequences for the species' conservation?

An uplisting of mobulids to Appendix I would likely result in illegal trade, and so improved efforts and resources would be needed in relation to education and training, as well as for fisheries monitoring, compliance, and enforcement.

An uplisting to Appendix I may impact on scientific data collection and impact on improved understanding of the species, including the collection of samples from scientific observers – including for observers on those vessels operating in the high seas. Appendix I listings may or may not impact on funding opportunities.

There is some trade in live mobulids for display in public aquaria, and an Appendix I listing would be expected to increase bureaucratic processes for the importing and exporting nations.

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TABLES AND FIGURES

Table 9. Export data for mobulid rays (Mobulidae) as reported tofrom the CITES Trade Database for the period 2020 to 2023 inclusive, of wild specimens for commercial purposes as reported by exporting Parties

Exporter	Importer	Term	Unit	2020	2021	2022	2023
India	China, Hong Kong SAR	Gill plates	kg	1 017.1	–	–	–
Oman	China, Hong Kong SAR	Fins	kg	–	88	–	–
Pakistan	United Kingdom of Great Britain and Northern Ireland	Specimens	g	–	–	355	–
South Africa	United Kingdom of Great Britain and Northern Ireland	Specimens	–	124	124	–	–
Sri Lanka	Australia	Specimens	No. specimens	–	–	–	23
Sri Lanka	China, Hong Kong SAR	Gill plates	kg	12 776.8	13 587.8	36 623.7	29 377
Sri Lanka	China, Hong Kong SAR	Gill plates	No. specimens	–	–	–	180
Sri Lanka	China, Hong Kong SAR	Gill plates	–	100	–	–	–
Sri Lanka	China, Hong Kong SAR	Live	kg	–	–	–	800
Sri Lanka	China, Hong Kong SAR	Skins	kg	–	–	–	250
Sri Lanka	Singapore	Gill plates	kg	–	–	500	–
United States of America	Portugal	Live	No. specimens	–	–	–	6
United States of America	United Arab Emirates	Live	No. specimens	–	–	30	13
Yemen	China, Hong Kong SAR	Fins	kg	500	1 500	387	–
Yemen	–	Fins	kg	–	500	–	–

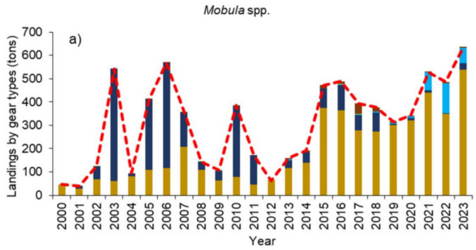
Source: CITES. 2025. Export data for mobulid rays (Mobulidae) 2020–2023. [Accessed on 23 July 2025]. In: *CITES Trade Database*. Available at https://trade.cites.org

Table 10. Declines in *Mobula* spp., as reported in the proposal, and comments from the Expert Panel

<table>
<tr><th>STUDY</th><th>PROPOSAL</th><th>EXPERT PANEL</th></tr>
<tr>
<td>Rojas-Perea et al., 2025</td>
<td>84 percent decline (2015–2023) Tumbes, Peru

“Declines for all mobulids in the study area. Data from Peru IMARPE data (government data)”.</td>
<td>Whilst the paper did report a decline in mobulids landed into the port of Tumbes during parts of the time-series, other ports showed an increase. The proposal has selected a particular part of the analyses in the paper to include in the proposal. This subset of data may not be representative and so should not be used to infer a decline. The paper also noted that mobulids were protected in 2016, so any perceived decline in a particular port over this period could be related to management measures.

This paper also illustrated an increase in mobulid landings (see Fig. 1a of Rojas-Perea et al., 2025).

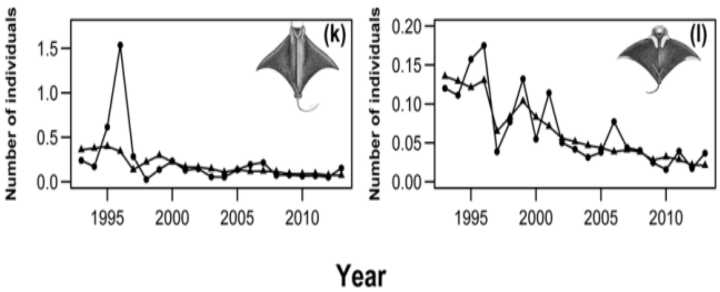


</td>
</tr>
<tr>
<td>White et al., 2015</td>
<td>78 percent (1993–2013)

Cocos Island, Costa Rica

From sightings data in 27 527 dives conducted in 21 years at 17 sites.</td>
<td>This purported decline should be viewed with caution, and are unlikely to reflect population trends. Specifically:

The paper states that “Mobula and manta rays were observed only occasionally at Cocos Island”), and so the indices are low and variable.
The study was conducted in the Cocos Island MPA and is so based on data from a very small part of the species range.
The study reported that “high manta ray abundance was correlated with lower El Nino activity” indicating that studies on abundance data for mobulids should consider oceanographic information.



Given the potential importance of oceanographic features influencing the distribution and relative abundance of mobulids, observed declines in spatially limited study areas are not considered representative of population trends.</td>
</tr>
</table>

Table 10 (Cont.)

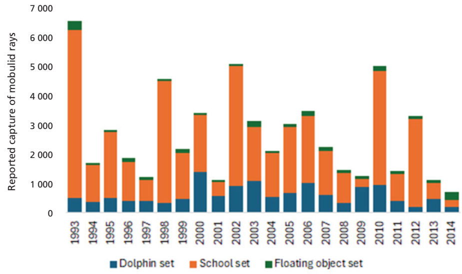
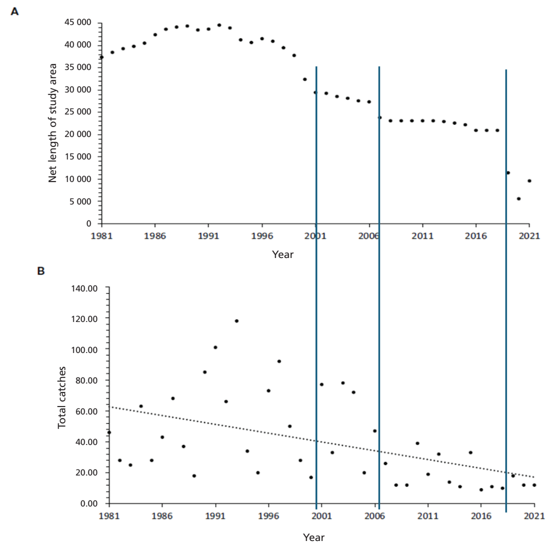
STUDY	PROPOSAL	EXPERT PANEL
Lezama-Ochoa *et al.*, 2019	This study was used several times in Table 1 of the proposal, with declines of 85–99 percent reported, depending on species and the exact period of time considered.	The Expert Panel noted that many of the purported values appeared to be based on calculating declines from the peak reported captures. From the data series in the table provided by Lezama-Ochoa *et al.* (2019), the authors of Proposal 30 have seemingly picked the peak year in the series for any individual species as the starting point, thus guaranteeing a decline being reported. The Expert Panel was unclear as to the accuracy of species-level reporting, and so considered the captures for the family as a whole.  Given interannual variability in reported captures, the Expert Panel examined mean annual captures for four time-periods. This showed a consistent decline from 3113.7/year (1993–1998), to 2978.2/year (1999–2003), to 2451.0 per year (2004–2008), to 2414.6/year (2009–2013). The lowest reported annual captures were in the last year of the time-series (2014), but it was unclear as to whether all data would have been available for that year, and so it was excluded here. Given that fishing effort had approximately doubled over the time-series, the observed decline would be greater than implied by the average annual captures given here. The Expert Panel considered that more robust analyses of these data could usefully be undertaken to better understand temporal trends in catch rates, including accessing more recent data from this fleet and observer programme.
Boggio-Pasqua *et al.*, forthcoming (a paper referred to in proposal 30 without reference).	83 percent decline in *Mobula hypostoma* (2002–2022) Southeastern United States of America	The Expert Panel had no access to an unpublished study, and the proposal did not give further details on this paper, such as the title. Given the paper was not available for Expert Panel consideration, this purported decline was excluded.
Chopra *et al.*, forthcoming	83–92 percent decline in reported landings (2013–2023) for various *Mobula* species	The Expert Panel had no access to an unpublished study, and the proposal did not give further details on this paper, such as the title. Given the paper was not available for Expert Panel consideration, this purported decline was excluded.
Lewis *et al.*, 2015	Landings and catch data used for Indonesia. Mobulid landings declined by 63–94 percent. Mo*bula tarapacana* declines by 99 percent (2001–2014) at Tanjung Lua, other locations surveyed also showed declines: Lakamera (75 percent); Cilacap (77 percent).	The Expert Panel noted that the Tanjung Luar series was fragmented (2001–2005, 2017–2012, 2013, 2014) and showed a decline between the first and third period, with a slight increase in the last period. The Cilacap series was also fragmented (2001–2005, 2006–2015, 2016) but showed a decline for this species landings. Lamakera series was not species specific, but showed a decline. Overall possible decline in landings. The Expert Panel considered that this study indicated a decline in mobulids, but that the extent of decline was difficult to quantify, as various factors had altered fleet and fisher behaviours.
Venables *et al.*, 2016	Data from diver sightings at Tofo (Mozambique; 2003–2023). Declines of 81 percent (*M. kuhlii*), 93 percent (*M. birostris*) and 99 percent (*M. alfredi*).	The Expert Panel noted the reported declines, which were also in part related to environmental characteristics (e.g. current strength, salinity, chlorophyll-a). Given the complex oceanography of the Mozambique Channel, changes in mobulid sightings could be related with environmental conditions, and so data from a small area (Praia do Tofo) may or may not be reflective of trends in the wider population.

Table 10 (Cont.)

STUDY	PROPOSAL	EXPERT PANEL
Carpenter *et al.*, 2021	Significant population declines (1981–2021) in the bather protection nets of KwaZulu-Natal Province (South Africa)	The authors assessed annual and seasonal trends in catch rates of *Mobula* spp. using GAM and the probability of encounter. CPUE was calculated by site and for the whole study period, rather than on an annual basis, and the catch decline seemed to follow a decline in the numbers and total lengths of nets deployed (drum lines were used increasingly from the early 2000s). The authors calculated a probability of encounter based on presence/absence, which differs from an index of abundance. The spatial and temporal extent of the data set was potentially informative for examining trends in catch rates. Future studies could usefully examine the catch per unit effort over the time-series. This would then provide a more informative picture of how catch rates changed over time (and in relation to the decrease in effort).  Annual changes in the total length of nets (top) and total number of mobulid rays caught (bottom). Vertical lines show when there were decreases in effort.
Moazzam, 2018	Declines in reported landings of 87 percent (*M. tarapacana*) to 98 percent (*M. kuhlii and M. mobular*)	The purported declines were based on a short time-series of landings, with analysis seemingly focused on reported landings between two time periods, namely, 2013–2015 and 2016–2018. Whilst reported landings declined, the Expert Panel note that not only are both time periods short, but that Section 59 (d) of the Balochistan (Pakistan, 2014), states that the Government shall provide "immediate protection for migratory species included in Appendix-I of CMS" (p. 29). Noting that all mobulid rays were listed in Appendix I of CMS in 2014, then the marked drop in landings from 2015 onwards may be more in line with management actions than indicative of population decline.

Sources: Boggio-Pasqua, A., Bassos-Hull, K., Stevens, G.M.W,. Morales-Saldaña, J.M., Adnet, S., Ferguson, M.A., Pelletier, N.A., DeGroot, B.C., Wilkinson, K.A., Humble, E., Del Moral-Flores, L.F., Mott, C.R., Guertin, J.R., Ajemian, M.J., Valek, J., Fogg, A.Q., Laglbauer, B.J., Kamla, A.T., Pate, J.H., Fuentes, K., Hoopes, L., Coulier, L., Price, M., Kinsler, J., Collister, R., Ferreira, A., Wyffels, J.T., Blanco-Parra, M.dP., Bonfil, R., Pérez-Jiménez, J.V., De Bruyne, G., Doherty P.D., Metcalfe, K., Minko, Y.I.M., Medeiros, A.M. & Notarbartolo di Sciara, G. 2025. Closing the gaps: Integrating biological, ecological and taxonomic data to support the conservation of the Atlantic pygmy devil ray (*Mobula hypostoma*). Submitted for consideration for publication in *Aquatic Conservation: Marine and Freshwater Ecosystems;* Carpenter, M., Parker, D., Dicken, M.L. & Griffiths, C.L. 2023. Multi-decade catches of manta rays (*Mobula alfredi, M. birostris*) from South Africa reveal significant decline. *Frontiers in Marine Science*, 10: 1128819; Chopra, M., Rowlands, M.G., Stevens, G.M.W., Fernando, D., Mohanraj, T., Laglbauer, B.J., Karnad, D. & Katrina, D. 2025. Fewer devil rays in the sea: Evidence of declining mobulid populations off India's southeastern coast. Submitted for consideration for publication in *Conservation Biology*; Lewis, S.A., Setiasih, N., Fahmi, Dharmadi, D., O'Malley, M.P., Campbell, S.J., Yusuf, M. & Sianipar, A.B. 2015. Assessing Indonesian manta and devil ray populations through historical landings and fishing community interviews. PeerJ Preprints, 6: e1334v1; Lezama-Ochoa, N., Hall, M., Román, M. & Vogel, N. 2019. Spatial and temporal distribution of mobulid ray species in the eastern Pacific Ocean ascertained from observer data from the tropical tuna purse-seine fishery. Environmental Biology of Fishes, 102(1): 1–17; Moazzam, M. 2018. Unprecedented decline in the catches of mobulids: an important component of tuna gillnet fisheries of the Northern Arabian Sea. Victoria, IOTC; Pakistan. 2014. Balochistan (Wildlife Protection, Preservation, Conservation and Management) Act, 2014 (No. XV of 2014). 8 March 2014. No.PAB/Legis: V (15)2014. (Also available at: https://www.fao.org/faolex/results/details/en/c/LEX-FAOC196570/); Rojas-Perea, S., D'Costa, N.G., Kanagusuku, K., Escobedo, R., Rodríguez, F., Mendoza, A., Maguiño, R., Flores, R., Laglbauer, B.J., Stevens, G.M. & Kelez, S. 2025. Fisheries, trade, and conservation of manta and devil rays in Peru. Environmental Biology of Fishes, 108: 725–748; Venables, S.K., Rohner, C.A., Flam, A.L., Pierce, S.J. & Marshall, A.D. 2025. Persistent declines in sightings of manta and devil rays (Mobulidae) at a global hotspot in southern Mozambique. Environmental Biology of Fishes, 108: 749–765; White, E.R., Myers, M.C., Flemming, J.M. & Baum, J.K. 2015. Shifting elasmobranch community assemblage at Cocos Island—an isolated marine protected area. Conservation Biology, 29(4): 1186–1197.

FAO EXPERT PANEL ASSESSMENT REPORT OF PROPOSAL 31: Whale shark (*Rhincodon typus*)

This proposal is for the transfer of whale shark (*Rhincodon typus*) from Appendix II to Appendix I satisfying Criterion C.

EXPERT PANEL RECOMMENDATION

PROPOSAL 31	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
Whale shark (*R. typus*)	–	X	–

After reviewing the scientific data and technical information, the Expert Panel assessed Proposal 31 to not meet the CITES listing criteria.

Historically, there is good evidence that targeted and bycatch fisheries pressures resulted in declines to whale shark populations. However whale shark population sizes remain above Appendix I listing threshold, and current fishery pressures are considered minimal compared to more appreciable risks from vessel strikes, habitat degradation (including pollution and reduced food availability) and environmental issues like climate change.

Any ongoing harvests are likely to present a minor threat to whale sharks. Although any impact is important, and a likely contributor to decline in the species, any associated trade in species commodities is strictly regulated or, where fisheries regulations have prohibited the retention of whale sharks, illegal. Uplisting the species from Appendix II to Appendix I will not change this fact. In toto, the Expert Panel considers that investments in market-related CITES controls offer little benefit to the conservation of this species.

The proposal fails to make clear what practical (in contrast to symbolic) benefits (if any) would accrue to the species from uplisting the whale shark from Appendix II to Appendix I. Additional evidence on non-fisheries related threats presented requires the most consideration. As global trade for whale shark products was not considered an important threat to the species, and noting current population estimates, the Expert Panel considered that any perceived need to reclassify the species under CITES Appendix I was unwarranted.

MAIN SUPPORTING INFORMATION

Section 1. Fishery, trade and utilization

1.1. Is the nature and scale of international trade well described?

Whale Sharks are distributed globally, being found circumtropically from approximately 30° north to 35° south.

Legal international trade of whale sharks is extremely limited. Information on fisheries and related international trade of whale sharks is relatively limited. Historically, fisheries directly targeting the species have rapidly collapsed, with most data and information on targeted fisheries, and both legal and illegal trade, being outdated and often relying on sources 10–20 years old. Apart from data reported from one Asian country, there is limited evidence in the literature for significant take in other countries (e.g. Haque, Das and Biswas, 2019; O'Malley *et al.*, 2016; Steinke *et al.*, 2017).

More recent data are needed to accurately reflect the current state of whale shark trade, particularly given that many countries have now implemented national protection for the species. Additionally, the species is also protected under international agreements – listed under Appendix I of the Convention on Migratory Species (CMS).

1.2. How significant is the threat of international trade to species in the wild?

The threat posed by international trade – both legal and illegal – to wild whale sharks is relatively low compared to other elasmobranch species. Some fisheryrelated threats remain (e.g. bycatch in tuna purse seine fisheries, and gillnet fisheries), but it is no longer considered to have a high relative impact on populations compared to other pressures. With widespread global protection in place, fishing for international trade appears to be a lesser threat and a threat that is declining due to increasing fisheries controls. Despite this, whale shark fins were still reported to have a high trade value a decade ago (McClenachan, Cooper and Dulvy, 2016).

More significant risks include human interactions (vessel strikes), habitat degradation (including pollution and reduced food availability), and environmental changes like a warming climate. Tourism is also potentially a threat, but with mixed risk levels depending on the activity and its regulation. Most of the salient threats to whale sharks are not linked to trade in the species or species products and it is difficult to see how further regulation of the legal trade would affect the suite of pressures on the species.

1.3. What is the importance of the species in local livelihoods and economies?

The proposal fails to define the importance of whale sharks to local livelihoods and economies. Although it mentions the high international market value of whale shark products such as fins, meat and liver oil, it lacks detail on the species' significance as a tourist attraction and its cultural importance in local traditions and knowledge systems.

Most of the values of whale shark to local livelihoods and economies are not linked to international trade.

Section 2. Inherent biological productivity

2.1. Are inherent biological traits relevant to the species' productivity and resilience well described?

Some biological traits of the species are well defined, including demographic parameters of growth rates and sizes at maturity. However, rates of reproduction and early survivorship remain largely unknown and therefore some uncertainty remains in the calculation of productivity and recovery potential (resilience) of the species.

2.2. Is the species' inherent productivity appropriately categorized (low, medium, high) for the purpose of applying the CITES biological listing criteria?

The categorization of the species' productivity as low is appropriate based on demographic information and comparison with other large elasmobranchs.

Section 3. Evaluation of species status and trends in relation to CITES criteria

3.1. In application of the CITES biological listing criteria is the best available status and trend information considered, and is it sufficient to support a confident and well-substantiated determination?

There are limited and imperfect data on the global population size of whale sharks. At present, the published estimate for the global population of adult breeding whale sharks is understood to range 119 000–238 000 individuals, based on genetic estimates of effective population size (Castro *et al.*, 2007). A separate genetic estimate by Schmidt *et al.* (2009) places the size of the adult breeding population at approximately 103 000 individuals, noting the total population size is larger than the adult breeding component. These numbers are reflected against other low productivity whale species (Table 11).

These genetic data on populations only consider the numbers of breeding adults. They do not include the numbers of nonbreeding animals (notably juveniles) that, in most species of fishes, can make up the bulk of the population. Genetic techniques also rely on several assumptions that at present cannot be validated and can cause large variability in abundance estimates. Quantifying total population size estimates is an urgent issue and is the subject of ongoing research.

3.2. Does the scientific data and technical information on historical extent of decline (Appendix I), meet the CITES biological listing criteria?

Three criteria are provided for determining whether species should be listed in CITES Appendix I (Annex 1 of Res. Conf. 9.24 (Rev. CoP14).

Whale sharks do not meet the "small wild population" criterion, and because individuals are wide ranging they do not meet the "geographically concentrated" criterion. To meet the final criterion, the species would need to meet the "marked decline in population size in the wild" criterion, either ongoing or past, or inferred or projected.

The primary argument for reclassifying the species under CITES Appendix I is based on its current IUCN Red List status as Endangered and evidence of population declines in certain regions, although some of these data are considered to be outdated. The current status of population sizes and the impacts of conservation efforts over the past decade have not been clearly quantified.

Overall, there is good evidence of population decline. The proposal presents evidence of global population declines estimated at 40–92 percent over the past three generations. In addition to declines in abundance, the mean total lengths of whale sharks declined at several locations (Pierce and Norman, 2016).

The proposal states the global population experienced an estimated overall decline of 50 percent over the last three generations (75 years, Pierce and Norman, 2016). Under CITES criteria, the known historical decline is assessed against CITES decline criteria, not a 75-year population change modelled across three generations. However, accepting this modelling, the historical extent of decline did not breach the 15–20 percent population threshold for low productivity species. This means the species does not meet the CITES criteria for listing in Appendix I.

Numerous management and conservation initiatives have been implemented by nations and conservationists in the last decade, which may reflect an improved situation for whale sharks in the wild. Although the species has a low reproductive rate, threat assessments should be updated to ensure the available data and ongoing risks to the species remain above Appendix I listing thresholds.

The most convincing evidence for population declines and the susceptibility of the species to harvest comes from the rapid collapse of targeted fisheries in the past, genetic analyses, and modeling using records from purse seine fisheries. It is difficult to interpret the results of changes in population size based on photoID databases, especially where markrecapture modelling is used to estimate population parameters. This is because photoID data for whale sharks violates many of the assumptions of markrecapture modeling. Importantly, rates of immigration and emigration to aggregation sites are unknown and this can have important impacts on model outcomes (e.g. Andrzejaczek *et al.*, 2016; Araujo *et al.*, 2022).

The historical data used to demonstrate population declines in whale sharks due to exploitation are considered to be outdated and should be supplemented with more recent population trend data. In many regions, sightings of whale sharks have increased – likely as a result of improved management and conservation efforts – but these developments are under-reported. Conversely, current impacts of threats from anthropogenic activities such as accidental capture, vessel strikes, and strandings are not yet clearly defined. There are mixed reports on the impact on the species from degradation of its natural habitat, or from wildlife tourism. Whereas tourism has been argued by some to negatively affect the species' natural behaviours and survival rates, published literature on artificial feeding and human interaction suggests it has minimal impacts (Meekan and Lowe, 2019; Barry *et al.*, 2023). At Ningaloo Reef, Australia, one of the largest wildlife tourism sites, there is no evidence that interactions with tourists affect the behaviour or likelihood of shark resighting (Sanzogni, Meekan and Meeuwig, 2015).

Additional evidence on nonfisheriesrelated threats requires the most consideration. As global markets for whale sharks were not considered a significant threat to the species, and noting current population estimates, the urgency of reclassifying the species under CITES Appendix I seems unwarranted.

3.3. What additional factors (e.g., vulnerability or resilience) should be considered in evaluating the species against the CITES biological listing criteria?

There are a range of notable risk factors associated with whale sharks that may increase the likelihood of extinction or improve the resilience of populations.

Factors increasing the species' extinction risk:

- Recent research shows that boat strikes pose a significant conservation threat. Analysis of global data from tagging studies shows that the final positions of sharks are often reported from busy shipping lanes, implying that these sharks have been killed by ship strike (Womersley *et al.*, 2022). The importance of the threat of ship strikes is supported by evidence from studies that examine scarring patterns on whale sharks in aggregation sites (e.g. Lester *et al.*, 2020).
- Plastics and persistent organic pollutants pose a possibly significant threat to these filterfeeding animals. Manufactured chemicals such as PFAS (per and polyfluoroalkyl substances) accumulate at the surface of the ocean and adhere to debris that are likely to be consumed by whale sharks (and other large filterfeeding species). Bioaccumulation of these compounds and plastics may have serious consequences for these animals, since they are known to be detrimental to other species (including humans).
- More research is needed to understand the impacts of habitat degradation and other environmental changes.

Factors increasing the species' resilience from extinction risk:

- Further research on the potential positive and negative impacts of wildlife tourism on whale sharks remains essential. Public awareness of the species' conservation status and the importance of protective measures has increased significantly in recent decades, in part due to tourism-based interactions. However, the extent to which the conservation benefits – such as increased local appreciation and valuation of whale shark aggregations – outweigh the potential negative effects, including potential behavioural alterations caused by provisioning and visitor disturbance, remains uncertain. Current evidence suggests that wildlife tourism provides a net positive contribution to the conservation of whale shark, though ongoing monitoring and evaluation are necessary.

On balance, factors acting on global whale shark populations are likely to increase vulnerability overall.

Section 4. Management, conservation and potential impact of listing

4.1. Are national or regional management measures currently in place to conserve the species well described in the proposal?

Although management measures at national and regional scales are well described in the proposal, the outcomes and success stories of these actions are not clearly presented. Over the past decade, awareness of whale shark conservation has grown significantly in many countries, accompanied by the implementation of various programs aimed at improving management.

These positive developments should be highlighted in the proposal to emphasize the importance of continued investment for protection of whale sharks in the wild.

4.2. Would a CITES listing likely enhance conservation outcomes for the species?

The proposal asserts that

> "An Appendix I listing will help this wide range of countries reinforce their domestic protections for whale sharks by adding extra monitoring for illegal trade in this species, via the CITES process".

Yet there is no evidence presented on how or why this would occur. Indeed, there is no compunction for countries to enhance research or enforcement efforts beyond what is already in place after any uplisting of the species. This is a major shortcoming of the proposal. In fact, research efforts may be hindered by trade limitations proposed under Appendix I (detailed below).

The proposal fails to make clear what practical (as opposed to symbolic) benefits (if any) would accrue to the species from uplisting whale shark from Appendix II to Appendix I.

The proponents offer no evidence that uplisting will alter the likelihood of any increase in enforcement of the regulations already in place. It might, however, make collaborative research across national borders more complex and timeconsuming. This is an issue for a species that is wide-ranging and where threats are not defined by national boundaries.

4.3. Could a CITES listing lead to unintended positive or negative consequences for the species' conservation?

The species is already protected by laws across multiple range states and in international multilateral conservation agreements. There is no evidence presented in the proposal that shows how uplisting would make a practical change to any illegal trade that already occurs despite these protections. As a species that is protected across most of its range, the retention or reporting of incidental catches already carries legal consequences under national laws, which discourage fishers and other stakeholders from reporting bycatch or mortality events.

As noted above, uplisting might complicate and delay collaborations among research groups that rely on the sharing of scientific samples for research, which often requires samples to move across international borders. Obtaining permits for research involving the protected species may become more complex and restrictive if the species is uplisted to the stricter provisions of Appendix I. It is unclear if research grants would be easier or more difficult to secure for an Appendix I species compared to an Appendix II or non-CITES-listed species. It was noted that strict handling and nondisturbance criteria are already in place to ensure this IUCN Red List Endangered species is not further negatively impacted by scientific research.

Uplisting the whale shark to CITES Appendix I could encourage Parties to strengthen their efforts toward sustainable management of wildlife tourism initiatives and increase public awareness of the conservation needs of the species. Even though this has no trade implications, potential negative consequences may also arise – including an increase in illegal trade due to the perception of the species rarity for specialized illegal markets. Whale shark fins have a small market but demand high prices. Any change in listing could lead to increased market demand and trade that services specialized markets (Li, Wang and Norman, 2012).

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TABLES AND FIGURES

Table 11. Population estimates of whale shark (*R. typus*) and other charismatic filter-feeding vertebrates

SPECIES	GLOBAL POPULATION (estimate)	RED LIST STATUS (IUCN)
Whale Shark	**119 000–238 000**	**Endangered**
Blue Whale	*10 000–25 000*	*Endangered*
Humpback Whale	*120 000–150 000*	*Least Concern*
Gray Whale (East Pacific)	*11 700–14 450*	*Vulnerable*
North Atlantic Right Whale	*350–370*	*Critically Endangered*

FAO EXPERT PANEL ASSESSMENT REPORT OF PROPOSAL 32: Giant guitarfish (*Glaucostegus* spp.)

Proposal for inclusion to the Appendix II listings of giant guitarfish (*Glaucostegus* spp.), annotation that sets "exports for commercial purposes" to zero.

EXPERT PANEL RECOMMENDATION

PROPOSAL 32	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
Glaucostegus spp. (zero commercial exports for commercial purposes)	–	–	X*

* Insufficient evidence of declines to make a judgement in relation to CITES criteria (CITES Res. Conf. 9.24. Rev. CoP17).

Giant guitarfishes (*Glaucostegus* spp.) are already listed in Appendix II of CITES (Table 12).

There is no accurate information on the current population sizes of any species in the genus. Whilst available information indicates that these species have declined, the magnitudes of any population declines are unknown. Therefore, the available data cannot be used in relation to the CITES "extent of decline" criterion.

It is consequently uncertain which members, if any, of the genus *Glaucostegus* have declined to the extent that would equate with an Appendix I listing, and thus warrant the "zero annual export quota for wild-taken specimens" annotation.

The fins and skins of giant guitarfishes are traded internationally, and there is more limited international trade in their meat. This indicates that the meat of giant guitarfish is largely consumed or traded domestically. Based on the available information, a zero annual export quota is not expected to provide further conservation benefits.

Recent trade data indicate that several parties to CITES have exported various products from giant guitarfishes, but publicly available non-detriment findings (NDFs) appear to be limited to two nations. Improved reporting and further development of NDFs are required.

MAIN SUPPORTING INFORMATION

Given that an earlier Expert Panel had evaluated the original proposal (FAO, 2019), and that CITES Parties considered that it was appropriate to list giant guitarfishes *Glaucostegus* spp. in Appendix II, this evaluation focuses on recent information provided in the proposal with regards to the merit of the suggested annotation "a zero annual export quota for wild-taken specimens traded for commercial purposes".

Section 1. Fishery, trade and utilization

1.1. Is the nature and scale of international trade well described?

Giant guitarfishes are fished (bycatch and targeted) throughout much of their range, and available evidence indicates that the fins and skins are traded internationally, as evidenced by the trade data submitted to CITES. Gill plates are also listed in a search of guitarfish trade records (CITES, 2025), but there is little information on this type of commodity in trade and it may be a Mobulid commodity reporting error. There can also be some trade in marine curios, whereby guitarfish are cut in strategic places and then dried to resemble mythical creatures (Huerta-Beltrán *et al.*, 2025).

There was limited documented trade in meat, which supports the view that the meat of guitarfish is largely consumed or traded domestically (with minimal international trade).

1.2. How significant is the threat of international trade to species in the wild?

Given the coastal nature of giant guitarfishes and overlap with artisanal fisheries (including gillnets), CITES listings are unlikely to have had any substantive impact on exploitation and mortality rates in those nations where exploitation is mostly driven by domestic consumption of the meat.

The current Appendix II listings should only allow international trade if an NDF has been granted. Information on the CITES website indicates that a positive NDF was given for *G. typus* (by Australia), with Bangladesh issuing a negative NDF as members of the family were all protected species in Bangladeshi waters. Two species of giant guitarfishes are protected in Indian waters, and hence fishery and trade of giant guitarfishes are prohibited in India (an NDF therefore is not required in this case).

Available trade data, as submitted to CITES, is summarized in Table 13. Most international trade of giant guitarfishes relates to their skins and fins.

1.3. What is the importance of the species in local livelihoods and economies?

The fins and skins of giant guitarfishes are considered high-value products, as documented in the proposal, with these products evident in international trade data collated by CITES (Table 13).

Giant guitarfishes are often reported as high-value species, but as the value of a fish species is a somewhat relative concept, the value of giant guitarfish (in relation to meat and domestic consumption) could not be evaluated by the Expert Panel in the time available. Whilst giant guitarfishes are of likely importance to local livelihoods and economies, there are insufficient data to quantify this. Given that available CITES trade data do not include large quantities of meat, the Expert Panel considered that the meat of giant guitarfishes would generally be consumed or traded domestically.

Section 2. Inherent biological productivity

2.1. Are inherent biological traits relevant to the species' productivity and resilience well described?

The biological traits were described in the proposal and were reviewed previously by an earlier Expert Panel (FAO, 2019). Whilst life history data are limited for some species, the betterstudied species serve as useful surrogates for the genus as a whole.

2.2. Is the species' inherent productivity appropriately categorized (low, medium, high) for the purpose of applying the CITES biological listing criteria?

Giant guitarfishes are of medium productivity.

The earlier Expert Panel considered giant guitarfishes to be of low to medium productivity (FAO, 2019), but more recent studies indicate that they should be considered as being of medium productivity (D'Alberto *et al.*, 2019; see also Table 14). This is in contrast to the "very low productivity" stated in the proposal.

Section 3. Evaluation of species status and trends in relation to CITES criteria

3.1. In application of the CITES biological listing criteria is the best available status and trend information considered, and is it sufficient to support a confident and well-substantiated determination?

There are no data available on the population sizes of giant guitarfishes, and robust species-specific population trend data are lacking in most instances. Whilst earlier IUCN Red List accounts indicated that giant guitarfishes were often Vulnerable or Endangered, more recent IUCN assessments have listed all members of the genus being Critically Endangered, and in all instances these assessments were based on inferred declines. The proposal indicates that the species are "significantly more threatened", but the underlying data used are more indicative of this being a change of perception rather than being based on contemporary data.

As most giant guitarfish species have relatively wide distributions, it is unlikely that the populations would equate with the "small populations" as defined under CITES.

3.2. Does the scientific data and technical information on historical extent of decline (Appendix I), meet the CITES biological listing criteria?

FAO considered the original proposal for blackchin guitarfish *G. cemiculus* and sharpnose guitarfish *G. granulatus* during the Sixth Expert Panel (FAO, 2019). Readers are referred to FAO (2019) for more detailed information, with the summary findings of that Expert Panel provided below:

- The Blackchin guitarfish, *G. cemiculus* and the sharpnose guitarfish, *G. granulatus* are both considered to be species of low to medium productivity. The Blackchin guitarfish, *G. cemiculus,* and other guitarfish have been extirpated in the northwestern Mediterranean part of their range. Elsewhere there is local evidence of long-term declines in guitarfish catch in Senegal, but widerscale numerical evidence is lacking. The panel considers decline in *G. cemiculus* is likely but could not establish its general extent either in the short or long term.
- The same is the case for the sharpnose guitarfish, *G. granulatus*. There is evidence for a short-term catch decline of 94 percent in Chennai, India, but broader numerical evidence of a decline is lacking. The panel considers that decline in *G. granulatus* is likely but could not establish its general extent either in the short or long term.
- Thus, for both *G. cemiculus* and *G. granulatus* the panel considers it uncertain whether they meet the criteria for CITES listing. The panel notes that *G. cemiculus* has been extirpated in the heavily fished northwestern Mediterranean shelf but had no information for the full species range.
- In considering whether to list these species, the Expert Panel recommends that CITES Parties take note of the extirpation, the widespread lack of management and the very high-value of the products (fins) in international trade.
- Listing would likely encourage appropriate local management measures and help lead to better documentation of the catch and effort for all sharks and rays caught in coastal areas. Such initiatives, while commendable, entail considerable costs. Therefore, it is possible, given the high-value of fins from these species, that fishing might continue unabated on an IUU basis.
- If the named species are listed under Appendix II in due course, listing of the remaining members of the *Glaucostegus* spp. in Appendix II under look alike provisions would be appropriate, given the similarities across the taxon and the inherent identification difficulties.

- The Expert Panel noted that there is no evidence that traders differentiate between species of wedgefishes and guitarfishes in the fin trade. The Expert Panel suggests that CITES Parties should carefully consider whether there is a look alike problem between guitarfishes and wedgefishes, especially as the wedgefish naming convention has undergone recent changes.

The Expert Panel convened in 2025 supported most of the views of the earlier Expert Panel (FAO, 2019) but noted that giant guitarfishes are of medium productivity, and also noted caution regarding the reported landings from Chennai (India). The current Expert Panel noted that changes in fishing effort and the decline in overall fish landings do not help the assessment of population decline of a species which is not listed in the underlying study. Guitarfishes and wedgefishes form only 3 percent of the total elasmobranch landings in India, of which *Glaucostegus* spp. form approximately 40 percent (CMFRI, 2024).

The Expert Panel recognized that there were still limited data relating to the populations of giant guitarfishes. An earlier Expert Panel noted that declines were "likely", but that they "could not establish its general extent either in the short or long term" (FAO, 2019, p. 35).

Whilst the current Expert Panel considered that there had likely been a decline in populations of giant guitarfishes, due to a combination of both fisheries exploitation and habitat loss and degradation, the magnitude of this decline was uncertain.

The Expert Panel considered it uncertain whether any of the giant guitarfishes in the genus *Glaucostegus* meet the criteria for listing on Appendix I of CITES, which was used as the basis for suggesting the zero annual export quota for wild-caught products.

The proposal referred to many of the purported declines given in the individual assessments undertaken for the IUCN Red List of Threatened and Declining Species.

Whilst the IUCN proposals would try and include some species-specific information (where available), a range of more generic information from different sources was the main source of information. These disparate datasets were suggested as being representative of the genus as a whole. Whilst such an overarching approach is possibly suited to taxa with both limited data and taxonomic confusion, there are potential issues over the data that have been used.

The text below is not an exhaustive review (which could not be undertaken given the time available to the Expert Panel) and is based on some of the generic information used in the IUCN account for *G. cemiculus* (Kyne and Jabado, 2019). Given that the supporting information used in CoP20 proposals for giant guitarfishes and wedgefish were usually similar, the comments below are of relevance to considering the population trends of both giant guitarfishes (Proposal 32) and wedgefish (Proposal 33).

- A 93 percent decline in Rhinobatidae (which probably equals guitarfishes generally) catch rate in the Gulf of Thailand from peak catches in 1968–1972 (Ritragsa, 1976; Pauly, 1979).

  Ritragsa (1976) provided the average catch rates for trawl surveys in the Gulf of Thailand (1963–1972), including the average catch rates per sector (I–IX), and for the overall area. This study did not provide an estimate of decline for Rhinobatids.

  Proposal 32 used data for the wider area (see Table 4 of Ritragsa, 1976) and calculated a decline of 93 percent based on the average catch (kg/hour) observed in 1968 (which was the highest value in the time-series) to the last value in the time-series (also the lowest). This indicates a selective use of data.

The Expert Panel noted that guitarfishes can be large-bodied and may only be encountered in small numbers during trawl surveys. Consequently, data on kg/hour may be more variable than data on numbers/hour, as the capture of one large in fish year *x*, with the capture of one smaller fish the following year (year *x + 1*) could result in a large change in biomass. The Expert Panel also noted that the paper by Ritragsa (1976) did not give sufficient details on the survey grid, gear description (and whether this was standardized over the time-series), or information on numbers at length to determine whether or not it was appropriate for providing an index of population size.

Given the low and variable catch rates in the available dataset given in Ritragsa (1976), the Expert Panel examined the mean annual catch rates for the initial 3 years (excluding 1963, when no rhinobatids were caught) in relation to the final 3 years of the available time-series. The mean annual catch rate (1966–1969) was 0.70 kg/hour, and this decreased to 0.31 kg/hour (mean of 1970–1972), a decline of 55.5 percent.

Whilst more data (including contemporary data) would be needed to provide a more accurate analysis of population trends in this area, the Expert Panel considered there was likely a decline, although the value given in the proposal was exaggerated.

- The collapse of Indonesian targeted wedgefish fisheries (Chen, 1996; Suzuki, 2002).

  Whilst both the cited accounts mention the importance of various fisheries for guitarfish and wedgefish (sharklike rays) for Indonesia, a more critical review of the available data and information should be undertaken. For example, declines in landings may have, at least in part, been related to the MOU Box, for which Australia allows some traditional Indonesian craft to operate in a specific area. Given the importance of these grounds to elasmobranchs, this may have impacted on relevant fisheries over time (e.g. effort, fleet activity).

  In terms of underlying landings data, Chen (1996) recognized that some rays (e.g. wedgefish and guitarfish) could be reported as sharks and attributed the fishery for whitespotted guitarfish as a reason for a rapid increase in reported shark landings, noting "Although it is technically a ray, the whitespotted shovelnose ray is sharklike in appearance and is probably included under this category" (p. 22).

  Whilst the Expert Panel was not in a position to undertake detailed analyses of national Indonesian data, the Expert Panel felt that these data needed to be interpreted with caution.

- The depletion of rays (which can be used to infer declines in wedgefishes) in in the Java Sea (Blaber *et al.*, 2009) (recent trawl surveys in the Java Sea and North Natuna Sea recorded only three *Rhynchobatus* (Tirtadanu *et al.*, 2018; Yusup *et al.*, 2018).

  Blaber *et al.* (2009) noted that for some sources "the number, but not the weight of sharks and rays are collected" (p. 337), and indicated that there may have been some potential confusion in units, further indicating that data need careful checking. Hence, interpretation of underlying data is problematic. It should also be noted that some of the data for "shark and rays" were included as sharks. Indeed, Blaber *et al.* (2009) noted "species from families such as *Rhynchobatus* and *Rhinobatos* were classed as sharks by DGCF, however these species are actually rays (Batoidei)" (p. 370).

  Changes in trawl survey catches in the paper by Blaber *et al.* (2009) clearly show the concentration of sharks and rays in the coastal areas, and so spatial variations in survey effort may be important (although their analysis did try to account for this to a certain degree). Whilst guitarfishes were likely included in sharks (which showed a more marked decline), the differences in spatial survey effort are important. Furthermore, there was no indication of gear type and sampling protocol for the two surveys (1976 and 1997), which could be important contributory factors to any observed changes in catch rates.

The paper mentioned in the proposal by Tirtadanu *et al.* (2018) indeed reported a single individual sharkray (*Rhynchobatus australiae*), but there was limited information on the trawl survey (such as type of ground gear) with which to interpret catch data. Many of the 30 stations (1 hour tows) were not in coastal areas. The paper by Yusup *et al.* (2018) provided some details of another trawl survey, aiming to interpret stingrays, but once again gear details were incomplete. Whilst small numbers of fish within the wedgefish/guitarfish group were caught, this may be an artefact of limited survey coverage.

- Declines in landings from Indonesia, the Islamic Republic of Iran, and Pakistan were reported, which are the equivalent of an 81–99 percent population reduction over the last three generation lengths (30–45 years) (DGCF, 2015, 2017, M. Gore, unpublished data).

  The majority of these inferred declines are based on comparing data from two different years. The provenance, representativeness and accuracy of the unpublished data provided by a named person is not possible to evaluate. The Expert Panel reiterated that reported landings may not be indicative of population trends due to a range of other potentially contributing factors.

- Significant declines were reported in landings of guitarfishes (which includes wedgefishes) in Tamil Nadu (86 percent decline for a 5 year period) and catch rates of rays (which does not include wedgefishes, but is representative of declines in demersal batoids) in Maharashtra (63 percent decline for a 15 year period) in India (Mohanraj *et al.*, 2009; Raje and Zacharia 2009, Supplementary Information).

  Both of these studies related to landings, and so data may be influenced by fishing patterns, market price of different fish species, any management measures etc. The consistency of reporting of different categories was not possible to evaluate.

  Mohanraj *et al.* (2009) indicated that guitarfish landings declined after 2002 (278.7 tonnes) and 2003 (145.7 tonnes), with annual reported landings being 40.8–50.8 tonnes in the subsequent 3 years. Whilst such a decline in landings may reflect a decrease in the population, there may be other factors (e.g. changes in target fisheries and fishing grounds, data reporting, fleet size, management measures and the impact of the 2004 tsunami on fishing activities during the first half of the subsequent year, the increased awareness on the protected status of *Rhynchobatus djiddensis* in India since 2001) which could also result in the observed pattern. The study by Raje and Zacharia (2009) did not include any types of sharklike rays (e.g. guitarfish and wedgefish) and should not be considered to provide information on the suggested decline of guitarfishes.

The Expert Panel did not consider that any of the studies reviewed gave sufficient evidence of the extent of any decline.

The Expert Panel undertook further analyses of the annual landing estimates compiled by ICAR-CMFRI for giant guitarfishes along the mainland coast of India, which indicated an increase in landings from < 200 tonnes during the period 2010–2016, to approximately 1 116 tonnes in 2020. These were mostly seen in the bycatch of bottomset gillnet fisheries operating in coastal waters. The increased landings of the group at that time were possibly due to increased coastal fishing activities by the artisanal sector while mechanized fishing operations remained suspended or with limited activity during the Covid-19 pandemic in 2020 and a major part of 2021.

In 2022, the widenose guitarfish, *G. obtusus* and the clubnose guitarfish *G. thouin* were listed in Schedule I (fishery and trade completely prohibited) of the Indian Wildlife (Protection) Act, through an Amendment (WPAA, 2022) and *Glaucostegus* spp. were listed in Schedule IV (trade regulated for CITES-listed species) of the Act. These conservation measures have resulted in a decrease in the reported landings of this group to approximately 492 tonnes in 2024 (Figure 8). This is perhaps an illustrative example of declines in landings being due to reasons other than overfishing (conservation measures, in this case) and that declining landings cannot be interpreted simply as a decline in the population.

Overall, the above indicates that there are potential national data sets that could be used to conduct more robust analyses on landings trends relating to giant guitarfishes and similar taxa. Such analyses would benefit from being undertaken in conjunction with national data collectors and fisheries managers in order to develop robust conclusions.

3.3. What additional factors (e.g., vulnerability or resilience) should be considered in evaluating the species against the CITES biological listing criteria?

The Expert Panel recognized that the shallow-water distribution and large size of *Glaucostegus* would make them susceptible to fishing pressure, and that other factors (e.g. habitat loss and degradation) may also impact populations.

The earlier Expert Panel considered that *Glaucostegus* spp. were of low to medium productivity. The current Expert Panel, using a more standardized approach, considered them to be of medium productivity. This is in line with recently published studies (D'Alberto *et al.*, 2019).

Section 4. Management, conservation and potential impact of listing

4.1. Are national or regional management measures currently in place to conserve the species well described in the proposal?

Some nations and areas have fisheries management and/or nature conservation measures in place (e.g. Mediterranean Sea through GFCM measures, India and Bangladesh). The introduction of inshore protected areas in relevant national waters might also have resulted in changes in some exploitation patterns. The proposal highlights many of the national measures but, given the wide geographical distribution of these species and number of range states, a detailed review was beyond the scope of the Expert Panel.

4.2. Would a CITES listing likely enhance conservation outcomes for the species?

Proposal 32 is for the maintenance of giant guitarfish (*Glaucostegus* spp.) in Appendix II with the inclusion of the annotation "a zero annual export quota for wild-taken specimens traded for commercial purposes".

The Expert Panel deliberated whether or not this annotation would enhance conservation outcomes for any of these species. Whilst the Expert Panel could not come to a definitive conclusion (see below for more details), there is no evidence that a zero-export quota would have clear additional conservation benefits to populations of giant guitarfishes.

4.3. Could a CITES listing lead to unintended positive or negative consequences for the species' conservation?

Available information indicates that domestic consumption of meat would still result in giant guitarfishes being landed. The more impactful component of international trade would relate to the fins and skins, and a zero-export quota would eliminate legal international trade in these products.

- If fishers were to reduce interactions with giant guitarfishes due to a loss of financial incentives from the fins and skins being sourced for international trade, then there would be conservation benefits.
- If fishers did not reduce interactions with giant guitarfishes, as they would still be captured and landed for national consumption, then there would be no conservation benefits, and fishers may simply lose some of their income.
- If fishers increased fishing effort to compensate for income lost from the sale of fins and skin, then there could potentially be unintended negative consequences.

Overall, the potential merits of the proposed zero trade are difficult to appraise as it would likely depend on the responses of individual fishers and fishing communities, which at this point are unclear.

The Expert Panel also questioned whether the zero-export trade annotation was required, as presumably CITES parties who had agreed to the original listing would be developing NDFs if they had any exports of members of the genus.

Those nations exporting products from giant guitarfishes should develop and/or monitor and revise existing NDFs. Given that giant guitarfishes have been listed relatively recently, there is a rationale that nations have sufficient time to improve catch reporting, undertake research and develop NDFs.

The Expert Panel considered that improved monitoring of populations and fisheries, and the development of robust and reviewable NDFs would be a more beneficial avenue of future work in relation to improving our knowledge of giant guitarfishes, and to better ensure sustainable fisheries.

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TABLES AND FIGURES

Table 12. Species in the genus *Glaucostegus* (Proposal 32)

Scientific name	Common name
G. cemiculus	Blackchin guitarfish
G. granulatus	Sharpnose (or granulated) guitarfish
G. halavi	Halavi ray
*G. microphthalmos**	Smalleyed guitarfish
G. obtusus	Widenose guitarfish
*G. petiti***	Madagascar guitarfish
*G. spinosus****	Spiny guitarfish
G. thouin	Clubnose guitarfish
G. typus	Giant guitarfish (giant shovelnose ray)
G. younholeei	Bangladeshi guitarfish

Notes: IUCN lists seven species, although other on taxonomic sources list up to ten valid species (the additional three species accepted by some sources being *G. microphthalmos, G. petiti* and *G. spinsous*). For the purposes of this account, the term "giant guitarfishes" is used to apply to all members of the *genus Glaucostegus*.

* Considered by some sources to be a junior synonym of *G. granulatus* (see Weigmann, 2016) or *G. typus* (see Kyne *et al.* 2019).

** Considered by some sources to be a junior synonym of *G. cemiculus*.

*** Potentially represents the young of another species (Weigmann, 2016).

Sources: Kyne, P.M., Rigby, C.L., Dharmadi, Gutteridge, A.N. & Jabado, R.W. 2019. Glaucostegus typus. The IUCN Red List of Threatened Species 2019: e.T104061138A68623995. [Cites 25 July 2025] (http://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T104061138A68623995.en); Weigmann, S. 2016. Annotated checklist of the living sharks, batoids and chimaeras (Chondrichthyes) of the world, with a focus on biogeographical diversity. *Journal of Fish Biology*, 88(3): 837–1037. https://doi.org/10.1111/jfb.12874 [Accessed 2 August 2025].

Table 13. Export and re-export data for giant guitarfishes (*Glaucostegus*) from the CITES Trade Database for the period 2020 to 2023 inclusive, of wild specimens for commercial purpose as reported by exporting Parties

Exporter	Importer	Term	Unit	2020	2021	2022	2023
Indonesia	Cambodia	Live	No. specimens	–	–	–	1
Indonesia	China	Bones	kg	–	–	–	14 425
Indonesia	China, Hong Kong SAR	Fin (dried)	kg	–	–	46 658.3	–
Indonesia	China, Hong Kong SAR	Fins	kg	–	305.4	–	37 664.3
Indonesia	China, Hong Kong SAR	Meat	kg	–	24 13.5	–	868.1
Indonesia	China, Hong Kong SAR	Skins	kg	–	2 564	34 837	23 120.9
Indonesia	Japan	Bones	kg	–	–	–	430.8
Indonesia	Malaysia	Skins	kg	–	–	–	301
Indonesia	New Zealand	Bones	kg	–	–	7 050	–
Indonesia	Qatar	Live	No. specimens	–	–	2	–
Indonesia	Singapore	Fin (dried)	kg	–	–	335.2	–
Indonesia	Singapore	Fins	kg	–	–	–	67
Indonesia	Taiwan Province of China	Skins	kg	–	–	2 349.5	–
Indonesia	Thailand	Fin (dried)	kg	–	–	41.4	–
New Zealand	Australia	Powder	kg	–	–	–	239.4
New Zealand	Republic of Korea	Powder	kg	–	–	–	23.4
New Zealand	Malaysia	Powder	kg	–	–	–	2.24
New Zealand	Taiwan Province of China	Powder	g	–	–	–	93.9
New Zealand	Taiwan Province of China	Powder	kg	–	–	26.9	429.2
New Zealand	Thailand	Powder	kg	–	–	8.96	26.88
New Zealand	United States of America	Powder	kg	–	–	289	65
Oman	China, Hong Kong SAR	Fins	kg	–	30	14	–
Papua New Guinea	China, Hong Kong SAR	Fin (dried)	kg	–	–	–	581.6
Papua New Guinea	Thailand	Bodies	kg	–	–	–	1 008
Papua New Guinea	Thailand	Specimens	kg	–	–	4 723	–
Senegal	China	Fin (dried)	kg	–	–	–	44 980
Singapore	China	Fins	kg	–	–	396.2	–
Singapore	China, Hong Kong SAR	Fins	kg	–	1 436.3	–	162
Sri Lanka	China, Hong Kong SAR	Fins	kg	–	300	1 580	3 763
Sri Lanka	China, Hong Kong SAR	Gill plates	kg	–	–	100	–
Sri Lanka	Singapore	Fins	kg	500	1 600	2 300	2 400
Yemen	China, Hong Kong SAR	Fins	kg	–	444.5	1 145.5	–
Yemen	Singapore	Fins	kg	–	–	317.5	–

Source: CITES. 2025. Export data for giant guitarfishes (*Glaucostegus*) 2020–2023. [Accessed on 23 July 2025]. In: *CITES Trade Database*. Available at https://trade.cites.org

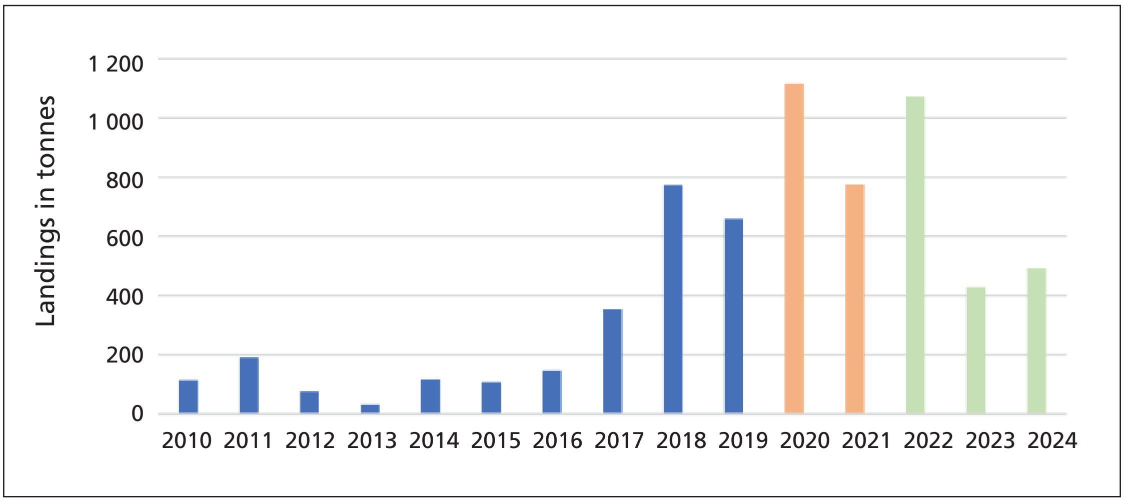
Table 14. Expert Panel assessment of inherent productivity of Guitarfish ("medium")

Source	Parameters	*G. cemiculus*	Productivity
this panel	*M*	0.287	Medium
this panel; CITES, 2024	*r*	0.110–0.471	Low-High
D'Alberto *et al*., 2019	*K*	0.20	Medium
D'Alberto *et al*., 2019	t_{mat}	5.1	Medium
D'Alberto *et al*., 2019	t_{max}	14	Medium
this panel	*G*	9	Medium

Source	Parameters	*G. typus*	PRODUCTIVITY
this panel	*M*	0.180	Low
this panel; CITES, 2024	*r*	0.175–0.352	Medium-High
D'Alberto *et al*., 2019	*K*	0.06	Low
D'Alberto *et al*., 2019	t_{mat}	6.5	Medium
D'Alberto *et al*., 2019	t_{max}	19	Medium
this panel	G	10	Medium

Sources: CITES. 2025. Export data for giant guitarfishes (*Glaucostegus*) 2020–2023. [Accessed on 23 July 2025]. In: *CITES Trade Database*. (Available at https://trade.cites.org); D'Alberto, B.M., Carlson, J.K., Pardo, S.A. & Simpfendorfer, C.A. 2019. Population productivity of shovelnose rays: Inferring the potential for recovery. *PLoS ONE*, 14(11): e0225183

Figure 8. Reported annual landings of *Glaucostegus* spp. from Indian waters (2010–2024), indicating data prior to the pandemic (blue), during the pandemic (orange), and the period from when there was protection under the WPAA (green)



Data source: ICAR-CMFRI, 2025. *MarineSTAT*. National Marine Fisheries Data Centre, ICAR-Central Marine Fisheries Research Institute, Kochi, India (accessed 25 July 2025).

FAO EXPERT PANEL ASSESSMENT REPORT OF PROPOSAL 33: Family Rhinidae (wedgefish)

Proposal for inclusion in the Appendix II listings of the family Rhinidae (wedgefish), of an annotation that sets “exports for commercial purposes” to zero.

EXPERT PANEL RECOMMENDATION

PROPOSAL 33	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
Family Rhinidae zero commercial exports for commercial purposes	–	–	X*

* Insufficient evidence of declines to make a judgement in relation to CITES criteria (CITES Res. Conf. 9.24. Rev. CoP17).

The family Rhinidae is already listed in Appendix II of CITES (Table 15).

There is no accurate information on the current population sizes of any species in the family. Whilst available information indicates that these species have declined, the magnitude of population decline is unknown. Therefore, the available data cannot be used in relation to the decline criterion.

It is uncertain which members, if any, of the family Rhinidae have declined to the extent that would equate with an Appendix I listing, and thus warrant the “zero annual export quota for wild-taken specimens” annotation.

The fins, skins and bones of wedgefish are traded internationally, but there is more limited international trade in their meat. This indicates that the meat of wedgefish is mainly consumed or traded domestically. Based on the available information, a zero annual quota is not expected to provide further conservation benefits.

Recent trade data indicate that several parties to CITES have exported various products of wedgefish, but publicly available non-detriment findings (NDFs) appear to be limited to two nations. Improved reporting and further development of NDFs are required.

MAIN SUPPORTING INFORMATION

Given that an earlier FAO Expert Panel had evaluated the proposal to list wedgefish on Appendix II (FAO, 2019), and that CITES parties considered that it was appropriate to list wedgefish (Rhinidae) in Appendix II, this evaluation focuses on recent information provided in the proposal with regards the merit of the suggested annotation “a zero annual export quota for wild-taken specimens traded for commercial purposes”.

Section 1. Fishery, trade and utilization

1.1. Is the nature and scale of international trade well described?

Wedgefish are fished throughout much of their geographical range, and available evidence indicates that the meat is either consumed domestically or traded internationally (which can include neighbouring countries), and that the fins, skin and bones are also traded internationally, as evidenced by the data submitted to CITES (Table 16).

1.2. How significant is the threat of international trade to species in the wild?

Given the coastal nature of wedgefish and the overlap with fisheries, including artisanal fisheries, the CITES Appendix II listing for this family is unlikely to have had any substantive impact on exploitation and mortality rates in those nations where there is domestic consumption and trade in their meat.

The current Appendix II listing should only allow international trade if a non-detriment finding (NDF) has been granted. Information on the CITES website indicates that positive NDFs have been produced by Australia and Indonesia, while India has a negative NDF for bowmouth guitarfish[1].

Available trade data, as submitted to CITES, is summarized (Table 16). Most international trade of wedgefish relates to their skins and fins, with some trade in bones.

1.3. What is the importance of the species in local livelihoods and economies?

The fins and skins of wedgefish are considered high-value products, as documented in the proposal, with these products evident in international trade data collated by CITES (Table 16).

Wedgefish are often reported as "high-value" species, but as the "value" of a fish species is a somewhat relative concept, the value of wedgefish (in relation to meat and domestic consumption) could not be evaluated by the Expert Panel in the time available. Whilst wedgefish are of likely importance to local livelihoods and economies, there are insufficient data to quantify this. Given that available CITES trade data do not include large quantities of meat, the Expert Panel considered that the meat of wedgefish would often be consumed or traded domestically.

Section 2. Inherent biological productivity

2.1. Are inherent biological traits relevant to the species' productivity and resilience well described?

The biological traits were described in the proposal and were reviewed previously by an earlier Expert Panel (FAO, 2019). Whilst life-history data are limited for some species, the better-studied species serve as useful surrogates for the genus as a whole.

2.2. Is the species' inherent productivity appropriately categorized (low, medium, high) for the purpose of applying the CITES biological listing criteria?

Wedgefish are of medium productivity.

[1] NDF-India-Rhina-ancylostoma-2022-2026.pdf.

The earlier Expert Panel considered wedgefish to be of low to medium productivity (FAO, 2019), but more recent studies indicate that they should be considered as being of medium productivity (D'Alberto *et al.*, 2019; Table 17).

Whilst Section 2 of the proposal infers wedgefish to be "low productivity", the proposal also states that "Studies suggest that if fishing mortality is kept low, species like wedgefishes could theoretically recover relatively fast (relative to other slow-growing elasmobranchs) (D'Alberto *et al*., 2019)", which indicates that wedgefish are not of low productivity.

Section 3. Evaluation of species status and trends in relation to CITES criteria

3.1. In application of the CITES biological listing criteria is the best available status and trend information considered, and is it sufficient to support a confident and well-substantiated determination?

There are no data available on the population sizes of wedgefish, and robust species-specific population trend data are lacking in most instances. The most recent assessments for the IUCN Red List of Threatened and Declining species indicate that ten of the eleven species are assessed as Critically Endangered, with eyebrow wedgefish *Rhynchobatus palpebratus* assessed as Least Concern. In terms of the species assessed as Critically Endangered, these are all "inferred" population reductions of >80 percent over three generations due to actual levels of exploitation.

The underlying data are typically of highly variable quality and often based on data from limited areas and periods.

3.2. Does the scientific data and technical information on historical extent of decline (App I), meet the CITES biological listing criteria?

The Expert Panel recognized that there were still limited data relating to the populations of wedgefish. An earlier Expert Panel (FAO, 2019, p. 50) stated, "*The information provided in the proposal on trends in populations across the species' range was limited, and not sufficient to allow the panel to determine whether the species qualified globally under the decline criteria for an Appendix II listing. The panel had access to two additional series of catches, from India and Indonesia, which displayed strong declines. These data were considered insufficient to change the conclusion above*".

Whilst the current Expert Panel considered that there had likely been a decline in populations of wedgefish, due to a combination of fisheries exploitation and habitat loss/degradation, the magnitude of this decline was uncertain. The original proposal to list wedgefish (CoP18 Proposal 44) used landings data presented by Mohanraj *et al.* (2009) to infer declines in wedgefish in the waters of Chennai (India). Such data related to landings, and so data may be influenced by fishing patterns, market price of different fish species, any management measures etc. The consistency of reporting of different categories was not possible to evaluate.

The Expert Panel undertook further analyses of the annual landing estimates compiled by ICAR-CMFRI for giant guitarfishes along the mainland coast of India, which indicated recent decline in landings in India (ICAR-CMFRI, 2025); this is likely due to improved conservation actions, which provided complete protection to three species of wedgefishes under the country's Wildlife Protection Act since 2022, rather than a decline of populations in the wild (Figure 9).

The current panel considers it uncertain whether any of the wedgefish in the family Rhinidae meet the criteria for listing on Appendix I of CITES, which was used as the basis for suggesting the zero annual export quota for wild-caught products.

The proposal referred to many of the purported declines given in the individual assessments undertaken for the IUCN Red List of Threatened and Declining Species.

Whilst the IUCN proposals would try and include some specific information (where available), a range of more generic information from different sources was also used. These disparate data sets were suggested as being representative of the family as a whole. Whilst such an overarching approach is possibly suited to taxa with both limited data and taxonomic confusion, there are potential issues over the data that have been used.

Given that much of the generic information used in the proposal for wedgefish was also used in the proposal for giant guitarfishes, the reader is referred to the Expert Panel's review of Proposal 32 (giant guitarfishes) in the present report for informative comments on the generic data that have been used to infer population declines relevant to this proposal.

The Expert Panel noted that there are various national data sets that could potentially be used to conduct more robust analyses on landings trends relating to wedgefish and related taxa. Such analyses would benefit from being undertaken in conjunction with national data collectors and fisheries managers, in order to develop robust conclusions.

3.3. What additional factors (e.g., vulnerability or resilience) should be considered in evaluating the species against the CITES biological listing criteria?

The Expert Panel recognized that the shallow-water distribution and large size of wedgefish (family Rhinidae) would make them susceptible to fishing pressure, and that other factors (e.g. habitat loss and degradation) may also impact populations.

An earlier panel considered members of this family to be of low to medium productivity. The current panel, using a more standardized approach, considered them to be of medium productivity. This is in line with recently published studies (D'Alberto *et al.* 2019).

Section 4. Management, conservation and potential impact of listing

4.1. Are national or regional management measures currently in place to conserve the species well described in the proposal?

Few nations have management measures in place that afford protection to wedgefish. The introduction of inshore protected areas in relevant national waters might also have resulted in changes in some exploitation patterns. The proposal highlights the limited national measures, but given the wide geographical distribution of these species and number of range states, a detailed review was beyond the scope of the Expert Panel.

4.2. Would a CITES listing likely enhance conservation outcomes for the species?

Proposal 33 is for the maintenance of wedgefish (Rhinidae) in Appendix II with the inclusion of the annotation "a zero annual export quota for wild-taken specimens traded for commercial purposes".

The Expert Panel deliberated whether or not this annotation would enhance conservation outcomes for any of these species. Whilst the Expert Panel could not come to a definitive conclusion (see below for more details), there is no evidence that a zero-export quota would have additional conservation benefits to wedgefish populations.

4.3. Could a CITES listing lead to unintended positive or negative consequences for the species' conservation?

Available information indicates that domestic consumption of meat would still result in wedgefish being landed. The more impactful component of international trade would relate to the fins and skins, and a zero-export quota would eliminate legal international trade in these products.

- If fishers were to reduce interactions with wedgefish due to a loss of financial incentives from the fins and skins being sourced for international trade, then there would be conservation benefits.
- If fishers did not reduce interactions with wedgefish, as they would still be captured and landed for domestic consumption and trade, then there would be no conservation benefits, and fishers may simply lose some of their income.
- If fishers increased fishing effort to compensate for income lost from the sale of fins and skin, then there could potentially be unintended negative consequences.

Overall, the potential merits of the proposed zero trade are difficult to appraise, as it would likely depend on the responses of individual fishers and fishing communities, which at this point are unclear.

The Expert Panel also questioned whether the zero-export trade annotation was required, as presumably CITES Parties who had agreed to the original listing would be developing NDFs if they had any exports of members of the family.

Those nations exporting products from wedgefish should develop and/or monitor and revise existing NDFs. Given that wedgefish have been listed relatively recently, there is a rationale that nations have sufficient time to improve catch reporting, undertake research, and develop NDFs.

The Expert Panel considered that improved monitoring of populations and fisheries, and the development of robust and reviewable NDFs would be a more beneficial avenue of future work in relation to improving our knowledge of wedgefish, and to better ensure sustainable fisheries.

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TABLES AND FIGURES

Table 15. Species in the family Rhinidae (wedgefish)

COMMON NAME	SCIENTIFIC NAME
Bowmouth guitarfish or shark ray	*Rhina ancylostoma*
Bottlenose wedgefish	*Rhynchobatus australiae*
Clown wedgefish or Roughnose wedgefish	*Rhynchobatus cooki*
Giant guitarfish or Giant Sandfish	*Rhynchobatus djiddensis*
Taiwanese Wedgefish	*Rhynchobatus immaculatus*
Smoothnose wedgefish	*Rhynchobatus laevis*
African wedgefish	*Rhynchobatus luebberti*
Japanese wedgefish	*Rhynchobatus mononoke*
Eyebrow wedgefish	*Rhynchobatus palpebratus*
Broadnose wedgefish	*Rhynchobatus springeri*
False shark ray	*Rhynchorhina mauritaniensis*

Note: Species in the family Rhinidae (wedgefish) are under taxonomic change. Misidentifications and confusion in common names over the longer term are common. Therefore, accurate species-specific data are often limited, thus often necessitating analyses at the family level, or for a larger grouping broadly relating to wedgefish (and guitarfish).

Table 16. Export data for wedgefish (Rhinidae) from the CITES Trade Database for the period 2020 to 2023 inclusive, of wild specimens (including unknown) for commercial purposes as reported by exporting Parties

Exporter	Importer	Term	Unit	2020	2021	2022	2023
Indonesia	Cambodia	Live	No. specimens	–	–	2	1
Indonesia	China	Bones	kg	–	–	–	19 425
Indonesia	China, Hong Kong SAR	Fin (dried)	kg			59 856.7	
Indonesia	China, Hong Kong SAR	Fins	kg	–	16 840.18	–	56 717.2
Indonesia	China, Hong Kong SAR	Fins	(blank)	–	6 037.2	–	–
Indonesia	China, Hong Kong SAR	Skins	kg	–	4 348.6	12 894.3	17 230.4
Indonesia	Japan	Bones	kg	–	–	–	527.7
Indonesia	Malaysia	Fin (dried)	kg	–	–	135.78	–
Indonesia	Malaysia	Fins	kg	–	5 632 058.7	–	23.36
Indonesia	New Zealand	Bones	kg	–	6 675	17 413.5	–
Indonesia	Singapore	Fin (dried)	kg	–	–	2 010.5	–
Indonesia	Singapore	Fins	kg	–	–	–	1 359.6
Indonesia	Singapore	Meat	kg	–	310	1 565.5	2 714
Indonesia	Taiwan Province of China	Skins	kg	–	–	100	–
Indonesia	Thailand	Fin (dried)	kg	–	–	764.6	–
Indonesia	Thailand	Fins	kg	–	37	–	410
Indonesia	United Arab Emirates	Live	No. specimens	–	4	–	2
Indonesia	Viet Nam	Live	No. specimens	–	–	1	–
Kenya	China	Fins	kg	–	61	–	–
Kenya	Croatia	Live	No. specimens	–	–	1	–
Kenya	China, Hong Kong SAR	Fins	(blank)	–	–	–	200.9
Kenya	Hungary	Live	No. specimens	–	1	–	–
Kenya	Mauritius	Live	No. specimens	–	–	1	–
Kenya	Netherlands (Kingdom of the)	Live	(blank)	–	–	–	3
Kenya	Poland	Live	No. specimens	–	4	–	–
Kenya	Taiwan Province of China	Fin (dried)	kg	–	–	225.5	–
Kenya	United Arab Emirates	Live	No. specimens	2	5	–	–
Kenya	United Arab Emirates	Live	(blank)	–	–	–	6
Mozambique	China, Hong Kong SAR	Fin (dried)	kg	–	–	303.6	–
New Zealand	Australia	Powder	kg	–	–	2 292.1	3 398.1
New Zealand	China	Powder	kg	–	–	380.4	513
New Zealand	Republic of Korea	Powder	kg	–	–	–	233.2
New Zealand	Malaysia	Powder	kg	–	–	68	20.4
New Zealand	Netherlands (Kingdom of the)	Powder	kg	–	–	341	–
New Zealand	Taiwan Province of China	Powder	g	–	–	–	151.3
New Zealand	Taiwan Province of China	Powder	kg	–	–	939.4	1 295.8
New Zealand	Thailand	Powder	kg	–	–	267.1	321.4
New Zealand	United States of America	Powder	kg	–	–	10 856	588
Oman	Hong Kong	Fins	kg	–	715	2 333	–

Table 16 (Cont.)

Exporter	Importer	Term	Unit	2020	2021	2022	2023
Papua New Guinea	China	Fin (dried)	kg	–	–	–	71.8
Papua New Guinea	China, Hong Kong SAR	Fin (dried)	kg	–	–	–	28.2
Papua New Guinea	Singapore	Fins	kg	–	6.14	37.0	–
Papua New Guinea	Thailand	Bodies	kg	–	–	–	159
Papua New Guinea	Thailand	Specimens	kg	–	–	8 477	–
Senegal	China	Fin (dried)	kg	–	–	53 895.5	8 349.5
Senegal	China	Fins	kg	–	14 201.5	–	–
Senegal	France	Fin (dried)	kg	–	–	13	1 000
Singapore	China	Fins	kg	–	–	312.6	–
Singapore	China, Hong Kong SAR	Fins	kg	–	4 944.8	70.5	1 341
Sri Lanka	China, Hong Kong SAR	Bodies	kg	200	–	–	–
Sri Lanka	China, Hong Kong SAR	Fins	kg	185.4	6 206.3	4 840	8 583.8
Sri Lanka	China, Hong Kong SAR	Fins	No. specimens	–	–	–	400
Sri Lanka	China, Hong Kong SAR	Gill plates	kg	–	–	180	–
Sri Lanka	Singapore	Fins	kg	2 200	4 750	2 800	900
Thailand	China, Hong Kong SAR	Fins	kg	–	37	–	–
Yemen	China, Hong Kong SAR	Fins	kg	500	3 129.6	7 152.3	–
Yemen	Singapore	Fins	kg	–	–	1 200.2	–

Source: CITES. 2025. Export data for wedgefish (Rhinidae) 2020–2023. [Accessed on 25 July 2025]. In: *CITES Trade Database*. Available at https://trade.cites.org

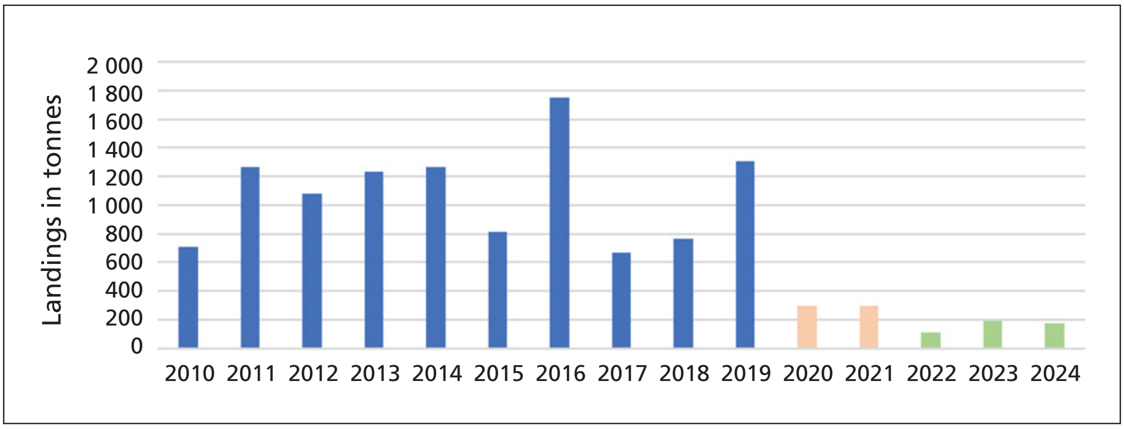
Table 17. Expert Panel assessment of inherent productivity of Wedgefish ("medium")

Source	Parameters	*R. australiae*	Productivity
this panel	*M*	0.284	Medium
this panel; CITES, 2024	*r*	0.309–0.498	Medium-High
d'Alberto *et al.*, 2019	*K*	0.08	Low
d'Alberto *et al.*, 2019	t_{mat}	3	High
d'Alberto *et al.*, 2019	t_{max}	12	High
this panel	*G*	6	Medium

Source	Parameters	*Rhina ancylostoma*	Productivity
this panel	*M*	0.156	Low
this panel	*r*	0.144	Medium
ICAR-CMFRI, 2022	*K*	0.15	Medium
Purushottama *et al.*, 2022	t_{mat}	6	Medium
Purushottama *et al.*, 2022	t_{max}	19	Medium
this panel	*G*	10	Medium

Sources: CITES. 2024. *Variability of life history parameters and productivity in elasmobranchs and other commercially exploited aquatic species*. Background document to the technical workshop on Aquatic species listed in the CITES Appendices (Geneva, April 2024); D'Alberto, B.M., Carlson, J.K., Pardo, S.A. & Simpfendorfer, C.A. 2019. Population productivity of shovelnose rays: Inferring the potential for recovery. *PLoS ONE*, 14(11): e0225183.9; ICAR-CMFRI. 2022. *MarineSTAT*. National Marine Fisheries Data Centre, ICAR-Central Marine Fisheries Research Institute, Kochi, India; Purushottama, G.B., Thomas, S., Kizhakudan, S.J. & Zacharia, P.U. 2022. Catch composition, reproductive biology and diet of the bowmouth guitarfish, *Rhina ancylostomus* Bloch and Shneider, 1801 (Batoidea: Rhinidae) in the eastern Arabian Sea, India. *Indian Journal of Fisheries*, 69(3): 1–11.

Figure 9. Reported annual landings of wedgefishes from Indian waters (2010 to 2024), indicating data prior to the pandemic (blue), during the pandemic (orange), and the period from when there was protection under the WPAA (2022; green)



Data source: ICAR-CMFRI, 2025. *MarineSTAT*. National Marine Fisheries Data Centre, ICAR-Central Marine Fisheries Research Institute, Kochi, India (accessed 25 July 2025).

FAO EXPERT PANEL ASSESSMENT REPORT OF PROPOSAL 34: Family Centrophoridae

This proposal is for the inclusion of the dwarf gulper shark (*Centrophorus atromarginatus*) and the gulper shark (*Centrophorus granulosus*) in Appendix II, under Annex 2 (a) criterion A and criterion B, and – for reasons of similarity – inclusion of all other species in the family Centrophoridae satisfying Annex 2b Criterion A.

EXPERT PANEL RECOMMENDATION

PROPOSAL 34	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
Gulper shark, (*C. atromarginatus,* and *C. granulosus*)	–	–	X*

SPECIES PROPOSED	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
C. atromarginatus	–	–	X*
C. granulosus	–	–	X*

LOOK ALIKE SPECIES	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
14 spp. of Centrophoridae**	–	–	X*

* Insufficient evidence of declines to make a judgement in relation to CITES criteria (CITES Res. Conf. 9.24. Rev. CoP17).

** *C. harrissoni, C. isodon, C. lesliei, C. longipinnis, C. lusitanicus, C. moluccensis, C. seychellorum, C. squamosus, C. tessellatus, C. uyato, C. westraliensis, Deania calceus, D. profundorum, D. quadrispinosa* and any other putative species within the family Centrophoridae.

The Expert Panel concludes that the best available scientific data and technical information presented in CoP20 Proposal 36 does not meet the criteria for listing in Appendix II. While some evidence supported precautionary listing under the criteria, other data could not be used to clearly identify whether the species meet the decline threshold.

Accordingly, the Expert Panel could not determine whether *C. atromarginatus* and *C. granulosus* meet the decline criteria for listing in Appendix II, noting that clear evidence of decreasing population trends is scant and limited to some areas. The Expert Panel determined that the available information was insufficient to determine population status in relation to the listing criteria for Appendix II at this time. This conclusion is based on a comprehensive evaluation of the best available scientific data and technical information, which indicates that gulper sharks (family Centrophoridae) are low productivity, but doubts remain regarding their contribution to the shark liver oil trade and the evidence available on the decline in their populations.

The Expert Panel considered that there would be potential net conservation benefits to listing these species in Appendix II. However, the Expert Panel noted that a CITES listing of Centrophoridae could be problematic for landing and exporting countries – often small island developing states, where capability and resources might be limited to manage the small-scale fisheries where the extraction originates. Recent trade statistics show that trade is limited and the Expert Panel assessed that it is unlikely to resume at the levels seen in past decades.

MAIN SUPPORTING INFORMATION

Section 1. Fishery, trade and utilization

1.1. Is the nature and scale of international trade well described?

Once more widespread, there now appear to be few if any targeted fisheries for the family Centrophoridae, which could be an indication that a population decline has occurred in the past but could also be a result of market and trade variables. Targeted fisheries were present in both exclusive economic zone (EEZ) areas and high seas areas, at both the artisanal and the industrial scale, and mainly operated through deepwater gillnets and demersal longlines. Artisanal fisheries for shark liver oil might have provided an income source to small-scale fishers who have had since to convert to other livelihood opportunities. Some bycatch fisheries still exist to this day but they typically harvest low volumes of these species.

The main product of these fisheries is shark liver oil, rich in squalene to various degrees, which is typically collected in barrels and traded internationally from the countries where local fisheries operate to other countries where squalene is further refined and traded. Demand for shark-sourced squalene has likely decreased compared to a peak in the 1980s and 1990s, due to the cosmetics companies adopting other sources, but the information on the international trade of shark-sourced squalene is not conclusive.

The Expert Panel considered shark oil to be the main internationally traded product from these species. There is a limited national trade of meat and fins in some areas, but restrictions exist on the trade of fins in nations such as Canada, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

Data on export of shark liver oil presented in the proposal for some countries (Maldives, Philippines) have shown signs of collapse. but the shark liver oil is likely sourced from a number of species potentially not included in the proposal. Unfortunately, there are no genus or species-specific Harmonised System (HS) tariff codes that would allow to identify the source species of shark liver oil, noting that the family Centrophoridae includes about a quarter of the shark species harvested for liver oil.

The overall reported volume in trade was higher in the past (400–1 000 tonnes in the 1980s) but is now reported to be less than 20 tonnes per year. However, the Expert Panel considered that there are no species-specific estimates of the volume of shark liver oil in international trade, and that there are likely gaps in reporting of shark liver oil trade volumes. Subsequently, trade trend information cannot be used to conclusively support whether a species meets the listing criteria for CITES Appendix II.

The Expert Panel was not aware of any relevant cases of illegal trade for these species. The Expert Panel noted that trade of products of Centrophoridae not reported at the species-level would not constitute illegal trade under current restrictions.

1.2. How significant is the threat of international trade to species in the wild?

The family Centrophoridae is mainly targeted for the extraction of shark liver oil products, which are often traded internationally. As such, the Expert Panel could classify international trade as the source of the main anthropogenic threat to this family in the wild. Secondary products include meat and fins, which are mostly traded at the national level.

Global demand for squalene, the main product from shark liver oil, is predominantly driven by the cosmetic industry which, due to consumer environmental concerns, has moved towards also utilizing squalene from alternative (plant-based) sources, available since the early 1990s. However, the Expert Panel noted that there is little up-to-date, species-specific trade information on the current relevance of harvest of these species to meet the market demand.

1.3. What is the importance of the species in local livelihoods and economies?

In the 1980s and 1990s, targeted fisheries for gulper sharks existed at the local level in developing countries, which typically exported the liver oil products to developed countries. The Expert Panel had no detailed information on the cultural or livelihood significance of these local fisheries, but considered that international trade could have provided relevant benefits.

Evidence that local fisheries shifted readily to other targets – once the resource harvesting was less profitable – indicates the possibility that other uses, not including international trade, were less relevant to local economies and that the overall reliance on this trade might have been low.

However, anecdotal evidence from some areas of the Indian Ocean indicates that a shift in the ability to exploit this resource could lead to a substantial reduction of the number of vessels at a local level, suggesting that at least in some cases there might not exist other comparably profitable targets for fisheries to shift to.

Section 2. Inherent biological productivity

2.1. Are inherent biological traits relevant to the species' productivity and resilience well described?

The biological traits and life history information were well described and more work was completed by the Expert Panel (Table 18).

2.2. Is the species' inherent productivity appropriately categorized (low, medium, high) for the purpose of applying the CITES biological listing criteria?

Gulper sharks are considered to be of low productivity. This is supported by consideration of the full range of life history parameters (Table 18).

Section 3. Evaluation of species status and trends in relation to CITES criteria

3.1. In application of the CITES biological listing criteria, is the best available status and trend information considered and is it sufficient to support a confident and well-substantiated determination?

Some species of *Centrophorus* spp. are suspected to have undergone population declines and even localized depletion, likely due to overexploitation by fisheries (e.g. Finucci *et al.*, 2024; Rigby, Ebert and Herman, 2024). However, the Expert Panel recognized that species-specific time-series data are typically too limited to provide robust estimates of population size.

While there may be local evidence of historical declines in *Centrophorus* spp. catches in some areas (e.g. the high seas of the Indian Ocean), numerical evidence is more limited to less reliable proxies in other areas. In summary, the assessment of scientific data and information across the decline criteria of CITES underlined that there is some descriptive information on declines in catch rates for one species (*C. granulosus*) and quantitative data on a decline in landings and exports of *Centrophorus* spp. products in some part of their distribution range.

The Expert Panel considered that the two species nominated for inclusion in Annex II have possibly had a historical decline, but could not determine whether these declines reached or exceeded the thresholds for the decline-related criteria used by CITES.

3.2. Does the scientific data and technical information on historical extent of decline and the recent rate of decline in conjunction (Appendix II) meet the CITES biological listing criteria?

The Expert Panel considered that there was circumstantial evidence that some fisheries for *C. atromarginatus* and *C. granulosus* (and more generally for the family Centrophoridae) might have caused the historical decline of some populations in different geographic areas. The Expert Panel was unable to ascertain the rate of recent decline, with the exception of the high seas areas of the Indian Ocean.

Using both the historical and recent rates of decline in conjunction, the Expert Panel found that there was insufficient evidence to determine whether *C. atromarginatus* and *C. granulosus* meet the decline criterion for listing in Appendix II.

When reviewing the information available in the proposal, the Expert Panel noted that surveys to monitor trends were seemingly lacking in many areas, and improved monitoring of populations should be considered by relevant range states.

Few instances of CPUE indices were available to the Expert Panel, and unfortunately some of those covered short (< 5 years) or medium (< 10 years) time periods. However, these constituted perhaps the strongest evidence of a decline of the species.

Datasets of reported landings are often incomplete, and the interpretation of such data requires detailed knowledge of temporal changes in data collection, fishing patterns and relevant management measures that may influence landings trends.

Finally, trade statistics were considered to be the least reliable indicator of species decline as they are affected by additional factors such as socioeconomic dynamics and product composition.

Taxonomic and identification issues also affected some datasets. Consequently, some of the information considered by the Expert Panel to possibly relate to a decline (in either population number or geographical extent) could not be quantified.

The Expert Panel evaluated the information in the proposal on a regional basis. In the IndoPacific region, the time-series were unpublished (Rigby *et al.*, 2020), anecdotal, or related to a single local fishery within a limited timespan (< 5 years, Samusamu and Dharmadi 2017).

In the Pacific region, there was anecdotal fishmarket presence (Ebert *et al.*, 2013), which could not be checked, or non-species-specific decline in shark landings (Liao *et al.*, 2019). The evidence on the export trade decline in the Philippines (BFAR, 2017) was considered by the Expert Panel to be indicative of a potential collapse of the fishery, and suggestive of a corresponding collapse of demersal shark populations, but could not be specifically attributed to the species in the proposal.

In the Indian Ocean region, the strongest evidence was based on shark liver oil export statistics and personal communications (Kyne and Simperdorfer, 2007) and was suggestive of a decline in the local Maldivian fishery for demersal sharks. Other evidence from this region was anecdotal (Akhilesh and Ganga, 2013) and the underlying data were unclear or could not be checked (A. Tanna, personal communication, 2019, cited in Finucci *et al.*, 2024), referred to a short time period (< 5 years) and/or mixed species (Soundararajan and Roy, 2004), and other causes were listed by the primary references as an explanation for the decline (e.g. Akhilesh and Ganga, 2013).

In the Atlantic Ocean region, information from the Mauritanian fishery was not attributable to a decline in the population, as stated by the authors of the primary reference (Fernández, Salmerón and Ramos, 2004). More robust evidence was provided for a historical decline in the Gulf of Mexico (Finucci *et al.*, 2024), based on a CPUE index, but the Expert Panel considered that the projected recent decline was much more uncertain. Finally, the strongest evidence for this area was provided by a decline in *C. granulosus* landings detected in Portugal (Alves *et al.*, 2020), even if the Expert Panel considered that other confounding factors were present – such as the restrictions introduced on the landing of demersal shark species, which prevented a clear inference to population declines.

In the high seas, the Expert Panel considered that catch report data from SIOFA was indicative of a decline in *C. granulosus* within one of the SIOFA subareas (Delegation of the European Union, 2024), and that this was one of the most robust information sources available.

The Expert Panel was unable to examine more reliable sources of information for *C. atromarginatus* and *C. granulosus* decline, and general sources related to other species in the family Centrophoridae, across the regions where these species are present. However, the Expert Panel was able to examine information that would suggest that the distribution range of these species is likely underestimated due to the lack of available data, particularly in the high seas.

3.3. What additional factors (e.g. vulnerability or resilience) should be considered in evaluating the species against the CITES biological listing criteria?

There are a range of notable risk factors associated with family Centrophoridae more generally that may increase the risk of extinction or offer resilience. The Expert Panel considered whether these characteristics would change the likelihood of Centrophoridae being depleted to the point where they would meet the criteria for listing in Appendix II.

Because of their life history characteristics and catchability, the species in this family are vulnerable to fishing pressure. The potential of other anthropogenic impacts could not be examined in detail during the Expert Panel meeting, but the Expert Panel considered that fishing would be the main anthropogenic driver behind any decline of the populations in the family Centrophoridae.

The members of this family are known to occasionally aggregate (e.g. in relation to reproductive events), which increases the probability of being caught in large numbers during a sensitive life stage, while being less able to sustain this than more productive species. However, the Expert Panel also noted that these species distributions likely extend beyond the known areas and well into the high seas, indicating the potential presence of refuge areas where they are less likely to be targeted e.g. by artisanal fisheries.

Uncertainty in current exploitations levels for the family Centrophoridae is also a concern. Preliminary examination of available information indicated that there might be only incomplete reporting and data availability for this family. The Expert Panel did not have sufficient time for a search of all data that may be available, especially at the national level, and considered that a more focused effort to collate relevant data could be useful in the future.

The Expert Panel also considered the available information on at vessel mortality (AVM) and post-release survival rates of released and discarded deepwater sharks within this family. In some studies, AVM can be < 10 percent for deep-water shark species after longline capture, with the short and medium term post-release survival rates (> 60 percent) suggesting that releasing caught individuals could be considered when trying to mitigate unwanted catch (Rodríguez Cabello and Sánchez, 2017). Other studies, however, have reported a higher AVM for centrophorids. Graça Aranha *et al*. (2025) examined mortality rates of deepwater sharks caught in a crustacean trawl fishery and reported an AVM of 88–96 percent for *Deania* species. Whilst no AVM was observed for the two species of *Centrophorus* encountered in that study, the sample size was low and the majority of specimens were assessed as being in "poor" condition. Longline studies undertaken by Talwar *et al*. (2017) reported 30.8 percent AVM for *Centrophorus* sp., and a subsequent post-release mortality of 83 percent, even with the soak time being shorter than for commercial fisheries.

Section 4. Management, conservation and potential impact of listing

4.1. Are national or regional management measures currently in place to conserve the species well described in the proposal?

There are no national species-specific management plans that address the two species included in the proposal, but there are many nonspecific measures in Australia and the European Union that would limit the catch and landing of these species.

Some regional management measures are in place in international waters, in particular in the Southern Indian Ocean (SIOFA Area), in the Northeast Atlantic (NEAFC Area), and, to some extent, in the Southern Pacific (SPRFMO Area). These measures include prohibition of targeting deepwater sharks and move-on rules in specific fisheries. A nonbinding recommendation to ban the targeting of deepwater sharks in the Southeast Atlantic (SEAFO Area) has not been implemented.

In the Mediterranean, *Centrophorus granulosus* (currently recognized as *C. uyato*) is listed in the Annex III List of Endangered or Threatened Species of the Protocol Concerning Specially Protected Area and Biological Diversity in the Mediterranean, of the Barcelona Convention (SPA/BD). The General Fisheries Commission for the Mediterranean (GFCM) adopted a measure related to the shark species listed in Annex III of the SPA/BD Protocol, as a result contracting parties and cooperating noncontracting parties are invited to adopt species-specific mitigation measures to minimize and eliminate, where possible, the incidental catch and to increase postrelease survival rates.

Other areas do not have specific or generic measures, which could challenge the effective management of further fishing pressure on the species within this family, at least within the known or inferred distribution range of the species.

4.2. Would a CITES listing likely enhance conservation outcomes for the species?

Should *C. atromarginatus* and *C. granulosus* be listed in Appendix II under Annex 2a Criterion A and Criterion B, including the proposed extension of the listing to all species in the family on the basis of the look alike provision under Annex 2b criterion A, this will require the same considerations and export permitting for all species in the family.

CITES provisions on the trade of 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:

- the export is not detrimental to the survival of the species in the wild; and
- the specimens were not obtained in contravention of the national laws of that State.

The Expert Panel considered that a CITES listing for these species might make targeted fisheries for the family Centrophoridae less profitable and likely limit the international trade of derived products, mainly shark liver oil, and that this is likely to have a positive effect on the conservation status of the family Centrophoridae.

The Expert Panel also considered that a CITES listing would have the greatest effects on small and developing states, while other states would have more capacity to continue operations and develop appropriate certifications.

4.3. Could a CITES listing lead to unintended positive or negative consequences for the species' conservation?

The Expert Panel considered that corollary positive consequences of listing in Appendix II for the species conservation could include:

- a better understanding of the biology and population characteristics of the family Centrophoridae, which might accompany the development of NDFs;
- the development of better management and trade traceability practices, which could lead to improved conservation and more detailed trade data; and
- an increased awareness of shark liver oil harvest and use for both resource managers and the general public.

The Expert Panel considered that unintended negative consequences of listing in Appendix II for the species conservation could include:

- limiting the opportunities for sample collection and sharing across national boundaries;
- a potential increase in illegal (or inadequately certified) trade, especially in those countries unable to invest in substantial research for certification;
- a potential shift or increase of fishing pressure on similar species not covered by Appendix II, especially given the challenges in taxonomic identification;
- a potential for trade to continue for named species with an export certificate, but including co-occurring species, which would need the development of specific assays and require additional resources for trade control.

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TABLES AND FIGURES

Table 18. Expert Panel assessment of inherent productivity of Centrophoridae ("low')

Source	Parameters	*C. granulosus*	*C. squamosus*	*Deania calcea*	Productivity
this panel	M	0.100	–	–	Low
this panel; CITES 2024	r	0–0.030	0.047	0.042	Low
Guallart and Vicent, 2001	K	0.096	–	–	Low
Guallart and Vicent, 2001	t_{mat}	16.5	–	–	Low
Guallart and Vicent, 2001	t_{max}	39	–	–	Low
this panel	G	23	–	–	Low

FAO EXPERT PANEL ASSESSMENT REPORT OF PROPOSAL 35: Japanese eel, *Anguilla japonica*, and American eel, *Anguilla rostrata*, plus all *Genus Anguilla*

This proposal is for inclusion of the Japanese eel, *A. japonica* and the American eel, *A. rostrata* in Appendix II, Under Annex 2 (a) criterion B.

It also includes all non-CITES species of the genus *Anguilla* in CITES Appendix II in accordance with Article II, Paragraph 2 (b) for reasons of similarity to *A. anguilla*, or to one of the species proposed (*A. japonica* and *A. rostrata*) in live or processed form.

EXPERT PANEL RECOMMENDATION

PROPOSAL 35	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
Japanese eel, *Anguilla japonica*, and American eel, *Anguilla rostrata*	–	X	–

	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
Japanese eel (*A. japonica*)	–	X	–
American eel (*A. rostrata*)	–	X	–

LOOK ALIKE	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
Anguilla 15 spp.	–	X	–

Japanese eel and other look alike eels
The Expert Panel assesses Proposal 35 not to meet the CITES listing criteria.

This conclusion is based on a comprehensive evaluation of the best available scientific data and technical information, which indicates that *A. japonica* and related species exhibit medium inherent productivity, large effective population sizes above the Appendix II extent of decline threshold, and low extinction risk as demonstrated by Population Viability Analysis (PVA). Furthermore, the suggested direct linking of international trade to population declines across the genus is not well supported by the evidence. Existing regional and national management measures across Asia are extensive and demonstrably effective, particularly in eastern Asia where cooperative frameworks and practical species identification methods support sustainable use and trade monitoring.

While an Appendix II listing might offer some regulatory harmonization benefits, the risks of unintended negative consequences – including increased illegal trade, market distortions and the disruption of successful management cooperation – are considerable. Therefore, the Expert Panel expresses moderate to high confidence in the result of their evaluation, emphasizing that targeted conservation actions and strengthened species and region-specific management represent more effective pathways to sustainable conservation outcomes than a premature genus-wide listing.

American eel
The Expert Panel assesses that information in Proposal 35 for American eel (*A. rostrata*) does not appear to meet the listing criteria for CITES Appendix II.

An evaluation of available scientific data and technical information revealed major data gaps that preclude a conclusion that the regulation of international trade in *A. rostrata* is required to ensure that fisheries harvest is not reducing the wild population to a level at which its survival might be threatened by continued harvesting or other influences.

Glass eel and elver stages (fished primarily in Nova Scotia, Canada; Maine, the United States of America; and some Caribbean islands, and shipped to stock eastern Asia aquaculture farms) are the most economically valuable fishery product. As a panmictic species (no subpopulations or barriers to gene flow), it is likely that *A. rostrata* is resilient to exploitation by fisheries occurring in only a small portion of its range. Given the high and density-dependent natural mortality of recruiting glass eels and elvers, it is expected that fishing pressure on these stages has a lower effect on the population than exploitation of later stages. Additionally, regional management frameworks are in place to regulate commercial eel fishing in some of its range. Unregulated and illegal fishing is a concern to *A. rostrata* managers, but the relative contributions of these actions to overall fishing mortality is unknown.

Abundance of yellow (and silver) stage *A. rostrata* in North America has experienced declines of over 50 percent but its population continues to be large and to occupy an enormous range between Greenland and northern South America. Because fisheries for these stages occur in only a small part of this range, there are no firm grounds to suggest that commercial fisheries are the primary driver of abundance declines relative to other threats such as habitat loss and environmental changes. The Expert Panel concludes that the risk of extinction posed by international trade is low. The Expert Panel considers that a CITES listing would not have conservation benefits outweighing the risks of unintended negative consequences. There is considerable concern that a listing could result in increased illegal trade and hence reduced resources for population and fishery monitoring, market disruptions, and economic harm to artisanal and small-scale fishers. The Expert Panel recommends the prioritization of alternative conservation and management efforts, such as those proposed in the Draft Resolution on Trade, Conservation and Management of Anguillid Eel Species (CITES, 2025).

MAIN SUPPORTING INFORMATION

Section 1. Fishery, trade and utilization

1.1. Is the nature and scale of international trade well described?

Japanese eel and other look alike eels
Eel fisheries are especially active in China, Japan, the Philippines, the Republic of Korea, Taiwan Province of China, Viet Nam, and Indonesia, with Myanmar also contributing regionally. These fisheries range from small-scale artisanal operations to industrial aquaculture and commercial operations, reflecting a wide diversity in scale and management formality. Eel consumption in these countries is deeply rooted in cultural and culinary traditions.

Glass eel fisheries are especially active in countries such as China, Japan, Myanmar, the Philippines, the Republic of Korea, Taiwan Province of China, Viet Nam, and Indonesia, with additional contributions from the Americas, Africa, and some parts of Oceania. Nonetheless, it is confined to only specific regions. In eastern Asia, aquaculture-dependent markets, notably China and Japan, drive much of the international trade in glass eels, while tropical species are fished mostly locally for subsistence and small-scale export. This trade dynamic encompasses both subsistence fishing in developing regions and high-value, industrialscale eel farming in eastern Asia.

International trade in anguillid eels in Asia involves a geographically diverse network of fisheries, aquaculture operations and markets, primarily concentrated in eastern and southeastern Asia, but also linked to Europe and the Americas. Despite efforts to monitor and regulate eel trade, serious limitations remain in the availability, accuracy, and interpretation of international trade data. The proposal acknowledges that official data remain an estimation of the full scope of information required, with much information on informal trade (IUU) poorly undocumented. Measurement of the scale of IUU trade is difficult, as noted in the European Union where – over 15 years on from the inclusion of the European eel (*A. anguilla*) on Appendix II (zero quota) – illegal trade continues and remains largely unquantified.

Trade databases such as UN Comtrade (United Nations, 2025) infer eel species trade information based on country of origin rather than species-specific data, leading to overestimations or misclassification. This is of particular issue in southeastern Asia, where shipments may include non-*Anguilla* species. Additionally, discrepancies between export quotas and import records, such as those reported for American eel (*A. rostrata*) in eastern Asia, highlight unresolved inconsistencies in trade data reliability.

While the proposal emphasizes the difficulty of distinguishing between eel species in trade, especially at early life stages and in processed products, substantial evidence demonstrates that practical morphological identification methods are both feasible and routinely applied in East and Southeast Asian fisheries. A well-documented body of research (Tabeta *et al.*, 1976; Leander *et al.*, 2012; Silfvergrip, 2009; Watanabe *et al.*, 2004) has established reliable diagnostic characteristics, such as pigmentation patterns and fin position, that enable accurate differentiation of glass eels among anguillid species. In Japan's southern Kyushu region, for example, glass eel fisheries routinely separate *A. japonica* and *A. marmorata* by morphology prior to shipment, as the latter has a lower market value in aquaculture. In the Philippines, the process of species-level separation has already commenced at the fisher level, based on morphology (pigmentation patterns). This activity is crucial due to the fact that *A. bicolor pacifica* is priced at a rate that is approximately 60 percent higher than that of *A. marmorata*.

In China, the practical risk of species substitution in formal customs procedures is considered low due to distinct commercial origins, notable size differences between species, and the absence of market incentives for fraudulent mislabeling. Furthermore, molecular identification techniques are readily available when necessary, although regional management in eastern Asia often relies effectively on morphology-based identification combined with traceability systems.

American eel

A. rostrata is in high international demand as a food item. Aquaculture produces 88 percent of *Anguilla* products that are consumed, with the remainder provided by wild-caught harvest. The main market is in eastern Asia, especially China, which absorbs 86 percent of production. To date, no commercially viable method exists to complete the *Anguilla* life cycle in captivity. Aquaculture production therefore depends on wild-caught juvenile eels for seedstock. As the result of export restrictions on the European eel *A. anguilla* and the inability of the Japanese eel *A. japonica* to meet market demands, there has been increased demand for juvenile *A. rostrata* to supply Asian seedstock needs.

A. rostrata consists of a single panmictic population, with all spawning in the Sargasso Sea. Larvae migrate with the aid of ocean currents to continental rearing habitats that range from Greenland to northern South America. As they transit continental shelves, larvae metamorphose into transparent glass eels, which become pigmented elvers when they reach continental waters. Elvers transform into subadult yellow eels, which grow in a variety of habitats (sheltered coastal waters, estuaries, rivers, lakes, ponds) for up to 20 years or more. At the end of continental growth, yellow eels metamorphose into sexually maturing silver eels that migrate to the Sargasso Sea where they spawn and die.

Canada

Fisheries on young-of-year (glass eels and elvers) contribute most of the economic value of Canadian *A. rostrata* fisheries. These fisheries, operated by Indigenous and non-Indigenous harvesters, are concentrated on the Atlantic coast of Nova Scotia, and to a smaller extent on the Fundy coasts of Nova Scotia and New Brunswick. In recent years, undocumented fishing has become widespread, which precludes collection of reliable landings data. With high-values per kg, the elver fisheries provide substantial economic benefits to coastal communities.

Larger (yellow and silver) eels are commercially fished in the St. Lawrence River and Estuary and various coastal and estuarine locations in Newfoundland, New Brunswick, Prince Edward Island, and Nova Scotia. Market demand for these larger eels is weak, and effort restrictions are generally well respected. According to an industry source (M. Feigenbaum, personal communication, 22 July 2025), roughly half of Canadian and US yellow and silver eel landings are exported overseas, with the remainder serving Canadian and US markets. Indigenous Peoples in eastern Canada have longstanding close associations with *A. rostrata*, and fisheries for this species have high cultural value.

The United States of America

Young-of-year fishing is restricted to two US states (Maine and South Carolina), with the great majority of harvest occurring in Maine for export markets (all to eastern Asia). Yellow eels are harvested between Maine and Florida on the US East Coast, but fisheries are heavily concentrated in the mid-Atlantic region. Nearly all fisheries are in coastal and estuarine waters. Silver eel fisheries are prohibited by seasonal closures during outmigration; a small silver eel fishery in the Delaware River is an exception. There are no directed eel fisheries in US Gulf of Mexico drainages.

Caribbean

A. rostrata is widely distributed in the Caribbean Basin and adjacent Gulf of Mexico, on islands within this region and along mainland coasts of North, Central, and South America from Florida to close to the island of Trinidad (Benchetrit and McCleave, 2016). *A. rostrata* is not subject to directed fisheries in most of this region, although it may be incidentally caught and consumed in some countries, including Mexico (Gollock *et al.*, 2022).

Young-of-year *A. rostrata* are fished in Cuba, the Dominican Republic, Haiti, and Jamaica, using nets that intercept incoming juveniles (M. Feigenbaum, personal communication, 22 July 2025). The review of international trade in eels in Gollock *et al.* (2022) shows that Haiti and the Dominican Republic are the Caribbean region's key exporters of glass eels to East Asian aquaculture markets. Smaller quantities of glass eels are also harvested in Cuba and Jamaica. Actual landings and exports from the Caribbean region are uncertain due to misrepresentation of records and the fact that the international customs coding system is poorly suited to deal with *Anguilla* eels and their life stage categories. High imports of eels from the Americas reported in China, Hong Kong SAR customs records (Shiraishi and Kaifu, 2023) may have been at least in part other eel species whose containers were mislabeled to facilitate illegal entry into China (M. Feigenbaum, personal communication, 22 July 2025).

1.2. How significant is the threat of international trade to species in the wild?

Japanese eel and other look alike eels
When considering the likely effectiveness of a trade control on conservation of the species, it is critical to clarify the extent of trade-related impacts compared to other ecological and anthropogenic pressures impacting anguillid eel populations. Eel populations face multiple, interacting threats, including habitat degradation and loss from pollution, and climate change. While international trade can amplify fishing pressure, its relative contribution to overall extinction risk remains uncertain and species-specific.

The proposal overstates the role of trade by insufficiently considering other drivers of decline. For example, even in cases like the European eel (*Anguilla anguilla*), where illegal trade has been a concern, the extent and ecological consequence of these activities lack clear quantification in recent years. Moreover, without separating the effects of trade from environmental factors, it is difficult to determine whether trade regulation alone would meaningfully improve conservation outcomes for these species.

Trade patterns in eastern Asia differ significantly from the assumptions presented in the proposal, which risks mischaracterizing regional impacts on wild stocks. The proposal claims American eel (*A. rostrata*) imports into Chinese aquaculture match or exceed those of Japanese eel (*A. japonica*). While this is true for China alone, *A. japonica* remains the dominant farmed species across the broader East Asian market. Genetic and trade analyses (Shiraishi *et al.*, 2025) indicate that *A. japonica* accounts for the majority of eel products in Japan, with European eel virtually absent from the market:

- Japanese eel, *A. japonica* 61.7 percent;
- American eel, *A. rostrata* 36.8 percent; and
- European eel, *A. anguilla* 1.5 percent.

Furthermore, assertions of large-scale illegal trade in European eel lack recent, verifiable data. Customs records and informal consultations confirm that *A. anguilla* is essentially absent from East Asian markets, and no credible evidence of significant illegal imports has been documented. The absence of quantitative, geographically detailed data on illegal trade undermines claims about its ongoing significance and weakens the argument for genus-wide trade regulation.

American eel
To evaluate the threat of international trade to *A. rostrata*, we must first understand the threat of fisheries to *A. rostrata*. In most exploited fish stocks, fisheries are assumed to be the major or sole anthropogenic impactor. It is also assumed that all geographic components of the stock are subject to fisheries at some life stage. These assumptions do not apply to *A. rostrata*.

A. rostrata glass eel fisheries are concentrated in Nova Scotia, Canada; Maine, the United States of America; and four Caribbean islands (see below), leaving the great majority of the species range unfished. This suggests that young-of-year fisheries may have little impact on overall *A. rostrata* conservation, even if local fisheries have high exploitation rates.

A key ecological question is the effect of density on early mortality. If incoming glass eels arrive in numbers that exceed the carrying capacity of the receiving habitat, the surplus will die through density-dependent mortality. A test of such an effect exists in a study of a southern French lagoon, where densities of settled European eel elvers plateaued at about 400 individuals/ha, despite influx of glass eel in densities that were several orders of magnitude higher (Bevacqua *et al.* 2019). However, an important caveat to this study is that access to upstream habitat was blocked by barriers, contrary to the usual situation in most natural waters. The findings in this study suggest that in times and places of abundant glass eel recruitment it is plausible that fisheries have little conservation impact because they are removing surplus individuals that would die even in the absence of fisheries.

Fishery-independent surveys have shown that yellow eels are common and widely distributed in sheltered coastal waters of Atlantic Canada. However, detailed mapping of fishing locations indicates that eel fishing occurs only in a small fraction of this habitat (Cairns *et al.*, 2012). In the eastern United States of America, yellow eel fisheries are concentrated in mid-Atlantic states, leaving most eel habitat in other states subject to little or no fishing. Given that the great majority of habitat occupied by *A. rostrata* is unfished for eel, it seems unlikely that fisheries have a substantial impact on species conservation. This suggests in turn that harvests of *A. rostrata* destined for export are unlikely to have a substantial impact on species conservation.

In addition, *A. rostrata* is subject to habitat loss, introduced parasites, chemical contamination and other impactors. The relative importance of each of these factors and their synergistic effects is unknown.

1.3. What is the importance of the species in local livelihoods and economies?

Japanese eel and other look alike eels
Asian eel fisheries and trade hold significant economic and social importance for a wide range of stakeholders, from coastal fishing communities to large-scale aquaculture industries. *Anguilla* species play a critical role in supporting both cultural traditions and local livelihoods throughout Asia and for traditional communities in Oceania (including Australia and New Zealand). These species hold deep cultural significance, especially in countries with historic eel consumption practices. In regions such as Southeast Asia (also Africa and the Caribbean), glass eel fishing is a crucial source of income for artisanal fishers and supports local livelihoods. Collaborative management efforts, including ongoing informal consultations among key stakeholders, further support sustainable trade and conservation, as discussed in later sections.

In East Asian consumer countries like Japan, eel consumption is deeply embedded in culinary traditions, creating a lucrative aquaculture and processing industry. In China, seasonal glass eel fisheries in coastal provinces like Fujian and Guangdong provide vital income for rural communities and support extensive aquaculture operations. The same situation is occurring in Indonesia, Myanmar, the Philippines and Viet Nam, where glass eel fisheries make a substantial contribution to monthly income. Eel fisheries are also of significant social and cultural significance to local communities, with women playing a significant role in the supply chain.

Countries such as China, Japan and the Republic of Korea sustain large aquaculture operations that rely on imported and locally caught eel fry. Indonesia, Myanmar, New Zealand, the Philippines and Viet Nam also have substantial eel fisheries that are traded internationally. The proposal does not fully acknowledge the practical application of morphological identification methods that enable effective trade monitoring and support the economic stability of fishing communities while aligning with regulatory requirements.

American eel
Indigenous Peoples in eastern Canada have longstanding close associations with *A. rostrata*, and fisheries for this species have high cultural value. Glass eel fisheries have high-value and substantially benefit livelihoods and economies in regions where fisheries take place. In Canada these benefits flow to Indigenous and non-Indigenous harvesters both licensed and unlicensed. Because some of the harvest occurs without authorization by either the

Government of Canada or by Indigenous groups, it is not possible to quantify economic benefits by fishing sector. In Canada, yellow and silver eel fisheries are generally secondary sources of income for fishers.

In the United States of America, the Maine elver fishery is highly valuable, with an average value of USD 17 million for 2021–2024. Maine's elver fishery has over 1 100 participants, approximately 700 of whom are members of the state's four Wabanaki Tribes (P. Keliher, personal communication, 20 June 2024). The average market price exceeds USD 2 200/kg, with peaks exceeding USD 4 400/kg (ASMFC 2023), which can be a significant contribution to coastal livelihoods. *A. rostrata* aquaculture has been practiced in Maine since 2019 by a single company, American Unagi. The company is dependent on the Maine elver fishery for stock, buying eel directly from local harvesters for captive grow-out.

While information is limited, existing reports and data suggest that Caribbean eel fisheries are important to local economies. Glass eel fisheries in the Caribbean are small-scale, localized, and have a high economic value to fishers. The Dominican Republic requires that eel fishers reside in the areas where the fish are harvested so that fishing incomes support local economies (Marcano, 2021). In Haiti, economic benefits cannot be readily quantified, but are likely high.

Section 2. Inherent biological productivity

2.1. Are inherent biological traits relevant to the species' productivity and resilience well described?

Japanese eel and other look alike eels

The proposal partially addresses traits relevant to productivity but focuses primarily on natural mortality (*M*) for temperate species, without adequately incorporating other essential parameters such as population intrinsic growth rate (*r*), individual growth coefficient (*k*), age at maturity (t_{mat}), maximum age (t_{max}), and population generation length (*GL*). Comprehensive inclusion of these traits is necessary to accurately reflect inherent productivity and resilience. According to Annex 5 of Resolution Conf. 9.24 (Rev. CoP17), productivity assessments require integration of multiple biological parameters. The proposal's limited scope in this regard reduces the robustness of its conclusions about species productivity and management implications. Focusing mainly on natural mortality (*M*) overlooks the complicated interaction among life history traits that shape maximum growth rate and resilience.

American eel

CITES defines productivity as the maximum percentage growth rate of a population. Productivity is not a direct criterion for CITES listing eligibility, serving instead to modulate application of the "Decline" criterion.

The proposal used two estimates of *M*, the first derived from maximum age by an unspecified method and the second calculated by European temperature-dependent formula, to infer productivity (Table 19). The Expert Panel reviewed alternate methods of estimating *M* (Kenchington, 2014). However, these methods may have little value for eels because they are based on typical teleost fishes, whose life history characteristics differ markedly from the semelparous breeding systems and catadromous migrations of anguillid eels. FAO (2007) considered average age at maturity to be the best basis for assessing productivity for the European eel. This inference is also weak, likewise because it is based on considerations of typical teleost fish (Musick, 1999; FAO, 2001). Catch curve analysis can be used to calculate the rate at which eels are lost from a population, but these losses include emigration of silver eels to the spawning ground and are therefore not equivalent to natural mortality (Cairns *et al.*, 2013).

The intrinsic rate of population increase (r), and K, a parameter of the von Bertalanffy growth model, can also be used to infer productivities. However, silvering and departure of eel for the spawning ground is associated with attainment of a size threshold, meaning that slow-growing eels remain in the local population for a long time. As length-at-age sampling is altered by slow-growing eels remaining and fastgrowing eels emigrating early, field samples can yield an unbalanced sample composition, and as such von Bertalanffy parameters calculated from length at age plots do not represent the population that a habitat produces (Daverat *et al.*, 2012).

Time to maturity (t_{mat}) for American eels can be calculated as the sum of the duration of larval migration to continental rearing habitats (9–12 months), continental age at silvering emigration (12.9 years for females, 10.9 years for males; Jessop, 2010), and duration of oceanic migration of silver eels (about 3 months). This gives a mean t_{mat} of approximately 14 years for females and approximately 12 years for males (Table 19). In semelparous species, t_{mat} and generation length are the same; hence generation length is also approximately 14 years for females and approximately 12 years for males. Maximum age (t_{max}) is used in some mortality estimators. However, t_{max} is hard to firmly establish because the maximum value within a sample tends to increase with sample size.

Anguillid eels are obligate semelparous spawners, a life history pattern shared with relatively few other fishes. For semelparous fish, annual mortality does not determine the number of spawners available to contribute to annual reproduction, because there is no annual reproduction. Instead, cumulative mortality up to the age of spawning determines the number of fish available to reproduce. This cumulative mortality can be calculated for a stable population, with simplifying assumptions, from fecundity as 0.9999997 (arithmetic measure) (Table 19). However, there is no body of theory which enables a value of this type to infer productivity.

2.2. *Is the species' inherent productivity appropriately categorized (low, medium, high) for the purpose of applying the CITES biological listing criteria?*

Japanese eel and other look alike eels

The proposal listed *A. japonica* corresponding to medium to high productivity during continental life stages (Lin and Sun, 2013). The panel conservatively categorized *A. japonica* as medium productivity.

Evaluation of inherent productivity based on best available information reveals the limitation of relying on natural mortality (M) alone to categorize species productivity. While M is an important factor, it alone does not fully capture productivity because productivity results from the combined effect of a large number of traits. Thus, relying solely on M to assess productivity is insufficient and can be misleading, especially for species with complex life histories and broad geographic ranges such as anguillid eels.

However, despite these limitations, the precedent set by previous CITES listings, including the case of the European eel (*A. anguilla*), has been to categorize productivity primarily based on M values, due to the practical challenges in obtaining comprehensive life history data for eel. Therefore, following this established approach, we apply M based evaluation cautiously to *A. japonica*, *A. marmorata*, *A. bicolor pacifica*, and *A. bicolor bicolor* while recognizing it as an approximation (Table 20).

American eel

The Expert Panel assigned productivity from vital rates for American eels, taking into account FAO and CITES advice (Table 19). Natural mortalities from Fisheries and Oceans Canada

(FOC, 2013) correspond with either low (cool northern part of eastern North America) or medium (warm southern part of eastern North America) productivities. CoP20 Proposal 35 suggested that American eels have low or medium productivity, based on reported natural mortalities, yet measurements of American eel annual natural mortality are unavailable.

Values of t_{mat}, t_{max}, and generation length correspond with low productivities. On the basis of these two approaches, the best estimate of American eel productivity is that it is low or perhaps medium in North America. The analysis of FOC (2013) did not extend to the Caribbean, but it is likely that warmer waters there would influence the Bevacqua (2011) model to estimate productivities corresponding to medium or high productivity.

Section 3. Evaluation of species status and trends in relation to CITES criteria

3.1. In application of the CITES biological listing criteria is the best available status and trend information considered, and is it sufficient to support a confident and well-substantiated determination?

Japanese eel and other look alike eels
The Expert Panel argues available data are insufficiently incorporated in the proposal to support a confident and well-substantiated determination under the CITES biological listing criteria for *A. japonica*. While some older assessments are referenced, the proposal omits key, publicly available and more recent information – such as the official stock status report in Japan (Hakoyama *et al.* 2025), quantitative extinction risk assessments, and updated estimates of effective population size (Ne) that were accessible at the time of submission.

This incomplete treatment of critical evidence compromises the credibility and balance of the proposal's conclusions. A scientifically robust evaluation requires integrating these findings to accurately assess population trends, extinction risks, and the role of international trade in the species' status.

Comprehensive stock assessments by Tanaka (2014, 2025) indicate that the Japanese eel (*A. japonica*) population does not meet the listing criteria for a medium productivity species under CITES criteria, as it is currently at approximately 22–24 percent of its carrying capacity, and showing signs of recovery since 1990.

Tanaka's (2014, 2025) assessments integrated extensive data from East Asia, including China, Japan, the Republic of Korea, and Taiwan Province of China, and employed age and sex-structured models along with the Beverton–Holt stock–recruitment relationship (Tanaka, 2014, 2025). The estimated exploitable stock was 18 700 tonnes in 2010 (about 24 percent of carrying capacity) and 17 000 tonnes in 2023 (about 22 percent of carrying capacity), with calculated maximum sustainable yields also shown (Tanaka, 2025).

However, the EU proposal dismisses these robust, regionally integrated stock assessments in favor of less extensive, localized critiques based primarily on Kaifu and Yokouchi (2019), which have been shown to suffer from insufficient statistical analysis and do not adequately account for stock enhancement effects (Kaifu *et al.*, 2018). This selective reliance undermines the scientific rigor and reliability of the proposal's conclusions regarding extinction risk for *A. japonica*.

The Expert Panel considers that the fisheries data are poorly represented. Catch data, despite inherent limitations, have been systematically collected for decades and provide valuable information on stock trends for *A. japonica* (Hakoyama *et al.*, 2016), forming the foundation of assessments such as the IUCN Red List. Many of the nuances in these data are poorly understood or analyzed in the proposal.

The Expert Panel notes serious gaps in baseline data for several *Anguilla* species, particularly tropical species that undermines the case for a genus-wide listing. Current knowledge of distribution, abundance, and population dynamics for many tropical *Anguilla* species is sparse, based on scattered regional surveys. The most urgent conservation priority is therefore to conduct systematic, science-based stock assessments prior to considering CITES listings.

The proposal relies heavily on aggregation of catch weights that are incomparable, without sufficiently addressing data quality issues and structural biases within these data sets. To make such comparisons of catches across time the proposal fails to address differences in the data compared. For example, cessation of reporting from key prefectures like Ibaraki, Japan, (Tonegawa River) since the 1960s introduces significant gaps and potential overestimation of declines when data are uncritically combined – comparing earlier inshore catch weights of elvers and glass eels with later catches of data comprising glass eels alone and giving the impression of declines (Figure 10).

Furthermore, the proposal does not consider recent more comprehensive fisheries data assessments, including updated stock status reports and stock enhancement effects, which are crucial for an accurate evaluation of population trends. The oversimplification and selective use of fisheries data weakens the proposal's conclusions and risks misrepresenting the true conservation status of the species.

The proposal ignores scientific assessments of effective population size (N_e) of *A. japonica* that provide critical understanding of extinction risk. Recent quantitative extinction risk assessments suggest that current population trends alone do not indicate a high probability of extinction for *A. japonica* within ecologically relevant timeframes. The effective population size (N_e) of *A. japonica* is assessed as sufficiently large from a conservation biology perspective to avoid immediate risks of genetic depletion of the species, and this critical information is omitted from the proposal.

Extinction risk depends on multiple factors, including population size, growth rate, environmental stochasticity, and carrying capacity (Lande and Orzack, 1988; Dennis, Munholland and Scott, 1991; Hakoyama and Iwasa, 2000), not on population declines alone. Importantly, for large populations, extinction risk tends to be overestimated if assessed solely based on rates of decline, as even substantial proportional reductions may still leave a demographically viable stock over relevant timeframes.

Notably, recent analyses by Hakoyama (forthcoming, see Hakoyama *et al.*, 2025), applying Criterion E of IUCN Red List assessment methodology concludes that *A. japonica* does not currently meet Red List thresholds for Endangered or Critically Endangered status. Although still under preparation, these findings have been acknowledged in the latest official stock status report of Japan (Hakoyama *et al.*, 2025) and should have been considered in the proposal's assessment of the species' vulnerability.

Recent studies using both microsatellite and single nucleotide polymorphisms (SNP) data have produced important new estimates of N_e for *A. japonica*. Earlier microsatellite-based studies estimated N_e values ranging from 400–600 to 4 000–6 000 (Han *et al.*, 2008; Takeuchi *et al.*, 2022; Tseng *et al.*, 2003). More importantly, Sekino *et al.* (forthcoming) applied linkage disequilibrium methods to SNP data and estimated N_e for each year from 2019 to 2023. Across all years, the estimates consistently indicated N_e values of approximately 20 000, a size widely regarded in conservation biology as sufficient to prevent immediate genetic threats such as inbreeding depression or loss of adaptive potential. These findings, acknowledged in Japan's official stock status report (Hakoyama *et al.*, 2025), are essential for evaluating long-term population viability and should have been incorporated in the proposal's assessment.

The proposal also presents weak evidence to link trade to eel population declines in *Anguilla* species. CITES is a trade control mechanism, and therefore listing of a species on Appendix II is proposed to put in such controls to protect species in the wild. Yet the proposal fails to offer robust evidence demonstrating a clear, documented link between trade and stock decline.

The failure of the *A. anguilla* population, now over 15 years listed in CITES, to recover despite strict trade restrictions suggests that unaddressed factors, including habitat loss, climate change and overfishing, are primary drivers of decline.

American eel
The proposal did not consider the United States Fish and Wildlife Service Endangered Species Act review (USFWS, 2015), nor consult regional experts within the *A. rostrata* range. This weakens the proposal's conclusions and its request for Appendix II listing. Based on current scientific evidence and CITES Resolution Conf. 9.24 (CoP17) Annex 5 criteria, *A. rostrata* does not meet the biological thresholds for listing in Appendix II. Given that *A. rostrata* abundance trends do not meet the productivity-specific decline thresholds for Canada and the United States of America – and that there is limited information available from the Caribbean, Central America and Mexico – conclusive assessments are not possible at this time.

The Expert Panel considered that the population in the central US Atlantic coast is stable, well managed, and that habitat improvements (e.g. dam removals) are being made to restore historic areas. *A. rostrata* is a resilient species and the Expert Panel assesses that the risk is low for species extinction or decline in population.

A. rostrata was designated a species of Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 2006). The status was redesignated as Threatened in May 2012 (COSEWIC, 2012), but has not yet received protection under Schedule 1 of the federal Species at Risk Act (SARA). The United States Fish and Wildlife Service (USFWS) has evaluated the American eel's status under the Endangered Species Act (ESA) on multiple occasions, most recently in 2007 and 2015 (USFWS, 2007, 2015). In both instances they concluded that listing was not warranted.

In the United States, the most recent stock assessment in 2023 (ASMFC, 2023) considered the population depleted. This means the population is below levels considered healthy, with abundance indices showing declines particularly during the 1980s and early 1990s. While some areas show stable or slightly increasing numbers, the overall trend remains negative. The depleted stock status recognizes that the stock is at or near historically low levels due to a combination of factors including historical overfishing, habitat loss, food web alterations, predation, turbine mortality, environmental changes, toxins and contaminants, and disease but it is uncertain if fishing mortality or other factors are the primary cause for reduced stock size (ASMFC, 2023).

3.2. Does the scientific data and technical information on historical extent of decline and the recent rate of decline in conjunction (Appendix II), meet the CITES biological listing criteria?

Japanese eel and other look alike eels
Based on current scientific evidence and CITES Resolution Conf. 9.24 (CoP17) Annex 5 criteria, *A. japonica* and related species do not meet the biological thresholds for listing in Appendix II. Their inherent productivity, stock assessments above critical thresholds, and sufficiently large effective population size – along with the lack of demonstrated causal links between international trade and population decline – collectively support this assessment.

A. japonica, being medium productivity species of large population size that is not subject to fragmentation[1] have the capacity for population growth and recovery. The species does not meet the biological criteria thresholds defined to advise parties on eligibility for listing in Appendix II.

Stock assessments indicate population not meeting critical thresholds for Appendix II listing
Comprehensive stock assessments (Tanaka, 2014, 2025) demonstrate that *A. japonica* populations currently reside at approximately 22–24 percent of carrying capacity, which is well above the precautionary thresholds defined in Annex 5 of CITES Resolution Conf. 9.24 (CoP17). Given the medium inherent productivity of the species, the observed stock levels and signs of recovery since 1990 indicate that the population does not meet the abundance or decline criteria defined to advise parties on eligibility for listing in Appendix II.

Effective population size (N_e) and extinction risk studies supports stock assessment advice on the species not meeting thresholds for Appendix II listing
The effective population size (N_e) of *A. japonica* and related species is sufficiently large to indicate low immediate genetic risk and therefore does not support inclusion in CITES Appendix II (see Section 3.1, p. 113). Current quantitative assessments of extinction risk for *A. japonica* indicate that population declines do not translate into a high probability of extinction within ecologically relevant timeframes. Therefore, these findings do not support the species' inclusion in CITES Appendix II (see Section 3.1, p. 113).

Lack of demonstrated link between international trade and population decline undermines arguments for Appendix II listing
A fundamental reason for listing species in Appendix II under Annex 5 of CITES Resolution Conf. 9.24 (CoP17) is to decrease extinction risk of trade on species in the wild. The proposal presents no clear and quantifiable causal relationship between international trade and population decline. For *A. japonica* (and other *Anguilla* species including *A. bicolor pacifica*, *A. anguilla*, *A. rostrata*, *A. marmorata* and *A. mossambica*) the available scientific and trade data fail to show this relationship as causal.

While some data indicate population declines, the overall evidence lacks completeness, suffers from unreliable trend analyses, and does not establish a definitive causal link to international trade. Moreover, the quality and resolution of trade data remain questionable, making accurate quantification of trade impacts on wild populations problematic. Consequently, based on the thresholds and requirements specified in Annex 5, the case for an Appendix II listing for these species is not supported by the current body of evidence.

American eel
Resolution Conference 9.24, Revision CoP17, Criteria for Amendment of Appendices I and II states "A general guideline for a marked historical extent of decline is a percentage decline to 5%–30% of the baseline, depending on the biology and productivity of the species" (p. 9). Specific guidelines are supplied for commercially exploited aquatic species: "In marine and large freshwater bodies, a narrower range of 15–20 percent for species with low productivity" (p. 9), which is used by the Expert Panel for *A. rostrata*, although medium or high productivities are plausible in the southern portions of its range (Section 2).

All available *A. rostrata* abundance series are from the Atlantic coasts and drainages of Canada and the United States of America. This area is only 20.5 percent of the plausible range of the species (Cairns *et al.*, 2022), which is a major constraint to understanding the population status of the species as a whole. The plausible historic continental range of

[1] Taxon not found in small and relatively isolated subpopulations, which decreases the probability that these subpopulations will become extinct or that there are few opportunities for reestablishment.

A. rostrata is 8.5 million km^2(Cairns *et al.*, 2022). Comparison of the plausible historic range with the extant range (Pike *et al.*, 2023) shows range shrinkage. However, the extant range continues to be much more than 50 percent of the area of the plausible historic range.

Canada
Canadian *A. rostrata* indicators of eel status declined severely (> 95 percent) in the upper St. Lawrence River area in the 1980s and have not since recovered (Cairns *et al.*, 2020; *Cornic et al.*, 2021). However, indices based on silver eel egress through the St. Lawrence estuary have declined less, approximately 70 percent. These silver eel indices reflect production from the entire St. Lawrence system. This suggests that *A. rostrata* abundance in the St. Lawrence system has not declined to the point that it meets the baseline threshold criterion for species of low productivity.

Elsewhere in Canada, abundance trends are mixed, with declining indices more numerous than increasing ones. However, current overall levels of long-term abundance indicators do not meet the baseline threshold criterion for species of low productivity. For recent rates of decline, abundance indicators have not declined to the point that they meet the 50 percent of baseline criterion.

United States of America
Population trends are mixed but with an overall declining trend, and current abundance is the lowest in the monitored series (ASMFC, 2023). The yellow eel abundance index for the US portion of the population indicates recent declines of over 50 percent (ASMFC, 2023). However, there is insufficient data through *A. rostrata's* range to meet a threshold. The USFWS's ESA evaluation and the ASMFC (2023) stock assessment do not indicate risks of further population decline or extinction, including from illegal trade. Overall, the Expert Panel found that abundance trends have not fallen below the baseline threshold criterion for species of low productivity.

It is possible that eels in the southern United States of America and the Caribbean are in the medium or even high productivity category. In such cases, the threshold criteria are less stringent and the Expert Panel considers these criteria are also not met.

3.3. What additional factors (e.g., vulnerability or resilience) should be considered in evaluating the species against the CITES biological listing criteria?

Japanese eel and other look alike eels
Species-specific "Vulnerability" and "Resilience" factors can weaken or strengthen a species. On vulnerability, data gaps and need for improved scientific knowledge are recognized factors adding to uncertainty in management. Persistent data gaps, especially regarding trade volumes and population dynamics of tropical species, underscore the need for improved scientific knowledge before considering broad regulatory measures. Proceeding without this foundation challenges countries ability to run an effective Non-Detrimental Finding process, and risks implementing ineffective or unnecessarily restrictive regulations, including formal bans whilst informal trade continues.

Conversely, considering the factors improving resilience one must acknowledge the extensive riverine environment in Japan that provides habitat for *A. japonica* – approximately 14 000 rivers, and around 1 500 km^2 of wetlands, which include marshes, swamps, peatlands and riverine wetlands. This includes 53 wetlands designated as Ramsar Sites, and 59 riverine surfaces designated as protected under the Protection of Fishery Resources Act, covering a total length of 2 303 kilometers. Since 2006, continuous efforts have been made for the purpose of the creation and conservation of a favorable riverine environment, based on the concept of "Nature-oriented river works" representing conservation and regeneration of the environment as habitat, growing and spawning grounds that rivers intrinsically have, which has become a basic idea for management of a river. This includes a number of prefectures which prohibit the catch of silver eel, which is increasing.

The establishment of effective regional management mechanisms and measures offers further resilience to management and conservation of Asian eels. Ongoing effective regional management measures – such as fishing licences in China and Indonesia, moratoriums in Japan and New Zealand, fish passages in Indonesia, New Zealand, the Republic of Korea and Viet Nam, and multilateral cooperation on fry management – play a significant role in promoting species resilience and sustainable use. The bodies benefit from recent scientific collaborations and assessments. Importantly, recent quantitative extinction risk analyses, updated effective population size (N_e) estimates, and the practical use of morphological identification in glass eel trade provide critical information omitted from the proposal. Incorporating these factors is vital for a balanced and evidence-based assessment of extinction risk, resilience, and population viability.

In control of aquaculture, Japan's use of eels is subject to licences and the duration of fishing season is limited. Since June 2015, the licensing system was introduced to eel aquaculture, under the Inland Water Fishery Promotion Act. Such controls implement severe penalties for noncompliance by aquaculture operations (without licences or exceeding individual quota of eel) including imprisonment of up to 3 years or fine up to JPY 2 million.

American eel
A range of factors may affect the risk of extinction or offer resilience to *A. rostrata* and other anguillid eels.

Vulnerability factors:

- Environmentally influenced sex determination in *A. rostrata* can create altered or skewed sex ratios, potentially influencing reproductive capacity (Oliveira, 1999; Jellyman, 2022).
- Depensation (proneness to continuing decline even in the absence of exploitation). Long-term shifts in ocean current and temperature may reduce *A. rostrata* larval survival or transport to coastal recruitment on the scale of decades or longer (Miller *et al.*, 2009).
- Direct mortality or injury from water intake impingement and hydroturbine passage, and migratory delays (Haro *et al.*, 2000). Filling, dredging, erosion, contamination, eutrophication or other alterations of habitats (coastal estuaries, rivers, stream, and lakes) reduce habitat quality and quantity for American eel (Haro *et al.*, 2000; Verreault *et al.*, 2004). Freshwater habitat degradation resulting in reduced food productivity increases mortality of the freshwater life stages (ASMFC 2023), plus behavioural factors due to exclusion from upstream habitats by tidal and riverine barriers (Haro *et al.*, 2000; Williamson *et al.*, 2023).
- Habitat fragmentation by dams, tidal barriers, road crossings, and other anthropogenic barriers can limit access of American eel to upstream habitat (Haro *et al.*, 2000; Verreault *et al.*, 2004; Haro, 2014). Eels that are unsuccessful in passing a barrier may experience higher densities below barriers and thus increased competition (lower growth rate or survival) and predation. Downstream migration in eels is at particular risk due to water intake screen impingement and turbine mortality and injury (Drouineau *et al.*, 2018, ASMFC 2023). Dams may also limit or delay downstream movements of spawning adults (Mensinger *et al.*, 2021).
- Threats from disease and parasitism: No records of OIEreportable diseases (World Organisation for Animal Health; WOAH) were reported for *A. rostrata* in 2020 (USFWS, 2020). American eels are potentially susceptible to finfish diseases listed by WOAH, including viral haemorrhagic septicaemia (VHS), infectious

pancreatic necrosis (IPN), Anguillid herpesvirus 1 (AngHV1), Eel Virus European (EVE), and parasitic infections. Threats from an exotic swim bladder nematode, *Anguillicoloides crassus*, reduces fitness and survival in the American eel and perhaps ability to regulate buoyancy and successfully migrate to the Sargasso Sea (Myrenås *et al.*, 2023). Exotic trematodes and other nonnative diseases are known to infect American eels in Chesapeake Bay (Kohli, 2023).

- Rapid environmental change (e.g. climate regime shifts) and stochastic events: Altered ocean currents and temperatures can affect dispersal and survival of American eel larvae (Miller *et al.*, 2009). Outmigration and survival of adult downstream migrant eels may also be affected by alterations in climate that affect precipitation and flow regimes (Drouineau *et al.*, 2018). Stochastic meteorological or oceanic events (e.g. drought, flood, cyclones) may effect eels, but likely only at local and short-term levels. American eels can tolerate periodic episodes of low dissolved oxygen and high carbon dioxide levels and can use soft substrates to burrow and survive short-term drought and freezing events (Williamson *et al.*, 2023).
- Environmental contaminants may affect the fitness of anguillid eels by impairing their ability to complete their life cycle, including their ability to swim, accumulate energy reserves, develop healthy oocytes, and reproduce (Belpaire *et al.*, 2019). American eels are particularly prone to accumulating and biomagnifying lipophilic and persistent organic pollutants and other chemicals of concern (Ashley *et al.*, 2007), but body burdens of contaminants vary widely depending on local levels of contamination. Contaminants could be a key factor in the decline of temperate eels on global scale (Castonguay *et al.*, 1994, Righton *et al.*, 2021). American eels that are heavily contaminated with chemicals may experience increased incidence of diseases and reproductive impairment (Couillard *et al.*, 1997).

Resiliency factors:

- Panmixia and broad geographic distribution, as American eel is a single genetic stock with low genetic differentiation (Côté *et al.*, 2012). The species is also widely distributed over most of eastern North America, Central America, the Caribbean, and northern South America. Panmixia and wide distribution make the species less sensitive to local effects on mortality, although large-scale environmental effects – e.g. North Atlantic Oscillation (Miller *et al.*, 2009), climate change (Williamson *et al.*, 2023) – may contribute significantly to population variability.
- Eels have a generalist behavior and habitat. American eels exhibit highly generalist habits in behavior, diet, and habitats, and may be one of the most generalist of fishes (Williamson *et al.*, 2023, Helfman *et al.*, 1987). Adaptability to almost all types of aquatic habitats and ability to accept a wide variety of prey allows the species to exploit multiple habitat types and be resilient to impacts to habitat quality, contributing to survival.

Section 4. Management, conservation and potential impact of listing

4.1. Are national or regional management measures currently in place to conserve the species well described in the proposal

Japanese eel and other look alike eels

Existing national and regional management measures are sufficient for conservation of *Anguilla* species. Comprehensive, operational, and demonstrably effective management mechanisms are in place providing substantial conservation benefit. Each country recognizes the significant socioeconomic value of eel species, particularly in terms of livelihoods and local economies, thus emphasizing the importance of effective management and sustainable utilization.

Eel management efforts have taken various forms, including protection measures – such as fishing bans in natural habitats and habitat restoration through the construction of fishways – as implemented in countries like China, Indonesia and New Zealand (Government of Sukabumi Regency, 2023; Franklin *et al.*, 2018).

China has put in place specific measures to protect eel resources. Since around 2020, a 10-year fishing ban has been implemented in the Yangtze River, along with the creation of special control zones at its estuary. These efforts have played an important role in conserving eel fry (Xie *et al.*, 2022). In addition, China manages the import and export of aquatic fry through a strict approval system. This includes licence reviews, quarantine checks, standardized labeling, and export certification (MARA, 2020; GACC, 2021). The government also has the authority to apply specific trade bans or restrictions when needed to protect the species and ensure responsible trade.

Specific regulatory actions including Indonesia's eel management plan under a Ministerial Decree, puts in place export bans on glass eels and restrictions on harvest of adult eel (MMAF, 2012). In addition, eel fishing in Indonesia now requires a quota licence (payment online by system), and the movement of eel materials must be approved through a special permit (SAJI), which can only be issued after obtaining the quota licence (Government of Indonesia, 2021a, 2021b). Japan, on the other hand, regularly updates its national data and stock assessments and has recently submitted a new stock evaluation (Tanaka, 2025).

In eastern Asia, China regulates glass eel fishing and trade through licensing systems, while Japan enforces quotas on eel fry aquaculture, size limits and fishing moratoriums. The Republic of Korea applies dual-licensing for fishing and aquaculture, enforces size restrictions, and undertakes stock enhancement activities. Tropical and Oceania regions have similarly targeted measures, including size and export restrictions in Indonesia and the Philippines, juvenile fishing restrictions in Australia, and quota management in New Zealand.

China's recent 10-year fishing ban in the Yangtze River Basin and establishment of controlled zones at the river's estuary are major conservation interventions with direct relevance to eel recruitment and international trade. Additionally, China's rigorous approval and traceability systems for aquatic fry, including licence reviews, quarantine, labeling standards, and trade restrictions, form a robust framework ensuring sustainable trade and disease prevention.

Well-developed spatial and seasonal fishing bans, licensing systems, traceability programs, habitat restoration initiatives, and enforcement mechanisms are actively implemented across key range states. The proposal's omissions and selective presentation obscure the reality and effectiveness of these efforts.

Regional management frameworks for anguillid eels are extensive and cover major distribution areas. Data standardization has been fostered through platforms for knowledge sharing and policy dialogue which are supported through regional forums, such as the Southeast Asian Fisheries Development Center (SEAFDEC), which facilitate collective learning and adaptive management strategies for eel conservation across Southeast Asia.

The proposal inaccurately portrays compliance and management in Japan, the Republic of Korea, and Taiwan Province of China. The proposal misrepresents the extent and consistency of fisheries management and compliance measures implemented in Japan, the Republic of Korea , and Taiwan Province of China by selectively omitting key, ongoing conservation actions. Contrary to the proposal's implication of weak or fragmented enforcement, these countries maintain comprehensive regulatory frameworks including seasonal and spatial fishing bans, minimum size limits, aquaculture licensing systems, stock enhancement programs, and trade volume restrictions for glass eel fry. These measures are actively enforced, publicly documented, and have contributed to regional population stabilization. In addition, the proposal fails to acknowledge well-established informal cooperative mechanisms among these countries, which coordinate the annual volume of Japanese eel fry entering aquaculture facilities through joint consultations and voluntary quotas. These mechanisms have demonstrably reduced harvest pressure and improved stock management outcomes.

Furthermore, the proposal omits the practical and routine application of morphological identification techniques for glass eel species, as well as traceability and certification systems for fry consignments. The exclusion of these measures results in an incomplete and unbalanced representation of conservation capacity and regulatory compliance in eastern Asia, weakening the justification for a genus-wide CITES listing.

American eel
Canada
Yellow and silver eel fisheries in Canada are regulated by effort restrictions. Quotas have been issued to manage glass eel and elver fisheries, but these measures may have limited effect due to unregulated harvest. Citing its inability to manage the fishery in an orderly manner, the Government of Canada ordered closures of all elver fisheries in 2020, 2023 and 2024, although unauthorized fisheries continued to an unknown extent. In 2025, a requirement for separate licences to possess and export elvers was imposed and an electronic catch traceability system was implemented. These measures appear to be having beneficial effects.

Conditions of possession licences include requirements to specify the location of holding facilities, label all shipment, and notify FOC before in addition to report to FOC after all transfers in and out of holding facilities, including transfers for export.

Efforts have been made to remediate the collapse of *A. rostrata* in the upper St. Lawrence River by introducing wild-caught elvers from the Atlantic coast. However, the advisability of these transfers has been called into question after they accidentally introduced the *Anguillicoloides crassus* parasite into receiving waters. Silvering eels have been trapped above major St. Lawrence River dams and released below them as a measure to avoid turbine mortality.

United States of America
The proposal broadly describes *A. rostrata* fishery management in the United States, but omits details on the conservation measures in place. In addition to the coastwide quota for yellow eel harvest and the Maine state quota for glass eel harvest mentioned in the proposal, the 15 Atlantic coastal states are required to implement and comply with measures under the ASMFC Interstate Fishery Management Plan (FMP) for American Eel and its Addenda (I–VII). The Commission's management program for American Eel includes measures to control fishing mortality in commercial and recreational fisheries with regulations for all eel life stages. For glass eel there are only two states with fisheries: South Carolina harvests no more than 341 kg annually and Maine has an annual quota of 4 394 kg. For yellow eel, the following measures are required in addition to the coastwide quota: a 229 mm minimum size limit for recreational and commercial fisheries, a 12.7 mm^2 minimum mesh size for eel pots, a 25fish recreational bag limit and a bait limit of 50 eels/day for party or charter boat captain and crew, and measures to restrict the development of fisheries on pigmented eels. Except for nine permit holders in the Delaware River weir fishery, no take of eel is allowed from any gear type other than baited traps and pots, or spears from September 1 to December 31 to protect silver eel as they migrate to the ocean to spawn.

Annually, ASMFC reviews each state's eel fishery, including state regulations, commercial and recreational landings, trends in fishery-independent data, enforcement issues, and research. This annual review allows the Commission to ensure state compliance with the FMP (including quotas), detect changes in the fishery or resource, and respond in a timely manner if necessary.

In addition to biological measures to protect American eel at its different life stages, the Commission's FMP requires states to collect fishery-dependent and independent data. States with a declared interest in the fishery must conduct a young-of-year survey to monitor annual recruitment each year and some states also conduct yellow eel surveys. Because Maine has a glass eel fishery that harvests more than 341 kg, it is required to conduct a fishery-independent life cycle survey of the glass, yellow and silver eel life stages within at least one river system. Trip-level harvest reporting is required for the commercial fishery and dealer transaction reporting is required.

The Maine glass eel (elver) fishery has been managed under an annual quota established by ASMFC since 2014. The Expert Panel notes that the proposal is incorrect in stating that the Maine elver quota was exceeded in 2023 and 2024. The landings values provided include the quota for domestic aquaculture which is not part of the quota for export fisheries. Maine implemented an individual quota system for state licence holders, calculated based on harvester reported landings during the 2011, 2012 and 2013 seasons. Beginning in 2013 the individual quota system was monitored using a "swipe" card. The swipe card system was created to enable Maine to monitor the state's overall elver quota as well as the individual fishing quota of harvesters. The system was designed to allow dealers to enter data daily and allow Maine Department of Marine Resources (ME DMR) staff to analyze that data within 24 hours of receipt. In 2024, Maine implemented elver reporting using an NFC token or QR code. This technology utilizes electronic reporting through the VESL app on harvester's phones. The transition to the app allowed the ME DMR Landings Program to align elver reporting with other state commercial fisheries which require state harvester reports. All functionality developed through the swipe card system remains under this new technology. Harvester sales are checked daily against their quota, and when the harvester's quota is reached or exceeded, their token is deactivated by ME DMR Landings Program staff.

Each elver dealer has a phone or tablet that can read NFC technology for the permanent facility, as well as all vehicles used to transport elvers. Dealers are required to submit transaction reports (including negative reports) by 14:00 each day of the elver season (22 March–7 June). If dealers are delinquent with two days' worth of reports, the system will not allow dealers to purchase elvers from harvesters until they submit all outstanding reports or create a negative report for the missing days. A dealer-to-dealer programme was added in 2015. The dealer-to-dealer programme requires a record each time dealers move elvers to another location or dealer. The dealer-to-dealer programme uses the same system as the harvester to dealer system and is also subject to daily reporting including negative reports.

In 2019, ME DMR added additional regulations for elver exporters, encompassing exports out of the state of Maine, including but not limited to exports out of the United States of America. Under this programme, elver export licence holders must notify the Maine Marine Patrol of their intention to prepare a shipment of elvers for export 48 hours in advance. The elver export licence holder must make arrangements for Maine Marine Patrol to be present when they are preparing the elvers for shipment, including the weighing and packing of the elvers for export. Upon completion of the packaging, Maine Marine Patrol seals the shipment of elvers and marks the package of elvers with the weight of elvers contained. The absence of a seal, a broken seal, or the absence of the weight marked on the package are prima facie evidence that the elvers are illegal and subject to seizure. Maine Marine Patrol are required to provide their token to complete an export transaction.

Caribbean
Management measures for eel fisheries in the Caribbean vary widely by country, but most do have some fishery restrictions which operate under various levels of formality.

In Cuba there is no specific legislation for American eels, but to fish requires a licence issued by the Ministry of Food Industry (MINAL), like any other fishery resource. The licences regulate fishing areas, gear and fishing effort, among other aspects. There is a system of fishing licences for each company, and there is required daily, monthly and annual reporting of fisheries, transportation, shipping and international trade, monitored at the national level by MINAL. Only one company is authorized for export of *A. rostrata*. Capturing, extracting, landing, transporting, processing or marketing without the corresponding authorization from MINAL is a legal violation with penalties including fines and other measures such as licence revocation or suspension, or confiscation of the product and fishing gear, vessels and equipment used to commit the offense.

In the Dominican Republic, the exploitation and export of eels requires special licences granted by the Dominican Council of Fishery and Aquaculture (CODOPESCA). Fishermen must be registered and have an identification card of the companies to which they sell their products, which must also have licences of commercialization and export. There is an Electronic Permit System for international trade in wild flora and fauna through which requests must be made. Current management measures include a fishing season from 1 November to 1 April and no harvest of any life stage outside of that season, as well as a quota of 150 kg/company and 2 500 kg per season, though there is no biological basis for the quotas. However, a 2021 status report concluded that an official Management Protocol is needed at the national level to regulate eel fisheries, including long-term conservation measures like pollution reduction, passage improvements, and other conservation actions (Marcano, 2021). Control measures are not successful at all times. In December 2024, the Coast Guard of Sint Maarten (Dutch part) seized an estimated 66 000 *A. rostrata* from a vessel that had travelled from the Dominican Republic to Sint Maarten bearing fraudulent Dominican permits (Nature Foundation of Sint Maarten, 2024).

In Haiti there are currently no local or national eel fisher associations, no permit requirement, and no established catch limit. All exporters must have a permit to be part of the association of exporters and must remain within the quota limit of 6 400 kg/exporter. It is noted that available data from the Ministry of Agriculture, Natural Resources and Rural Development are unreliable and therefore a challenge to effective monitoring of the fishery and trade (Jean, 2021).

In Jamaica, the fishery is underdeveloped and the management of the *A. rostrata* fishery is regulated by the National Fisheries Authority (NFA). All harvesters are required to have a valid NFA licence to fish. All licensed fishing entities are required to report catch to the NFA for the monitoring of fishing activities. Additionally, exporters must have a valid Catch Certificate issued by the NFA, which verifies that the catch has been harvested in compliance with the applicable laws and licence conditions. The Fisheries Act is the national policy under which *A. rostrata* is managed. In addition to fishery regulations, it also includes provisions to ensure migratory fish passage (upstream and downstream) by prohibiting any impediments, and other habitat protection provisions that safeguard the Jamaican *A. rostrata* population.

4.2. Would a CITES listing likely enhance conservation outcomes for the species?

Japanese eel and other look alike eels

The Expert Panel considers that a genus-wide CITES Appendix II listing for *Anguilla* species is unlikely to enhance conservation outcomes and carries significant risks of counterproductive effects without complementary regulatory, technical, and enforcement support. Existing regional management measures are already in place and being progressively and interactively implemented for effective management and conservation of key species (see press release of 18th Meeting of the Informal Consultation on International Cooperation for Conservation and Management of Japanese Eel Stock and Other Relevant Eel Species). There is a risk that premature listing of Asian eels under CITES provisions may divert capacity and funding which may undermine these frameworks, disrupt legal trade, and shift illegal exploitation pressure onto unregulated species.

Current regional frameworks – including spatial and seasonal fishing bans, minimum size limits, aquaculture licensing systems, trade restrictions, and cooperative stock enhancement programs – have demonstrably contributed to stabilizing anguillid eel populations, particularly in eastern Asia. The proposal underrepresents the breadth and effectiveness of these measures, including China's 10-year Yangtze fishing ban, Japan's Inland Water Fishery Promotion Act provisions, and coordinated fry trade volume controls among China, Japan, the Republic of Korea, and Taiwan Province of China.

Given these well-established and actively enforced national and regional controls, a CITES listing would offer minimal incremental conservation benefit. The proposal fails to acknowledge widespread and practical morphological identification practices for glass eels and existing traceability systems, which already regulate international trade effectively in key producing and consuming countries.

A genus-wide listing risks imposing disproportionate regulatory burdens on fisheries and aquaculture operations, potentially driving trade underground and destabilizing longstanding cooperative management mechanisms. Such a move could divert enforcement resources away from illegal trade hotspots and weaken stakeholder cooperation essential for effective conservation.

Listing the entire genus prematurely may shift illegal trade pressure onto lesser-known, tropical *Anguilla* species, trigger speculative overfishing in the period after listing but prior to provisions coming into force, and damage sustainable management incentives for species and regions currently operating under sustainable use frameworks. Without corresponding improvements in enforcement capacity, trade monitoring systems and species identification technology, these unintended effects could undermine overall conservation outcomes.

A more effective strategy would focus on strengthening targeted conservation measures for species already recognized as highly threatened, such as *A. anguilla*, while supporting regional management frameworks for other species. Advancing artificial breeding technology, improving trade data accuracy and enhancing species identification methods should be prioritized over a premature, broad CITES listing.

American eel

The Expert Panel determined that listing all *Anguilla* spp. under CITES Appendix II is not likely to enhance conservation outcomes for the species. Range states have already implemented effective management frameworks to limit and monitor harvest and trade of *A. rostrata*. Where regulations and conservation measures could be improved (i.e. Nova

Scotia, the Caribbean), it seems that a CITES listing would hinder rather than support such efforts by increasing administrative burdens for underfunded fishery management agencies.

For Canada and the United States of America, a CITES Appendix II listing would pose duplications of enforcement efforts. Canada's new regulations for elver possession and export have the potential to limit illegal harvest and export. Maine's electronic tracking system significantly limits the possibility for the illegal harvest and exportation of glass eels. The State has also implemented a penalty system appropriate for the value of the fishery. For any export shipments of live eel (yellow and glass), the USFWS also requires a 48hour notice. The majority of elver violations were criminalized in 2014, changing from a civil violation to a crime with a USD 2 000 fine. In addition to the USD 2 000 fine, individuals who exceed their quota are subject to a "pecuniary gain" fine, where they must pay back to the State the value of any elvers that were taken in excess of their quota. ME DMR is authorized to deny the renewal of the licence of an individual who has failed to pay their pecuniary gain fine in its entirety prior to the following elver season. Maine also passed legislation that makes permanent revocation of the licence the penalty for buying or selling elvers without using the swipe card system on the first offense. Harvesters, dealers, and aquaculture facilities may have random inspections conducted of the facility and places of harvest to ensure all rules and regulations under conditions of permit(s) are being adhered to.

The permitting process that would be required for the export of glass eel if A. rostrata were listed under Appendix II is likely to pose challenges to legal US fisheries due to the time required to obtain permits. Glass eel, once caught, must be shipped within a few days or there is a high risk of mortality. Therefore, any unexpected delays in permitting could be catastrophic given the high economic value of glass eel.

In 2024 a comprehensive needs analysis on the USFWS conservation permitting program was completed by the Jandor Group. This analysis of the permitting process revealed that the processing time for CITES permits is on average much longer than the 60–90 days claimed by USFWS, sometimes requiring multiple years. As part of the 2024 study, interviews with employees found that due to the lengthy permitting process, "the process is failing species that require timely moves" (p. 56) This substantiates concerns that a CITES Appendix II listing could negatively impact the operability of *A. rostrata* fisheries in the United States of America.

The Expert Panel notes that for range states in the Caribbean addressing challenges like insufficient financing and capacity, incomplete management frameworks, and limited scientific understanding would likely be more beneficial for the conservation of *A. rostrata* than a CITES listing. While a CITES listing could oblige Parties to issue permits for international trade, the conditions for issuing and accepting those permits are only recommendations under the Convention and are ultimately established by the Parties. Thus, CITES permits would not guarantee the sustainable use of the *A. rostrata* resource, particularly in countries where there is little to no scientific information being used to inform management of the fisheries and limited capacity for implementation and enforcement.

4.3. Could a CITES listing lead to unintended positive or negative consequences for the species' conservation?

Stein *et al.* (2025) stated that

> Before any changes to the CITES listings, a comprehensive assessment is needed to evaluate the expected impacts on stocks, eel aquaculture, legal trade and smuggling relative to conservation targets and risk analyses.(p. 13)

The Expert Panels discussed the positive or negative consequences for the species' conservation of any potential listing below.

Japanese eel and other look alike eels
A CITES genus-wide Appendix II listing for *Anguilla* species might offer some regulatory harmonization benefits, however the potential negative consequences are more substantial, including increased illegal trade, socioeconomic disruption, market distortion, and reduced compliance. These unintended effects could ultimately undermine conservation outcomes and destabilize regional management frameworks.

A CITES genus-wide listing could, in principle, help align trade regulations and protection measures across different countries and regions, reducing inconsistencies in permitting and reporting. This harmonization might improve trade monitoring in jurisdictions currently lacking regulatory capacity. However, past experience with the European eel (*A. anguilla*) illustrates that stricter trade controls can drive markets underground. If the generic listing proposal were adopted there would be a need to greatly speed up CITES permitting systems to cope with multiple consignments of live eels that cannot wait the standard 2–3 weeks for a CITES permit to be issued. This could be achieved by copying Australia's multiple consignment permit system, but many countries' CITES management authorities do not have the option or the inclination to hand over some of the permitting process to exporters, though it is within the bounds of overall export permit requirements. Following its Appendix II listing, illegal trade volumes surged (CITES, 2018), shifting pressure to substitute places (e.g. Morocco and Tunisia) and species. A similar outcome is likely if the entire *Anguilla* genus is listed, exacerbating enforcement challenges and undermining legitimate management.

A genus-wide listing would increase operational costs and regulatory burdens on legal fisheries and aquaculture sectors, particularly in eastern Asia. It would complicate fry sourcing for aquaculture, elevate enforcement costs and generate tensions within fishing communities, potentially destabilizing cooperative management efforts that are currently effective.

By inflating market prices for legally traded eels, a listing risks incentivizing speculative and opportunistic fishing, increasing pressure on unregulated tropical species. This economic distortion could delay the necessary investment in artificial breeding technologies by prolonging dependence on wild-caught juveniles.

An overreliance on molecular identification requirements under CITES would disregard proven morphological identification practices and disrupt existing management systems that already regulate fry trade effectively. This would increase compliance costs and enforcement complexity without delivering proportional conservation gains.

The risk of implementation failures leading to weak international compliance across major consumer countries with large eel markets is real, as inadequate enforcement of the genus-wide listing, or inconsistent implementation and compliance could fragment regulatory oversight, reducing the practical effectiveness of CITES controls and shifting trade to non-participating jurisdictions.

Given these significant risks, a phased, species-specific approach is preferable, focusing first on high-risk species like *A. anguilla* while allowing time to strengthen trade monitoring systems, artificial propagation technologies, and regional management cooperation for other *Anguilla* species.

American eel

The Expert Panel reiterated the fear that it is plausible that unmonitored or illegal fisheries would increase to meet market demand – should a CITES Appendix II listing lead to failures in trade of legal and managed fisheries exports from the United States of America, which are strictly monitored and regulated to ensure sustainability – due to challenges associated with obtaining CITES permits.

It is probable that the unintended consequences of overregulating glass eel and elver would severely impact aquaculture of eels, which could then increase the illegal harvest of eels, including silver eels, from the wild. This would represent a severe impact on commercial *Anguilla* populations as take from larger eel size classes has the most detrimental effect on population status (ASMFC, 2023). However, as noted in Section 3 1.2b, yellow *A. rostrata* eels are harvested only in a small fraction of their range, suggesting the possibility that harvest could increase without conservation harm.

Noting that limited resources are available for research, monitoring, enforcement, and restoration work that could have significant benefits to species conservation, the Expert Panel is concerned that diversion of resources to implementation and enforcement of CITES Appendix II requirements would be negative for on-going other management and conservation efforts. At worst they may result in current work being defunded, halted or restricted in future development. This appears to be particularly true for range states in the Caribbean.

Should new rapid, onsite methods for *Anguilla* species identification be developed (e.g. eDNA assay and identification), a CITES listing could more effectively be implemented as it would overcome difficulties in identifying imported and exported species by regulatory agencies.

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TABLES AND FIGURES

Table 19. Calculating inherent productivity of American eel (*A. rostrata*)

Vital rate	Productivity assignment				American eel values			
	Low	*Medium*	*High*		*Females*	*Males*	*Either sex*	*Source*
Natural mortality	< 0.2	0.2–0.5	> 0.5				0.15–0.25	ASMFC, 2012[a]
(*M*)					0.04–0.44	0.05–0.39		FOC, 2013[b]
					0.12	0.14		Jensen's 1st[c]
Lifetime mortality					0.9999997			[e]
(arithmetic)								
r	< 0.14	0.14–0.35	<0.35		NA	NA	NA	
K	< 0.15	0.15–0.33	>0.33		NA	NA	NA	
t_{mat}	> 8	3.3–8	<2.3		14	12		Jessop, 2010[f]
t_{max}	> 25	14–25	<14				30	Cairns, 2020[g]
							> 40	USFWS, 2025
Generation time	> 10	5–10	< 5		14	12		[h]
Fecundity					6 341 300			Jessop, 2018[i]

Notes: Vital rates proposed as guidelines of productivity for exploited fisheries (FAO, 2001), and their values for American eel. Fecundity data are also included. Ages and generations times are in years.

[a] The stated natural mortality range (0.15–0.25) is said to capture the variability of maximum age reported from northern and southern portions of the United States population. However, the method of estimating natural mortality rate from maximum age was not specified.

[b] For eels of continental age 5, across the latitudinal range of the species' distribution in eastern North America, as predicted by Bevacqua *et al.*'s (2011) temperature-dependent formula for estimating annual mortality of the European eel. Predicted mortality is lowest in cool northern waters and highest in warm southern waters.

[c] Jensen's First Estimator, $M = 1.65/t_{max}$ (Kenchington 2014).

[d] $M = 4.8999 \times t_{max}$ -0.916, from Then *et al.* (2015), based on a t_{max} of 40.

[e] Arithmetic lifetime mortality is calculated based on the assumptions that eels have equal sex ratios (which they don't), that every egg hatches, and that each spawning female produces on average one spawning female and one spawning male, thereby maintaining a stable population. Calculated as (Fecundity - 2)/Fecundity = (6 341 300 - 2) /6 341 300 = 0.9999997.

[f] Values are based on a literature survey of continental ages of silver eels sampled from eastern North American locations, to which one year is added to account for larval and silver eel oceanic migrations.

[g] Highest age measured from 2 183 eels sampled in the Canadian Atlantic provinces.

[h] t_{max} and generation length are the same in semelparous species.

[i] Mean of fecundities measured in five regions of eastern North America.

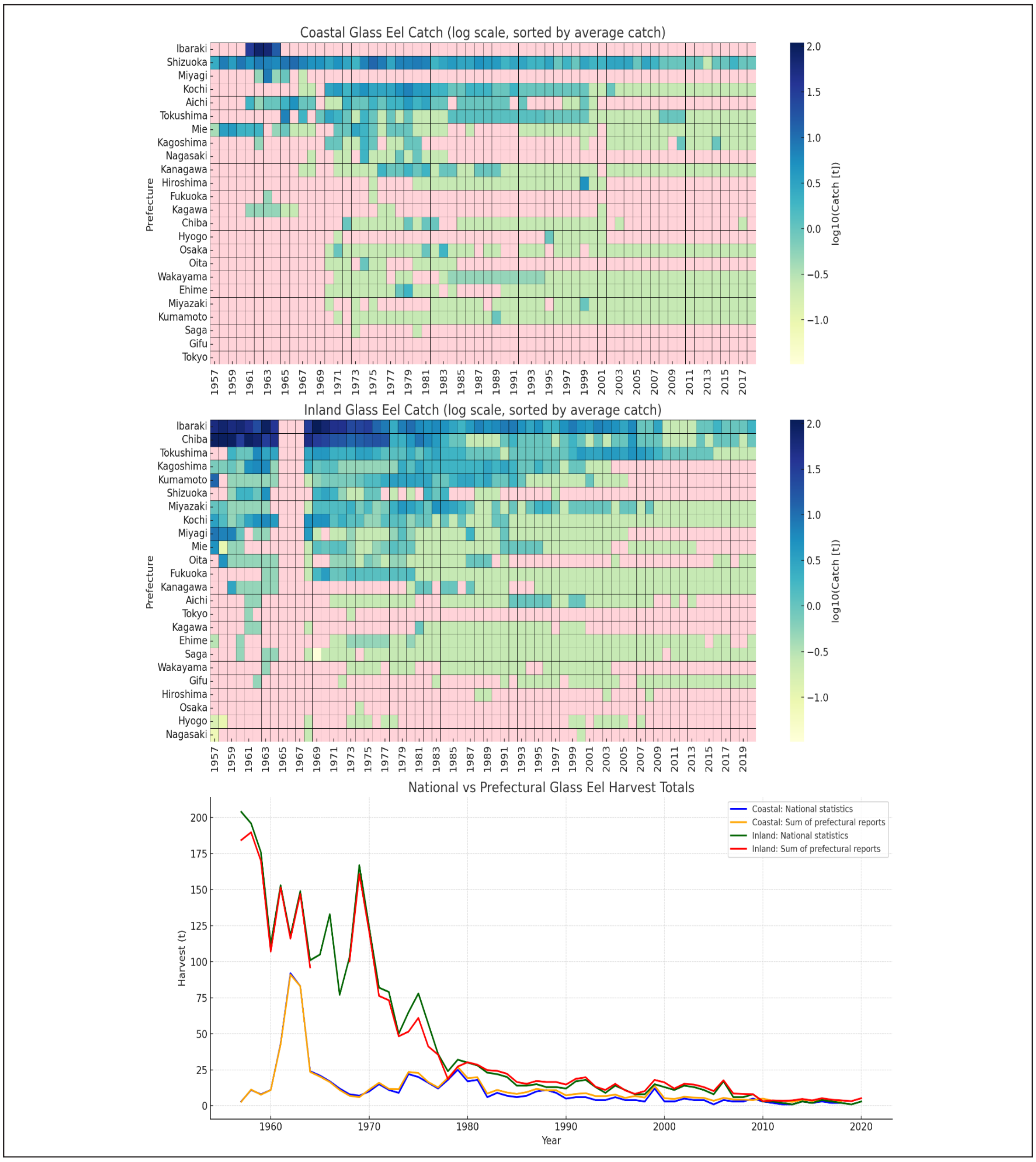
Sources: ASMFC. 2012. *American eel benchmark stock assessment.* Stock Assessment Report No. 12-01 of the Atlantic States Marine Fisheries Commission. Arlington, USA, Atlantic States Marine Fisheries Commission. (https://asmfc.org/wp-content/uploads/2024/11/americanEelBenchmarkStockAssessmentReport_May2012.pdf); Bevacqua, D., Melià, P., De Leo, G.A. & Gatto, M. 2011. Intra-specific scaling of natural mortality in fish: the paradigmatic case of the European eel. *Oecologia*, 165: 333–339; Cairns, D.K., Benchetrit, J., Bernatchez, L., Bornarel, V., Casselman, J.M., Castonguay, M., Charsley, A.R., Dorow, M., Drouineau, H., Frankowski, J., Haro, A., Hoyle, S.D., Knickle, D.C., Koops, M.A., Poirier, L.A., Thorson, J.T., Young, J. & Zhu, X. 2022. Thirteen novel ideas and underutilized resources to support progress toward a range-wide American eel stock assessment. *Fisheries Management and Ecology*, 29(5): 516–541; FAO. 2001. *A background analysis and framework for evaluating the status of Commercially-exploited aquatic species in a CITES context. Second technical consultation on the suitability of the cites criteria for listing Commercially-exploited aquatic species. Windhoek, Namibia, 22–25 October 2001* . Rome, FAO. (https://www.fao.org/4/Y1455E/Y1455E.htm); Jessop, B.M. 2010. Geographic effects on American eel (*Anguilla rostrata*) life history characteristics and strategies. *Canadian Journal of Fisheries and Aquatic Science*, 67(2): 326–346; Jessop, B.M. 2018. American eel fecundity and ovary maturity in relation to body size and geographic distribution. *Marine and Coastal Fisheries*, 10: 169–189; Then, A.Y., Hoenig, J.M., Hall, N.G., Hewitt, D.A. & Jardim, E. 2015. Evaluating the predictive performance of empirical estimators of natural mortality rate using information on over 200 fish species. *ICES Journal of Marine Science*, 72: 82–92; USFWS. 2025. American eel. In: *U.S. Fish and Wildlife Service*. Washington, DC. [Cited 25 July 2025]. https://www.fws.gov/species/american-eel-anguilla-rostrata

Table 20. Expert Panel information on productivity of Japanese and other Asian eels

EEL SPECIES	PRODUCTIVITY	NOTES
A. japonica	medium	*M* values for *A. japonica* during recruitment to inland habitats range from 0.31 to 0.78 per year (Lin and Sun, 2013). According to Annex 5 of Resolution Conf. 9.24, these values correspond to medium to high productivity categories. Considering geographic variation in Japan, including faster growth and earlier maturity in southern populations, a uniform classification of low productivity is inappropriate.
A. marmorata	high	*M* based productivity categorization to *Anguilla marmorata*, concluding that it fits the high productivity category. Reported *M* values for *A. marmorata* during recruitment to inland habitats is 0.66/year (Pangerang *et al.*, 2018).
Anguilla bicolor bicolor	medium	*M* values and assigns it to the medium productivity category. For *Anguilla bicolor bicolor*, *M* values vary from 0.46 to 0.56 per year (Samuel *et al.*, 2025), spanning medium to high productivity categories depending on location and environmental conditions.
Anguilla bicolor pacifica	medium	*M* values vary from 0.21/year to 0.34/year (Arai, Abdul Kadir and Chino, 2016; Sugeha *et al.*, 2021; Amaral *et al.*, 2019), spanning low to high productivity categories depending on location and environmental conditions

Sources: Amaral, A.R. *et al.* 2019. DNA-based identification reveals illegal trade of European eels (*Anguilla anguilla*) in Hong Kong. *Animal Conservation*, 22(2): 176–185. (https://doi.org/10.1111/acv.12456); Arai, T., Abdul Kadir, S. & Chino, N. 2016. Year-round spawning by a tropical catadromous eel *Anguilla bicolor bicolor*. *Marine Biology*, 163(2): 37; Lin, Y.-J. & Sun, C.-L. 2013. Estimation of natural mortality of Japanese eel (Anguilla japonica) using multiple indirect methods. *Journal of the Fisheries Society of Taiwan*, 40: 171–182; Samuel, Y.C., Ditya, S., Kaban, T.N., Merlia Wulandari, D.P., Anggraeni, M., Dwirastina, A., Wibowo, D., Atminarso, S., Makmur, R.D.P. & Mentari. 2025. Population dynamics of the data-limited Indonesian shortfin eel (Anguilla bicolor) fisheries in the Greater Sunda Islands. *Egyptian Journal of Aquatic Research*, 51(1): 207–216; Sugeha, H.Y. & Arai, T. 2021. Contrasting morphology, genetic, and recruitment season of Anguilla marmorata glass eels from northern, western, and central Sulawesi Island, Indonesia. Ilmu Kelautan: *Indonesian Journal of Marine Sciences*, 26(1): 1–12.

Figure 10. Change in abundance of Japanese eel (*A. japonica*)



Sources: Hakoyama, H., Fujimori, H., Okamoto, C. & Kodama, S. 2016. Compilation of Japanese fisheries statistics for the Japanese eel, *Anguilla japonica*, since 1894: a historical dataset for stock assessment. *Ecological Research*, 31(2): 153–153; The Annual Report of Catch Statistics on Fishery and Aquaculture in Japan

Notes: Number of reporting prefectures and total reported catch of eel seedlings (glass eels and elvers) from marine and inland fisheries in Japan, 1957–2018.Log_{10}-scaled heatmaps of annual catch by prefecture, sorted by average harvest; missing values (NA) shown in light pink. While many coastal fisheries exhibit frequent gaps in reporting, inland fisheries generally show more consistent data availability. Shizuoka is the only coastal prefecture with complete reporting across all years.

Comparison between national totals and the sum of prefectural reports for annual glass eel harvest in Japan's coastal and inland waters. National totals closely match sums of prefectural reports, revealing aggregation bias – especially in coastal data where key contributors like Ibaraki were missing in some years. For both fisheries, the two lines often track closely, suggesting that national statistics were largely based on the subset of prefectures that submitted data. This aggregation bias is particularly pronounced in coastal fisheries. For example, Ibaraki, a major coastal harvesting prefecture, reported data in only a few years during the 1960s, which strongly contributes to the apparent long-term decline. In the inland dataset, there are 3 years (1965–1967) where the national total is present despite the absence of any prefectural reports, further indicating inconsistencies in data compilation. These findings highlight that combining coastal and inland totals to construct a time-series index of glass eel abundance can be misleading. The inland series appears relatively reliable, whereas the coastal series is more vulnerable to reporting bias and should be interpreted with caution.

FAO EXPERT PANEL ASSESSMENT REPORT OF PROPOSAL 36: *Actinopyga* spp.

This proposal is for the inclusion in Appendix II of *Actinopyga echinites*, *A. mauritiana*, *A. miliaris* and *A. varians* in Appendix II, under Annex 2 (a) criterion B, and for reasons of similarity, inclusion of *A. lecanora* and *A. palauensis* satisfying Annex 2b Criterion A.

EXPERT PANEL RECOMMENDATION

PROPOSAL 36	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
Actinopyga spp.	–	X	–

SPECIES PROPOSED	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
A. echinites	–	X	–
A. mauritiana	–	X	–
A. miliaris	–	X	–
A. varians	–	X	–

LOOK ALIKE SPECIES	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
A. lecanora	–	X	–
A. palauensis	–	–	Insufficient evidence*

* Insufficient evidence of declines to make a judgement in relation to CITES criteria (CITES Res. Conf. 9.24. Rev. CoP17).

The Expert Panel concludes that the best available scientific data and technical information presented in CoP 20 Proposal 36 does not meet the criteria for listing in CITES Appendix II.

The Expert Panel noted *Actinopyga* spp. have high productivity, and their effective population sizes do not meet Appendix II thresholds for extent of decline (see CITES Conf. 9.24 Rev. CoP13, Annex 5, footnote 1). This determination is based on the absence of clear, empirically supported evidence of widespread population declines across the genus. Furthermore, the Expert Panel had very low confidence in the application of proxy species data, given the documented species-specific life history characteristics, and species targeted fishing pressure.

Listing of *Actinopyga* spp. in Appendix II could result in substantial issues for fishers and authorities in developing range States where capacity and resources are constrained for managing these extensive, dispersed and mostly small-scale fisheries. Remote communities are often heavily reliant on sea cucumber resources, which offer one of their few opportunities for cash incomes. Finding the appropriate resources to implement management and compliance arrangements remains an outstanding need; absence of these resources will lead to a substantial burden on affected fishers.

MAIN SUPPORTING INFORMATION

Section 1. Fishery, trade and utilization

1.1. Is the nature and scale of international trade well described?

Actinopyga spp. *Fisheries are Common and Important:* Fisheries taking *Actinopyga* spp. are widely distributed from East Africa to Polynesia. They are typically found in shallow tropical waters, often in reef flats and lagoons, which are frequently remote and difficult to monitor. *A. echinites* is a major fishery in the Philippines and is popular in the Peoples Republic of China as a Shanghai dish (Arriesgado *et al.*, 2025). The Seychelles is reported to be a major producer of *A. miliaris* (Apostolaki *et al.*, 2017). Overfishing is the primary threat to sea cucumber populations, driven by the high demand for bêche-de-mer in the international market (Mercier *et al.*, 2025; Purcell *et al.*, 2014). The species' status is characterized by boom-and-bust cycles, with recovery facilitated by the productivity of echinoderm species as a whole (Uthicke *et al*., 2009).

Trade is on-going but there is limited availability of production and trade data: The nature of trade in sea cucumbers in their dried form (bêche-de-mer), a product that can be stored without refrigeration, facilitates stockpiling and transport to export markets. Sea cucumbers can also be traded as salted or frozen. The vast majority of sea cucumbers harvested are taken for export markets in mainland China and Hong Kong SAR (Fabinyi *et al.*, 2017). Other key consumers include Japan, Republic of Korea, Malaysia, Taiwan and Singapore (Louw and Burgener, 2020; Purcell *et al.*, 2014, 2025).

Despite their commercial importance, *Actinopyga* spp. are under-represented in global production and trade datasets, even though some developed range States (e.g., Australia) collate more defined catch and trade data. In many range States, national production of bêche-de- mer is demonstrably inaccurate and unreliable. Consequently, robust trend information for the proposed *Actinopyga* species, which is essential to assess against CITES Appendix II listing criteria, is demonstrably absent. Overall, accurate and species-specific trade data for *Actinopyga* species is severely limited across many range States, obscuring the identification of actual trade trends.

In tracking *Actinopyga* species in trade, there are no genus or species-specific Harmonised System (HS codes) tariff codes. While species-specific FAO 3-alpha species codes have been assigned to *A. echinites* (KUE), *A. lecanora* (YVV), *A. mauritiana* (KUY), *A. miliaris* (KUQ), *A. palauensis* (YGP) and *A. varians* (FJG)), species reporting is largely absent. Further complicating the accuracy of trade data is amalgamating records in the volume of exports, in that trade of *Actinopgya* species includes a combination of dried, salted and frozen animals. Finally, the UN COMTRADE data on commercial forms of sea cucumber species does not provide details on whether the exporting country is also the country of origin for any of the commercial forms (see UN COMTRADE database). This severely hampers the proposal, as overall trade in sea cucumber species tells you little about exports of the various *Actinopyga* species, as trade data are largely not classified to species-level.

Many *Actinopyga* spp. are difficult to differentiate due to their morphometric considerations being similar, making their abundance difficult to document in trade. Even trends in amalgamated catches, used to describe changes in wild abundance in the Proposal, are not necessarily evidence of concomitant trends in individual in-water species status.

Informal Trade (including Illegal Trade) is Common: No documented reports on the illegal trade of *Actinopyga* spp. were found in the proposal, although anecdotal unattributed reports stated that it was common practice to trade in sea cucumbers in bulk or processed forms outside of formal management processes, as well as noting practices of mislabeling and under-reporting of trade. Such informal and illicit trade was reported as common and presents a management challenge to understanding the scale of trade in individual species, even for those already listed in CITES Appendices.

1.2. How significant is the threat of international trade to species in the wild?

Fishing has a Long History with *International Trade is a Significant Threat:* Bêche-de-mer have been in high demand for millennia, but demand peaked during the late 1880s and early 1900s with demand remaining high until a virtual hiatus in the late 1930s followed by a resurgence in demand beginning in the early 1990s. Typical of most tropical sea cucumber fisheries, the harvesting of sea cucumbers, including the proposed *Actinopyga* species in their range States, is predominantly taken by small-scale and artisanal fishers that have few income opportunities. The cash economy benefits of these renewable resources are an important source of livelihoods for coastal and island communities.

Reports of Population and Trade Trends Attributed to Fishing: At present, given the paucity of accurate trade data on the proposed *Actinopyga* species, it is difficult to determine the level of impact of trade on *Actinopyga* populations in their range States. The proposal details some of population trends from several range States of various *Actinopyga* species over recent decades, which are ascribed to overfishing (i.e., to service international trade, and some domestic consumption), specifically *A. echinites*, *A. mauritiana* and *A. miliaris*.

The Expert Panel recognizes that sea cucumber stocks are susceptible to overfishing (Mercier *et al.*, 2025) with the most valuable and accessible sea cucumber species at the greatest risk of exploitation. *Actinopyga* species are low to medium value species that can come under increased market pressure once higher value species become overfished (Kerr *et al.*, 2017; Maka *et al.*, 2022).

1.3. What is the importance of the species in local livelihoods and economies?

Domestic Use of Actinopyga species: Kinch *et al.* (2008) note several Pacific Island countries where their inhabitants consume several *Actinopyga* species for subsistence purposes, most notably, *A. mauritiana*. The proposal also notes additional reports of subsistence consumption in the Philippines (Gamboa *et al.*, 2024), Madagascar and Mauritius (Conand *et al.*, 2022), but these do not mention which species. In many range States with significant Asian diaspora communities, domestic consumption of sea cucumbers is common—particularly within the restaurant sector and during cultural or ceremonial events.

Livelihoods and Incomes from Export Markets: Diving and hand collection of sea cucumber are an important income sources for many coastal and island communities (especially for women and children who collect the sea cucumbers inhabiting the intertidal zone and seagrass beds). International market prices for sea cucumbers have risen sharply in recent years, with research by Purcell (2014) and Purcell *et al.* (2018; 2025) providing price changes of bêche-de-mer at retail shops in China and Hong Kong SAR in 2011, 2016 and 2022.

Fishers are reported to receive around 68 percent of the export price (Preston, 2023; Kinch *et al.*, 2008). However, Preston (2023) noted that it was unlikely that fishers actually received this percentage of the export price, since the export price was more than likely understated, and governance protections are few for small-scale fishers in many developing range states.

Establishment and Commercialization of Sea Cucumber Aquaculture: Several sea cucumber species are being bred and farmed, including *Apostichopus japonicus*, *Holothuria scabra* and *H. whitmaei* (Ramofafia *et al.*, 2003; Tanita *et al.*, 2023; Hair *et al.*, 2024). However, to date there has been no particular focus on *Actinopyga* spp.

Section 2. Inherent biological productivity

2.1. Are inherent biological traits relevant to the species' productivity and resilience well described?

Available Information on Inherent Biological Traits is Poor: In general, the biological estimates provided in the proposal are poorly described and inadequately analyzed. Data is critically lacking, and many publications underpinning the available information are outdated. A robust assessment against CITES criteria necessitates a clear and contemporary understanding of specific biological and life history traits, which is not present for *Actinopyga* spp. in the proposal.

The Expert Panel noted that life history information is challenging to assess within and between sea cucumber species as they demonstrate plasticity in many characteristics, which reduces the ability to obtain an accurate measure of change — sea cucumbers soft bodies expand and contract rapidly which compromises conventional length, width and weight measures. Empirical biological data presented for the six *Actinopyga* species, both in the proposal and in the additional literature cited, show clear species-specific differences in life history parameters for these species, making it difficult to extrapolate findings across *Actinopyga* species (Table *21*). For example, size at maturity for *A. mauritania* is documented as 22–23 cm whereas the same parameter for *A. echinites* is documented as 12 cm, half the size of *A. mauritania*.

Obtaining robust estimates for key parameters, such as growth, longevity, and natural mortality, is rarely achieved in sea cucumbers due to the highly cryptic nature of recruits and juveniles of the species' (e.g., Maunder *et al.*, 2023). Data for these early life history stages cannot be easily inferred from aquaculture, as *Actinopyga* spp. are rarely cultured, and there is little supporting evidence to show that growth rates in captivity are representative of those for wild individuals.

Intrinsic growth rates for any life history stage are not reported in the proposal and remain largely unknown for *Actinopyga* spp. and growth rates have usually been taken from related species in culture. There are, however, a handful of studies of species in culture that have measured growth rates for *Actinopyga* juveniles. A recent study by Tanita *et al.* (2023) estimated a daily growth rate of 91.8 ± 1.5 µm for juvenile *A. lecanora*. Similarly, Dissanayake and Wijeyaratne (1994) recorded an increase in growth of 1,500 percent for juvenile *A. echinites* over an 11-month period. Both studies report these rates as rapid growth.

Generation lengths are not given in the proposal, but it is generally inferred that these species have long generation lengths. Generation length (*GL*) can be estimated using the IUCN generation length calculator (IUCN 2025). Very few parameters are available for the calculation input, however, rough estimates using the IUCN calculator show substantially shorter generation length than previously considered.

Biological traits and life history information for the six *Actinopyga* species are summarized in Table 21.

2.2. Is the species' inherent productivity appropriately categorized (low, medium, high) for the purpose of applying the CITES biological listing criteria?

"High Productivity" is supported by consideration of the full range of life history parameters: Based on the proposal and other fishery-independent information from available literature, *Actinopyga* spp. was assessed as having high inherent productivity. In the proposal the designation of high productivity for *A. mauritania* and *A. echinites* is underpinned solely on rates of natural mortality inferred from related species. In the case of *A. varians*, *A. miliaris* and *A. palauensis*, the proposal references localized empirical estimates of natural mortality by Conand (1989), Dissanayake & Wijeyaratne (2007; 2010), and Skewes *et al.* (2014), respectively. No natural mortality estimate is provided or discussed for *A. lecanora*.

A robust assessment of productivity should consider all known biological traits, including natural mortality (M), individual growth coefficient (k), population intrinsic growth rate (r), age at maturity (t_{mat}), maximum age (t_{max}) and population generation length (GL) in calculating "the maximum percentage growth rate of a population" (Resolution Conf. 9.24).

These data were not available for many of the *Actinopyga* spp., but perhaps a slightly more robust estimation of productivity can be calculated for *A. varians* using the FAO guidance for productivity and a calculation of generation length. Based on Conand's (1989) estimate of M in New Caledonia as 1.45, a generation length of 3 years is calculated using the IUCN generation length definition and calculation approach (IUCN, 2025), which supported the categorization of inherent productivity as high, although caution is needed around this calculation due to the lack of trait parameters available for input. Critically, no information was found that refuted the determination of high productivity for *Actinopyga* spp. While there may be low confidence in precise numerical values for productivity, there is medium-high to high confidence in the general classification of high productivity for the genus, a conclusion supported by consistent biological information across *Actinopyga* spp.

Section 3. Evaluation of species status and trends in relation to CITES criteria

3.1. In application of the CITES biological listing criteria is the best available status and trend information considered, and is it sufficient to support a confident and well-substantiated determination?

Data Paucity on Population Estimates and Stock Status Assessments: Possibly due to a lack of reliable population size estimates for any of the *Actinopyga* spp. at a global level, the proposal has a strong reliance on IUCN Red List classifications to support its statements. This is of concern as these IUCN assessments are themselves based on inadequate or no supporting data, which are often qualitative rather than quantitative in their assessment. Some of these issues are outlined below in Table 22.

The IUCN assessments used in this proposal are largely based on single surveys that offer only a snapshot of a specific *Actinopyga* spp. in one country or region, yet findings are used to extrapolate understanding of species status across the species' entire distribution. Other species of sea cucumbers can display vastly different biological traits and habitat requirements across regions (e.g., Arndt and Smith, 1998), making any extrapolation between species subject to substantial risk and error. Extrapolations within a species of sea cucumber in different regions may also be subject to changes associated with external factors, such as differences in densities in regional habitats (Kinch *et al.*, 2008; Purcell *et al.*, 2009), and internal factors such as differing sex ratios (e.g., Kohler *et al.*, 2009), spawning periods, and aggregating behaviour (e.g., Kinch *et al.*, 2008). It is reasonable to assume that some *Actinopyga* spp. may also differ in a similar manner.

Proposals require species-specific and empirical data at both national and regional levels to make robust assumptions on species status. The only empirical catch trend data available for two of the proposed species is from the eastern Australian commercial fishery and presented by the Queensland Sea Cucumber Association (Figure 13). Here, catch weight data over a ~30-year period does not show declines in population trends for *A. mauritiana* or *A. miliaris*. Data on *A. lecanora* are limited due to their patchy abundances in the area and the need to harvest them at night because of their cryptic behaviour. This species hides during daytime hours, and commercial divers do not harvest at night. While fishery-independent data are not available for these time-series, these data show no concerning change in abundances.

Proposal Errors in Location and Species: There are other issues in the proposal. Description of population trends notes that Indonesia is part of the Pacific Islands region, while Indonesia is geographically part of Asia. Because of the misplacement of Indonesia's geographic location, the proposal presents a confusing statement regarding the population attribution of some of the *Actinopyga* spp., e.g., *A. varians*, cited in the proposal, which is actually *A. mauritiana* in the reference cited (Setyastuti *et al.*, 2018). However, due to taxonomic confusion of species regarding the position of Indonesia, the proposal changes the species name based on a recent publication, noting that *A. mauritiana* is exclusively distributed in the Indian Ocean, and *A. varians*, which was previously described as *A. mauritiana*, is exclusively distributed across the Pacific Islands region. This needs to be revised, as both species occur in Indonesia (Setyastuti *et al.*, 2018; Setyastuti *et al.*, 2019; Wirawati *et al.*, 2019; Setyastuti *et al.*, 2024). A recent study by Netchy Samyn and Paulayet (2025) also recorded *A. varians* as present in Indonesia.

3.2. Does the scientific data and technical information on historical extent of decline and the recent rate of decline in conjunction (Appendix II), meet the CITES biological listing criteria?

The Proposal recommends an Appendix II listing of *Actinopyga* spp. based on a declining population trends reported in the 2010 IUCN Red List assessment. However, there are no reliable estimates of the volume of any *Actinopyga* spp. in international trade, as the majority of sea cucumber catch and international trade statistics are not reported at the species-level.

Evidence of Small Population Size, Population Declines and Low Densities
The panel examined the proposals use of Conand *et al.* (2013a), which reports:

- *A. echinites* population declines of 60–90 percent over at least half of their ranges since the 1960s, and is considered overexploited in at least 30–40 percent of its range;
- *A. mauritiana,* populations declined by more than 60–90 percent in at least 60 percent of its range over the past 50 years, and is considered overexploited in at least 25 percent of its range (Conand *et al.*, 2013b); and
- *A. miliaris* has declined between 60–90 percent in at least 50 percent of its range since the 1960s, and is considered overexploited in at least 40 percent of its range (Conand *et al.*, 2013c).

These IUCN Red List assessment reports use point density data from survey dataset(s) and extrapolate these to estimate percentage population declines across each species' range. The Expert Panel found that the specific locations used provided only a limited understanding of the total population, making it inappropriate to extrapolate population declines from these records, as they were not supported by the available data. This sentiment was also supported by the Red List assessment authors as they note in their species reports — "*declines are difficult to estimate*". There is no global assessment of population size for each *Actinopyga* spp. Additionally, only scarce information is available from point surveys (site-specific surveys that were not well replicated through time (see Section 2 of Introduction).

The Expert Panel highlighted how sparse point-density records from limited locations were extrapolated to global population estimates. Given the limited and site-specific nature of the data collected, such extrapolations are not reliable measures of population declines across range States, and use of such indicators as population estimates is misleading. For example, in Conand *et al.* (2022), a decline in *A. palauensis* density in Mauritius is reported, yet the proposal applies this trend to the broader Indian Ocean region. The reported decline is based on data from only one of three Mauritian sites assessed. If all three sites are considered, the estimated decline for that area would be 2.89 times lower, with an annual density decrease of 0.0642. In Indonesia, there is limited data on changing population density. In an archipelago of 17 000 islands any survey that covers limited portions of Indonesia's vast area cannot be used to reveal significant declines nationwide.

3.3. What additional factors (e.g., vulnerability or resilience) should be considered in evaluating the species against the CITES biological listing criteria?

There are a range of notable risk factors associated with *Actinopyga* spp., and sea cucumbers more generally that may increase the risk of extinction or offer resilience.

Factors Increasing Species' Vulnerability

- poor understanding of life history characteristics (e.g., fecundity, growth rate, age at first maturity) and poor knowledge of absolute numbers or biomass, selectivity of removals, age, size or stage structure of a population, social structure (e.g., sex ratio, etc.);
- the Allee ("depensatory effects") effects impacting breeding success at low population densities — maintenance of their "effective" population size for successful reproduction (mate finding) for depleted populations of sessile or semi-sessile species. When stocks are widely dispersed and occur at low densities, some species may experience negative population growth, despite individuals having a high output of gametes;
- as these species primarily inhabit shallow waters, they are easily accessible by a wide range of fishers and can readily be processed for long term storage as "bêche-de-mer"; and
- many *Actinopyga* species are difficult to differentiate making their abundances difficult document in the wild and in trade. For example, *A. echintes* can be misidentified as either *A. mauritiana* or *A. miliaris*, while the latter can also be confused with *A. spinea* and *A. palauensis* (see Murphy *et al.*, 2019; Skewes and Long, 2022; Di Simone *et al.*, 2022; Ducarme *et al.*, 2023; Purcell *et al.*, 2023).

Factors Mitigating Risk and Offering Species' Resilience

- Sea cucumbers have proven to have good resilience and recovery when overfishing ceases (Friedman *et al.*, 2011). The nature of echinoderm species in exhibiting rapid population growth has also been documented (Uthicke *et al.*, 2009).
- Juveniles are cryptic and are generally protected from exploitation (Purcell *et al.*, 2023).
- The genus *Actinopyga* remains at low to moderate value in the market states, making small shipments uneconomic. The lower market value of these species is a mitigating risk factor, as the cost of processing sea cucumbers, even for artisanal fishers, means there is a negative incentive to continue harvesting at low densities.
- As mentioned, small-scale aquaculture initiatives for *Actinopyga* spp. have been reported in some Pacific Island countries, which could offer in-situ breeding and restocking opportunities, however these breeding and culture initiatives do not seem to be intensifying.

Section 4. Management, conservation and potential impact of listing

4.1. Are national or regional management measures currently in place to conserve the species well described in the proposal?

National Management: The proposal provides a comprehensive list of national management measures in several range States (noting that management regulations are also legislated for the Federated States of Micronesia, the Republic of Marshall Islands, and French Polynesia which are missing from the proposal despite being range States).

The Expert Panel highlight Australia's developed sea cucumber management approaches that are still being further refined and offer valuable learning opportunities for those looking to improve their management of *Actinopyga* species. Australia is benchmarking stewardship and management methods for sea cucumber assessment. In commercial fisheries these include; comprehensive harvest strategies with the use of daily logbooks, compliance strategies, a responsive set of harvest control rule strategies (HCR), effort controls, gear limitations (hand collection only), biologically appropriate and voluntary size limits, fishery dependent and fishery independent indices, and model-based assessment methods. In Queensland, compliance and management evaluation of the fishery is further controlled through the Queensland Sea Cucumber Working Group, an independent body of scientists, managers and policymakers that meets ~quarterly.

The gold star standard for national management approaches is Marine Stewardship Council (MSC) certification, and marketing of certified sustainable products. The MSC recently developed a revised standard for fishery certification, requiring greater degrees of evidence of management performance, more rigorous protection of endangered species and vulnerable habitats and the inclusion of socioeconomic performance indicators (David *et al.*, 2023; Cadrin and Nakatsuka, 2024).

In Western Australia, the MSC has certified a fishery that targets *H. scabra* and *A. echinites* using hand collection by diving (https://fisheries.msc.org/en/fisheries/western-australia-sea-cucumber/). This is the world's only MSC-certified sea cucumber fishery. The recent reassessment for continued certification of this fishery found that the fisheries-independent survey provides a sound biomass estimate for the surveyed area, and at biomass significantly recovered to near unfished levels. In addition, the limited fishing effort and hand collection methods used make this a highly selective, relatively low impact fishery, with minimal impacts on the marine environment.

Fishery management is predominantly implemented by national government fishery ministries. Nevertheless, co-management arrangements exist in some range states, including some successes in the co-management of sea cucumber fisheries between local communities and government in New Caledonia (Devez *et al.*, 2023) and French Polynesia (Stein, 2018). In French Polynesia a total allowable catch was established for individual atolls and export was only allowed through a controlled channel. Improvements in traceability; processors and the recording of data in a database of harvested or marketed products by weight and number, species and geographical origin improved sustainability and increased returns 3–5 fold. It should be noted that a major feature of the fisheries in New Caledonia and French Polynesia is the far higher capacity and resourcing of the fisheries authorities to enforce the management system.

Another example of community management is cited in Waldie *et al.* (2024) from Manus Province, Papua New Guinea where local communities were supported in managing *H. scabra* stocks within their territorial waters. Their findings suggested that the average

H. scabra larva travelled 15 km from its spawning location, with 50 percent of larvae settling within 6.7 km of their parents and 95 percent of larvae settling within 59 km of their parents. The authors concluded that the local Titan tribes' plan to protect their *H. scabra* spawning stocks through locally managed marine areas across 65 km of continuous coastline is a culturally and fisheries appropriate strategy.

Regional or International Management: Currently, there are no regional or international management schemes for the proposed *Actinopyga* species (or sea cucumbers species in general), though it has been previously proposed that a similar arrangement to the Parties to the Nauru Agreement (established to manage tuna stocks and associated revenue) be established for Pacific range States. The Melanesian Spearhead Group (comprised of Fiji, Papua New Guinea, Solomon Islands, Vanuatu, and the Kanak and Socialist National Liberation Front of New Caledonia) have previously proposed several management measures including the standardization of size limits across members.

4.2. Would a CITES listing likely enhance conservation outcomes for the species?

A CITES Appendix II listing for the proposed *Actinopyga* species might lead to restrictions on legal trade, at least initially, due to difficulties in establishing an adequate basis for NDFs. Putting such measures in place could positively affect species status, as would any restrictions on trade arising from the inability to issue NDFs. These CITES Appendix II listing benefits would only accrue if informal and illegal trade could be countered.

Implementation of CITES provisions comes with a capacity and resource cost. A range of intergovernmental, non-governmental and governmental organizations with remits in the Indo-Pacific region that could promote and support the research and governance of sea cucumbers by range states needs to be the recipient of further investment to deliver the support needed. In addition, the IUCN has established a Species Survival Commission Sea Cucumber Specialist Group (Pollom, 2022) that could assist in coordinating messaging and sharing on successful conservation outcomes.

Benefits of Improved Fishery Management if Supported by CITES Donors: Improved management could realize better financial returns from harvested sea cucumber species including the proposed *Actinopyga* species. For example, Lee *et al.* (2018) modelled production for four high-value species using the MSG size limits and size distribution samples from recent export data from Fiji and Vanuatu where 25–94 percent of exported animals were undersized (estimates for Solomon Islands are similar). The analysis found that if minimum legal-size limits were enforced, the entire long-term harvest would increase 97 percent by weight and 144 percent more revenue. In other words, fishers and governments lose significant revenue by not strictly enforcing size limits as well as losing the spawning potential of these larger animals and their ecological functions cleaning the seabed. As another example, Carleton *et al.* (2013) state that more conservative management and more rigorous enforcement of regulations would likely increase the average annual value of a specific range State' bêche-de-mer exports by 80 to 105 percent.

Opportunities for Development and Implementation of New or Emerging Technologies: New technologies are emerging in recent years that will make management and stewardship faster and more effective for sea cucumber species. For example, the Pacific Community has over the last few years developed and refined an artificial intelligence program for mobile devices, known as IKASAVEA (https://fame.spc.int/resources/tools/ikasavea) for monitoring landings and products of various coastal fisheries. IKASAVEA is a centralized, cloud-based monitoring system to automate data extraction and analysis processes. The system extracts information from images of fish and invertebrates collected as part of in-country monitoring programmes overseen by national fisheries agencies. As of December 2023, the system had facilitated automated identification of over six hundred nearshore finfish species, and automated length and weight measurements of more than 80 000 specimens across the Pacific Islands region (Shedrawi *et al.*, 2024). The learning mode for IKASAVEA can be developed further to identify, measure and weigh species in their dried and live forms. New mark and recapture methods are being developed in Australia using time-series photographic technology to assess growth and movement (Purcell *et al.*, 2016; Hammond and Purcell, 2023).

Large-scale assessment of live sea cucumber populations in-situ using remote sensing technology is being developed in Australia. Based on drone assessments of *Holothuria atra* in large areas of shallow waters (Williamson *et al.*, 2021), underwater survey methods using towed miniROVs (Raoult *et al*., 2025) and BlueBoats have been developed that can cover over 10 km (38 000 m^2, to a depth of up to 60 m) of habitat and associated species daily. Such methods allow for efficiencies in time and labour and give analogous results in terms of sea cucumber diversity and abundance to the more traditional visual census methods by snorkelling and diving (Williamson *et al*., in review). A major bottleneck with this method is processing time of the footage procured post fieldwork. Therefore, machine and deep learning approaches are also being developed to allow automated detection to species and abundances per area and habitat, based on a similar automation pipeline developed for fishes (Connolly *et al*., 2024). This deep learning identification research looks promising (Rod Connolly, pers comm July 2025).

Capacity Development and Training Requirements: With investment in implementation support, fishery and post-harvest capacity development constraints could be overcome. It is suggested that if there was more investment in governance and management (catch quota and licensing, minimum legal size, seasonal closures, rotational fishing, no-take zones, gear limitation, species protection, habitat protection, trade management, and restocking through hatchery seed production and aquaculture), information on fishing activities would be easier to collect and fishers would likely receive a more regular income from their export of sea cucumber. To date investment in implementation support following CITES listing of other sea cucumber species has been insufficient to meet the need.

4.3. Could a CITES listing lead to unintended positive or negative consequences for the species' conservation?

Potential Secondary Benefits of CITES Listing if Implementation is Well-Funded: Beyond CITES' provisions offering an opportunity for improved governance of trade of *Actinopyga* spp., there is the opportunity to create better relationships amongst often fragmented responsibilities across government authorities. Through delivery of well-funded CITES programs tensions over roles and responsibilities distributed across national conservation and fisheries agencies may be overcome. A listing on Appendix II with appropriate funding could assist with creating greater collaborations between respective management and scientific authorities, in particular range States, to support better management and improve permitting processes that allow international trade in listed aquatic species.

With financial and technical support for national fisheries and conservation agencies, data on the status of the proposed *Actinopyga* spp. could be collected, compiled, and shared at national and/or regional levels. This would help all range States gain a better understanding of how stocks respond to fishing pressure and support the development of reference density estimates to define healthy stock for a given species and location. These estimates could then be used to enhance regional management efforts.

Potential Secondary Negative Consequences: CITES impacts could negatively and unfairly affect the livelihoods of poor and remote small-scale and artisanal fishing communities, even when their fishing practices are sustainable and legal, if the requirements are too burdensome to implement. For disadvantaged communities, difficulties overcoming barriers in accessing market opportunities can result in unintended negative consequences for both people and aquatic resource statuses, as fishers may turn to other forms of income to which they are not suited, or to the informal economy, which makes their catches invisible to authorities except through records of compliance breaches.

Experience with previous listing of sea cucumbers shows that illegal, unreported, and unregulated ("informal') trade in sea cucumbers is common and is expected to continue unless there is significant improvement in transparency, traceability, and surveillance along the value and market chain. Because of difficulties in complying with the Appendix II listing provisions, in the past, several range States have resorted to banning legal exports of species listed in CITES, with informal trade continuing or increasing. In other cases, fishers are reluctant to report on the species in question, further limiting opportunities for empirical data collection for research into questions of stock status.

Hurdles to delivering positive NDFs and legal acquisition findings (LAF) required for listed sea cucumber species are well known. Even in range States with ready capacity and resources, time delays are common in providing the legal and practical provisions of CITES, and government and private sector stakeholders incur significant costs, which are diverted from other management requirements to service this need.

Experience in Australia, shows how CITES listings negatively impacted trade of sustainable product of the legal fishery. Additionally, it is estimated that the NDF process cost industry USD 195 000 per species (Queensland Sea Cucumber Fishery, pers comm), funds and related capacity that otherwise may have been invested in further sea cucumber fishery management. This for a well-managed sea cucumber fishery which had access to 27 years of fishery CPUE and trade information. How would this approach apply in a country with less experience, resources, and capacity?

To assist parties in the Pacific Islands region, the Pacific Community has produced an online electronic tool to determine NDFs (Shedrawi *et al.*, 2019). However, many Pacific Island countries still require adequate financial and technical capacity to fulfil the requirements to conduct adequate NDFs and LAFs assessments. Currently, there are no NDFs available on the CITES portal (see https://cites.org/eng/virtual-college/ndf) that could serve as templates for fishery managers, although Australia has posted their NDFs for teatfish species and the *Thelenota* genus on line (https://www.dcceew.gov.au/environment/wildlife-trade/publications/non-detriment-finding-cites-thelenota-sea-cucumbers). For these to be adopted, countries with economies in development are looking for implementation support.

Data recording, analysis and storage of information are also areas requiring substantial improvement. Of importance for NDFs is the accurate and timely reporting of surveys and fishery catches and the size classes of individual animals in the wild and being sold. Buyers and exporters purchase sea cucumber products by grade, which reflects factors such as sea cucumber length and weight (number of pieces/kg), and the quality of processing. Knowing the location of where CITES listed species are being purchased and their grade allows managers to get an indirect measure of shifting status that could help with targeted follow up stock surveys and adaptive management in implementing fishery controls.

A key component of any fishery improvement program is the requirement for widespread education and awareness raising across the entire value chain, including fishers, buyers and exporters. Challenges exist, however, in transmitting information of changes in international governance (e.g., a CITES listing), especially to remote communities that are largely unaware of international trade controls (Herath *et al.*, 2019). In many cases, fishers reliant on these resources for their food security and livelihoods would be unaware of the changes to international norms until they experience added hurdles to accessing legal avenues to market products already taken and processed.

Market Shift Considerations: CITES listing on a subset of sea cucumber species can cause shifts in international markets. Purcell *et al.* (2025) noted that an increase in retail prices of sea cucumber species was potentially exacerbated by trade restrictions from previous CITES listings of the teatfish group (*H. nobilis, H. whitmaei* and *H. fuscogilva*) and *Thelenota* spp. (*T. anas, T. anax* and *T. rublianeata*). Subsequently, there can be a shift in target species as others become restricted in trade or increases in “informal” trade.

Careful consideration is required as CITES listing as listing on Appendix II needs to be combined with substantial support for resource monitoring by fishery managers, strengthened fishery management measures, and appropriate support for stakeholders to comply with CITES requirements within the range States. In some areas this will include support for the introduction of alternatives livelihood for affected fishers.

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TABLES AND FIGURES

Table 21. Expert Panel assessment of inherent productivity of *Actinopyga* spp.

L. echinites

PARAMETER	INFORMATION	COMMENTS	CONFIDENCE	SOURCE
Distribution	Widely distributed throughout the Indo-Pacific, with the range well described in the proposal. Depth 0–30 m (Conand *et al.* 2013a) but prefers 0–12 (Kinch *et al.* 2008) Recorded as 0–10 in Proposal (Purcell *et al.* 2023).	NOTE: full genome assembly for this species is deposited in the NCBI database (assembly ASM1001598v1), which will further help elucidate distributions in the future.	*H*	Western Pacific: Kinch, *et al.*, 2008 Asia: Choo, 2008 India: Conand, 2008 Conand *et al.*, 2013a
REPRODUCTION				
Sex ratio	A ratio of 1:2, male to female was recorded by Kohler *et al.* (2009) and in Kenya by Muthiga and Conand (2013). Others have 1:1 ratios (in proposal)	Well discussed	*M*	Kohler, 2009; Muthiga & Conand, 2013
Spawning	Can spawn throughout the year, although the main spawning season varies by region in the warmer months. Broadcast spawner.		*H*	
Larval duration and feeding mode	Planktotrophic; competent to settle at ~18 d	Not mentioned in the proposal	*L*	Chen *et al.*, 1991
Fecundity	Females can produce up to 18–25 million eggs High potential fecundity (Conand 1998)			Conand, 1998
Size/age at maturity	Analogous species mature early (~1 year in culture) so maybe 2 y in culture) Size = 12 cm Weight is listed in the proposal as 45–90 g (Region dependent). Weight at first maturity is listed as 85g by Conand (1982).	Proposal uses one weight from Conand for internationals representation. Not always the case. For example, Weight at sexual maturity documented as 65 g at La Reunion (Kohler *et al.* 2009)	*L*	Conand, 1982; Kohler *et al.*, 2009
MORPHOMETRICS				
Growth rate	No information in the proposal for growth rates.	One study has found an increase in growth for juveniles over an 11 month period to be 1 500 percent (Wiedemeyer, 1994), which was considered a high rate of growth.	*L*	Wiedemeyer, 1994
Natural mortality	Proposal recorded *M* as 0.64. Based on other *Actinopyga* species. Conand (1989) reports *M* as 0.67. Conand (1989) is not included in the literature in the proposal.	A study in Sri Lanka by Dissanayake & Wijeyaratne (2007) needs to be considered with caution. The study assessed natural mortality (M) as 2.62 for this species using the Golland method, which appears extremely high and may not be directly comparable to other methods used in assessing this parameter in the proposal.	*L*	Wiedemeyer, 1994; Dissanayake & Wijeyaratne 2007
Longevity	Not reported in the proposal. Kinch *et al.* (2008) report that it can live more than 12 years.		*L*	Kinch, *et al.*, 2008
Generation length	Can live up to 12 years (Kinch*et al.*, 2008). "assumed to be greater than several decades" from the proposal.	Please use Kinch*et al* (2008) for the source of this parameter.	*M* Generation length only recorded in one area of distribution.	Kinch, *et al.*, 2008
Average weight/ length	Length: 15 cm in Mauritius; 20 cm in Réunion, Madagascar, PNG, India Weight: 300 g.	Not discussed well in the proposal. Indonesia (from 23 locations): length 13.7 ± 12.81 cm; weight 145.43 ± 246.49 g (Setyastuti *et al.*, 2024) Philippines: Average length 7.71; weight 35.20 g (Sornito *et al.*, 2022)	*L*	Kinch, *et al.*, 2008 Minimum wet length 12 cm for several countries Setyastuti *et al.*, 2024; Sornito, *et al.*, 2022

Table 21 (Cont.)

PARAMETER	INFORMATION	COMMENTS	CONFIDENCE	SOURCE
Max weight/length	Length = 35 (36) cm (Purcell *et al.* 2008). Max weight 1 kg (Fischer *et al.* 1990?) 650 g total weight (Kohler *et al.* (2009)	The proposal needs to rectify the following: change Purcell *et al.* date to 2008 from 2023, and max length of 36 cm for length.	*L-M*	Purcell, *et al.*, 2008; Kohler *et al.,* 2009
Density	Can reach densities of 1/m (10 000/ha) on seagrass and other preferred habitat (Conand 1998) Phillipines: Sornito *et al.* (2022) estimated a mean density of 1 572 ± 225 ind/ha Indonesia: In Maluku, 481 individuals were recorded in 2017		*M*	Conand, 1998; Sornito, 2022
Habitat	Occurs on outer reef flats (Skewes *et al.* 2004), in littoral zones, and in estuaries and lagoons. Abundant on seagrass beds and rubble (Conand 1998). Juveniles prefer cryptic habitats over sandy substrate (Wiedemeyer 1994). The species also occurs in lagoon-islet reefs and rubble reefs (Kinch *et al.* 2008)	Habitat association appears well discussed in the proposal, however, the source references within Purcell *et al.* (2023) should be used.	*M–H*	Conand, 1998; Skewes, *et al.*, 2004; Wiedemeyer, 1994; Kinch, *et al.*, 2008
Productivity	Assessed as having high productivity (based mostly on Resolution 9.24 (Rev. CoP17) that states that "One possible guideline for indexing productivity is the natural mortality rate, with the range 0.2–0.5 per year indicating".		*M*	
IUCN CLASSIFICATION	Listed as Vulnerable (VU)	Need more quantitative data for impacts of fishing as none are given, even though fishing is listed as the major threat.	*L*	Conand, *et al.*, 2013a

A. mauritiana

PARAMETER	INFORMATION	COMMENTS	CONFIDENCE	SOURCE
Distribution	Widely distributed across the western Indian Ocean (formerly thought to also occur in the Pacific Ocean, this is now believed to represent *A. varians*)	Also occurs in Indonesia (likely coexistent with *A. mauritiana* (Setyastuti *et al.*, 2018, 2019, 2024; Wirawati *et al.*, 2019)	*H*	Conand *et al.*, 2013b; Purcell *et al.*, 2023; Setyastuti *et al.*, 2018, 2019, 2024; Wirawati *et al.*, 2019
REPRODUCTION				
Sex ratio	Sexes separate. Asexual reproduction via adult fission has been documented in the Maldives for this species (Reichenbach *et al.*, 1996).	Likely to be unity	*L*	Reichenbach *et al.*, 1996
Spawning	Seasonal spawning in warm seasons.	Few local studies. Information confounded by taxonomic conflation with *A. varians* (e.g. using studies from the Solomon Is and Guam).	*M*	Conand *et al.*, 2013b; Purcell *et al.*, 2023
Larval duration and feeding mode	No information in the proposal.	Information in literature ascribed to *A. mauritiana* is likely *A. varians* (Solomon Islands)	*L–M*	
Fecundity	Information on fecundity is generally lacking in the proposal	Study in the Solomon Island show the mean number of fertilised eggs was 2.6 million (± 0.1 S.E., n=6) (Battaglene *et al.*, 2022). Mean absolute fecundity (FA) was 33.63 106 oocytes, with a range of 26.27x106 – 40.98x 106. Using data from the peak reproductive sample period (April 1989)with a mean drained body weight of 344± 75.8 g (n = 17) the FR came to 9.78 x 104 Oocytes g-1 (Hopper *et al.*, 1998)	*M*	Battaglene *et al.*, 2022; Hopper *et al.*, 1998
Size/age at maturity	23 and 22 cm for females and males, respectively, in the Red Sea (Gabr *et al.*, 2004).	Few local studies. Information confounded by taxonomic conflation with *A. varians* (e.g. using studies from New Caledonia and Guam).	*M–H*	Gabr *et al.*, 2004

Table 21 (Cont.)

PARAMETER	INFORMATION	COMMENTS	CONFIDENCE	SOURCE
MORPHOMETRICS				
Growth rate	Information on growth rates are generally lacking.	Juveniles grew ~10 g per month (10.4 g/month ± 1.49) under optimal low-density culture (Ramofafia *et al.*, 1997)	*M*	Ramofafia *et al.*, 1997
Natural mortality	Unknown	Likely variable with age and by location. Other *Actinopyga* show *M* of 0.67 for *A. echinites* to >2 for *A. miliaris* (see refs in Proposal)	*L*	
Longevity	Not reported in proposal.	No new information.	*L*	
Generation length	Proposal says "information on generation length is lacking" but inferred from studies of other species to be in the order of at least two or three decades	An important parameter for assessing extinction risk and vulnerability.	*L*	Conand *et al.*, 2013b; Purcell *et al.*, 2023
Average weight/ length	No information in the proposal.	A recent study from 23 locations across Indonesian water estimated the average length 21.83±22.66 cm, and average weight 361.33±520.24 g (Setyastuti *et al.* 2024)		Setyastuti *et al.* 2024
Max weight/length	Up to 35 cm in length with an average fresh weight of 400 g (Purcell *et al.*, 2023)		*H*	Purcell *et al.*, 2023
Habitat	Outer reef flats that are exposed to the surf, but is also occasionally found in seagrass beds. Juveniles occur predominately in seagrass, rubble, reef flats and reef crests (Wolfe *et al.*, 2023 & references within)	Habitat preferences are reasonably well described.	*M–H*	Purcell *et al.* 2023; Conand *et al.*, 2013b; Wolfe *et al.*, 2023
PRODUCTIVITY	Assessed as having high productivity (based mostly on reported *M* rates for *Actinopygas* and guidance from Resolution 9.24 (Rev. CoP17) that states that "One possible guideline for indexing productivity is the natural mortality rate, with the range 0.2–0.5 per year indicating medium productivity".	Available *Actinopyga* mortality rates range from 0.64/year for *A. echinites* (Conand, 1989) to 2.81/year for *A. miliaris* (Dissanayake & Wijeyaratne, 2007). So mostly in the high-range indicating relatively high productivity (relatively rapid turnover) for *Actinopyga* species.	*L*	
VULNERABILITY	Vulnerable to overfishing based on slow recovery after depletion (Purcell, 2010)	No data on this species to support this statement.	*L–M*	Purcell 2010
IUCN CLASSIFICATION	Classified as Vulnerable.	Based on the aggregated *A. mauritiana* and *A. varians* dataset. Declined by more than 60–90 percent in at least 60 percent of its range over the past 50 years.	*L–M* (due to conflation with *A. varians*)	Conand *et al.*, 2013b
DENSITY AND TRENDS				
Density	Written in the proposal: In Egypt, the survey in 2000 showed records of 2610 ind./ha, and entirely absent in 2016. In the Indian Ocean, a mean density of 2.75 ± 1 ind./ha. In Reunion, mean density 130±240 ind./ha In Seychelles, surveys between 2003 and 2004 estimated a density of 0.11 ind./ha	Only one individual of a large size was found in Lampung, Indonesia, during the 2016 survey (Setyastuti *et al.* 2018). Six ind. within 23 locations across Indonesia (Setyastuti *et al.* 2024). However, this survey area only covers a limited portion of Indonesia's vast area, which consists of more than 17 000 islands.		Setyastuti *et al.* 2018; Setyastuti *et al.*, 2024
Trends	Written in the proposal: Information on the global population size of *A. echinites*, *A. mauritiana*, *A. miliaris* and *A. varians* is not available. *A. echinites*, *A. mauritiana*, *A. miliaris* (noting *A. varians* was assessed as *A. mauritiana*) were considered to be undergoing current population declines of 30–40 percent based on depletion of stocks and ongoing overexploitation (Conand *et al.*, 2013a, 2013b, 2013c)	Difficult to estimate the trends, due to scarce information being available from site-specific surveys		Conand *et al.*, 2013a, 2013b, 2013c

Table 21 (Cont.)

A. miliaris

PARAMETER	INFORMATION	COMMENTS	CONFIDENCE	SOURCE
Distribution	Widely distributed: Reported to occur in: American Samoa (United States); Australia; Brunei Darussalam; Cambodia; China; Comoros; Cook Islands (non-Party); Egypt; Eritrea; Fiji; French Polynesia (France); Guam (United States); India; Indonesia; Israel; Japan; Jordan; Kenya; Kiribati (non-Party); Madagascar; Malaysia; Maldives; Marshall Islands (non-Party); Mauritius; Mayotte (France); Federated States of Micronesia (non-Party); Mozambique; Myanmar; Nauru (non-Party); New Caledonia (France); Commonwealth of the Northern Mariana Islands (United States); Palau; Papua New Guinea; Philippines; Réunion (France); Saudi Arabia; Seychelles; Singapore; Solomon Islands; Somalia; Sri Lanka; Sudan; Taiwan; United Republic of Tanzania; Thailand; Tokelau (non-Party); Tonga; Tuvalu (non-Party); Vanuatu; Viet Nam; Wallis and Futuna Islands (France); Yemen (Conand *et al.*, 2013c). 0–23 meters depth	Well noted in the proposal	*M–H*	Conand *et al.* 2013c; Setyastuti *et al.,* 2019; Massin, 1999; Massin, 1996; Pattinasarany & Manuputty, 2018. IUCN Redlist (accessed 08.07.2025)
REPRODUCTION				
Sex ratio	Sexes separate.	Likely to be unity but not documented	*L*	
Spawning	Twice a year (March and in November and December) in New Caledonia	Few local studies.	*M*	In proposal
Larval duration and feeding mode	Not reported in proposal	Few local studies. Recent research was a study in Sri Lanka estimates 12–22 days to doliolaria (larvae).	*M*	Dissanayake & Wijeyaratne, 2007
Fecundity	In Sri Lanka, Dissanayake & Wijeyaratne (2007) estimated 1.94 or 2.81/year	Limited study on this topic.	*L–M*	In proposal; Dissanayake & Wijeyaratne, 2007
Size/age at maturity	In proposal stated there was limited information on the biology of *A. miliaris*	Few local studies. Likely about 25 cm total length based on size data	*M*	Dissanayake & Wijeyaratne, 2007
MORPHOMETRICS				
Growth rate	In proposal it is stated that information on growth rates are generally lacking	Few local studies. Early larval days only, but juvenile growth is unknown (not published)	*M*	Dissanayake & Wijeyaratne, 2007
Natural mortality	Recent study estimated at 1.94 or 2.81/ year	The study in Sri Lanka that assessed the estimates of *M* by Dissanayake & Wijeyaratne (2007) needs to be considered with caution. The study assessed natural mortality via the Golland method, which may not be directly comparable to other methods used in assessing this parameter in the proposal.	*L*	Dissanayake & Wijeyaratne, 2007
Longevity	Not reported specifically for *A. miliaris* in the proposal. *Actinopyga* species are likely susceptible due to a combination of occurrence in shallow water habitats and ease of accessibility, assumed longevity (12 years or more), and slow recovery rates	Limited study on this topic	*L*	
Generation length	Assumed to be greater than several decades in a natural, undisturbed environment	Limited study on this topic	*M*	
Average weight/ length	Limited information in the proposal. Length 30 cm and weight 2 kg in Indonesia (Palomares & Pauly, 2025). A recent study in Indonesia estimated the average length 8.50±1.8 cm, and average weight 16.40±2.51 g.	Limited study on this topic.	*M–H*	Palomares & Pauly, 2025; Setyastuti *et al.,* 2024
Max weight/length	Unknown			

Table 21 (Cont.)

PARAMETER	INFORMATION	COMMENTS	CONFIDENCE	SOURCE
Density	In the proposal the citation of the density was only calculated for soft benthos sites, of 150 ind./ha in daytime soft benthos transect surveys and 200 ind./ha during nighttime surveys. In Egypt, population declined between 2000–2016 from 2,160 to 370 ind./ha; Fiji (in proposal). In the Philippines, density is estimated at 0.1 ind./ha in Milne Bay, 38.7 ind./ha in Madang, and 57 ind./ha in Oro (Kinch *et al.* 2008). In southern Kenya density estimates 0.75 ± 0.5 ind./ha, in Seychelles between 2003–2004 density estimates 4980 tonnes and 1.09 ind./ha (in proposal).	Few studies on this topic. According to IUCN the decline of the species is more than 60–90 percent in at least 50 percent of its range since 1960. In Maluku, Indonesia 801 individuals were recorded in 2017 (Pattinasarany & Manuputty, 2018).	*M–H*	Proposal EU, Conand *et al.*, 2013c; Pattinasarany & Manuputty, 2018; Kinch *et al.* 2008
Habitat	Seagrass beds, sandy flats, and reef rubble across Indonesi.	Habitat preferences are reasonably well described. James (2005) reports juveniles (100 mm and less in length) at 5 m depth in the Gulf of Mannar, with adults observed nearby.	*M-H*	Purcell *et al.* 2023. Conand *et al.*, 2013c Setyastuti *et al.* 2019 Wirawati *et al.* 2019 James, 2005
PRODUCTIVITY	Assessed as having high productivity (based mostly on Resolution 9.24 (Rev. CoP17) that states that "One possible guideline for indexing productivity is the natural mortality rate, with the range 0.2–0.5 per year indicating".	No targeted productivity study for this species. Based on one study on natural mortality in one area.	*L*	Dissanayake & Wijeyaratne, 2007
IUCN CLASSIFICATION	Classified as vulnerable.	At present, global declines are therefore estimated to be between 30 percent-40 percent based on estimates of depletion and overexploitation across its range. *A. miliaris* is therefore listed as Vulnerable	*L*	Conand *et al.,* 2013c

A. varians

PARAMETER	INFORMATION	COMMENTS	CONFIDENCE	SOURCE
Distribution	Widely distributed throughout the Pacific (includes the previous Pacific distribution of *A. mauritiana* before the split)	Also occurs in Indonesia (likely coexistent with *A. mauritiana* (Setyastuti *et al.*, 2018, 2019, 2024; Wirawati *et al.*, 2019)	*M–H*	Conand *et al.*, 2013b; Purcell *et al.*, 2023 Setyastuti *et al.*, 2018, 2019, 2024; Wirawati *et al.*, 2019
REPRODUCTION				
Sex ratio	Sexes separate.	Likely to be unity but not documented for this species.	*L*	
Spawning	Seasonal spawning in the warm seasons.	Few local studies. Summer (Kinch *et al.*, 2008). Information confounded by taxonomic conflation with *A. mauritiana*.	*M*	Conand *et al.*, 2013b; Purcell *et al.*, 2023
Larval duration and feeding mode	No information in the proposal.	16 to 29 days, Planktotrophic in study from Solomon islands (Ramofafia *et al.*, 2003).	*L–M*	Ramofafia *et al.*, 2003
Fecundity	Information on fecundity is generally lacking.	Assumed to be high?	*L*	
Size/age at maturity	22 cm and 370 g (Conand, 1993)	Reported as *A. mauritiana*.	*M*	Conand, 1993
MORPHOMETRICS				
Growth rate	Information on growth rates is generally lacking.			
Natural mortality	1.45/year in New Caledonia (Conand, 1989)	Suggests a high natural mortality rate. Likely variable with age and by location.	*M*	Conand, 1989
Longevity	Not reported in the proposal.	No new information.	*L*	
Generation length	Proposal says "information on generation length is lacking" but inferred from studies of other species to be in the order of at least two or three decades	Using estimated *M* for *A. varians* in New Caledonia 1.45 (Conand, 1989), and estimated age at maturity of 2.5 yrs, estimated Generation length is 3 yrs using IUCN calculator.	*L* (information in proposal); *M* new information.	Conand, 1989; Purcell *et al.*, 2023
Max weight/length	No information in the proposal.	Maximum length about 35 cm, commonly to 20 cm; average fresh weight from 300 to 700 g; average fresh length from 20 to 40 cm. (Purcell *et al.*, 2023)	*M*	Purcell *et al.*, 2023

Table 21 (Cont.)

PARAMETER	INFORMATION	COMMENTS	CONFIDENCE	SOURCE
Habitat	Outer reef flats that are exposed to the surf, but is also occasionally found in seagrass beds	Habitat preferences are reasonably well described. Very similar to *A. mauritiana*.	*M–H*	Purcell *et al.* 2023; Conand *et al.*, 2013c
PRODUCTIVITY	Assessed as having high productivity (based mostly on reported *M* rates for *Actinopygas* and guidance from Resolution 9.24 (Rev. CoP17) that states that "One possible guideline for indexing productivity is the natural mortality rate, with the range 0.2–0.5 per year indicating medium productivity".	Estimated mortality rate of 1.45/year in New Caledonia (Conand, 1989) is in the high range indicating relatively high productivity (relatively rapid turnover) for *Actinopyga* species.	*L*	
VULNERABILITY	Vulnerable to overfishing based on slow recovery after depletion (Purcell, 2010)	No species-specific supporting data	*L*	Purcell, 2010
IUCN CLASSIFICATION	Classified as Data Deficient.	Needs to be reassessed using updated taxonomic split for *A. mauritiana* and *A. varians.*	*L*	Samyn, 2013
DENSITY AND TRENDS				
Density	No information in the proposal.	Difficult to get information due to taxonomic conflation with *A. mauritiana*.	*L*	
Trends	Written in the proposal: *A. echinites, A. mauritiana*, *A. miliaris* (noting *A. varians* was assessed as *A. mauritiana*) were considered to be undergoing current population declines of 30–40 percent based on depletion of stocks and ongoing overexploitation (Conand *et al.*, 2013a, 2013b, 2013c)	Difficult to get information due to taxonomic conflation with *A. mauritiana*.	*L*	Conand *et al.*, 2013a, 2013b, 2013c

Note: Information on *A. lecanora* and *A. palauensis* was also collated and is available from FAO on request.

Sources: Aumeeruddy, R. & Conand, C. 2008. Seychelles: A hotspot of sea cucumber fisheries in Africa and the Indian Ocean region. In: Toral-Granda, V., Lovatelli, A. & Marcelo, V., eds. *Sea cucumbers: A global review of fisheries and trade*. Rome, FAO. pp. 195–209; attaglene, S.C., Seymour, J.E., Ramofafia, C. & Lane, I. 2002. Spawning induction of three tropical sea cucumbers, *Holothuria scabra, H. fuscogilva,* and *Actinopyga mauritania*. *Aquaculture*, 207: 29–47; Chen, C., Hsu, H. & Deng, D. 1991. Comparison of larval development and growth of the sea cucumber *Actinopyga echinites*: Ovary-induced ova and DTT-induced ova. *Marine Biology*, 109: 453–457; Choo, P. 2008. Population status, fisheries and trade of sea cucumbers in Asia. In: Toral-Granda, M.V., Lovatelli, A. & Vasconcellos, M., eds. Sea cucumbers: A global review on fisheries and trade. Rome, FAO; Conand, C. 1982. 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Table 22. Further information for assessing abundance of *Actinopyga* spp. as reviewed by the Expert Panel

A. echinites

COVERAGE	INDICATOR/PERIOD	ABUNDANCE	CONFIDENCE	SOURCE
Papua New Guinea (East New Britain Province)	2001	0.1 ind./ha	*M*	Kinch *et al*., 2008
Papua New Guinea (Central Province)	Early 1980s	1 800 ind./ha	*L*	Kinch *et al*., 2008
New Caledonia (Grand Terre)	2007	9.35 ind./ha (50 reef flat sites)	*H*	Purcell *et al*., 2009
New Caledonia (La Foa)	2021	16.14 ind./ha (range 6.64 to 25.11 ind./ha)	*H*	Gilbert *et al*., 2022
Philippines (Cabgan Island)	2021	1 572 ± 225 ind./ha estimated from a shallow seagrass bed station, and 1389 ± 178 ind./ha in a station established at deep algal flats	*M*	Sornito *et al*., 2022
Madagascar (Norinkazo, Beankiho and Mareana)	Not detailed	0 to 25 ind./ha	*L*	Muthiga & Conand, 2013
Reunion	2007	2.9 ± 5.9 ind./ha	*M*	Muthiga & Conand, 2013
Seychelles (Mahé and Amirantes Plateaus)	2003–2004	0.64 ind./ha.	*H*	Aumeeruddy & Conand, 2008
Egypt (Abu Ghosoun)	2000, 2006 and 2016	2 450 to 240 ind./ha	*M*	Hasan, 2019

A. mauritiana

COVERAGE	INDICATOR/PERIOD	ABUNDANCE	CONFIDENCE	SOURCE
Kenya (Malindi, Mayungu, Watamu, Wesa, Kivulini, Vipingo, Mombasa, Tiwi, Diani and Shimoni)	2005–2007	0.11 ± 0.04 ind./400m sq	*M*	Muthiga & Conand, 2013
Reunion	2007	1.3 ± 2.4 ind./ha	*H*	Muthiga & Conand, 2013
Seychelles (Mahé and Amirantes Plateaus)	2003–2004	0.11 ind./ha	*H*	Aumeeruddy & Conand, 2008
Egypt (Abu Ghosoun)	2000, 2006 and 2016	2610 ind./ha to 0 ind./ha	*M*	Hasan, 2019
Egypt (Red Sea)	2004 and 2014	612 ind./ha to 7.5 ind./ha (six sites)	*M*	Ahmed, 2015
Egypt (northern Red Sea)	2019	160 ind./ha	*M*	Ghallab *et al*., 2022

A. milaris

COVERAGE	INDICATOR/PERIOD	ABUNDANCE	CONFIDENCE	SOURCE
Pacific	2004–2008	150 ind./ha in daytime soft benthos transect surveys and 200 ind./ha during nighttime surveys	*H*	Pakoa *et al*., 2014
Papua New Guinea (Milne Bay Province)	2001	0.1 ind./ha	*H*	Kinch *et al*., 2008
Papua New Guinea (Oro Province)	1993	57 ind./ha	*M*	Kinch *et al*., 2008
New Caledonia (Grand Terre)	2007	3.78 ind./ha (in lagoons)	*H*	Purcell *et al*., 2009
Tonga (Ha'apai)	2014 and 2016	16.37 ± 11.80 ind./ha		Moore *et al*., 2017
Seychelles Mahé and Amirantes Plateaus)	2003–2004	1.09 ind./ha	*H*	Aumeeruddy & Conand, 2008
Egypt (Abu Ghosoun)	2000, 2006 and 2016	2160 to 370 ind./ha	*M*	Hasan, 2019
Egypt (northern Red Sea)	2019	80 ind./ha	*M*	Ghallab *et al*., 2022
Kenya (Malindi, Mayungu, Watamu, Wesa, Kivulini, Vipingo, Mombasa, Tiwi, Diani and Shimoni)	2005–2007	0.03 ± 0.02 ind./400 m sq	*M*	Muthiga and Conand, 2013

Table 22 (Cont.)

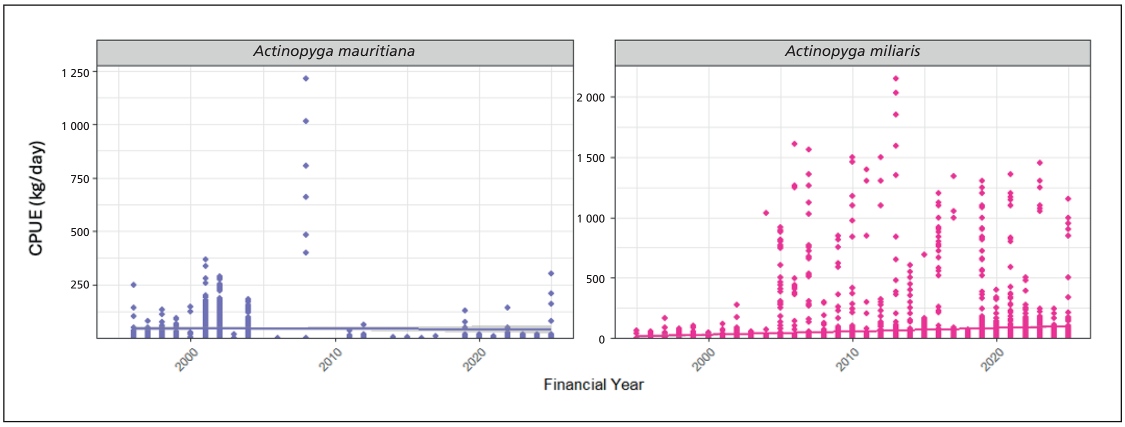
A. varians

COVERAGE	INDICATOR/PERIOD	ABUNDANCE	CONFIDENCE	SOURCE
Pacific	2004–2008	200 ind./ha at reef benthos stations/ reef-front timed swims	*H*	Pakoa *et al.*, 2014
Papua New Guinea (Madang Province)	1991	38.7 ind./ha	*M*	Kinch *et al.*, 2008
Papua New Guinea (Milne Bay Province)	2001	0.1 ind./ha	*H*	Kinch *et al.*, 2008
New Caledonia (Grand Terre)	2007	8.12 ind./ha (on reef crests)	*H*	Purcell *et al.*, 2009

Note: Confidence in the information presented has been rated as High (H), Medium (M), and Low (L), depending on the rigour of the science underpinning the information (e.g., number of replicates, methodology used, number of sites and countries, age of publication, etc.).

Sources: Ahmed, M.I. 2015. A decade of sea cucumber fishing in Egypt, a boom and bust case study. *Egyptian Society for Environmental Sciences*, 12(1): 81–85. (https://doi.org/10.1111/ j.1467-2979.2010.00384.x); Aumeeruddy, R. & Conand, C. 2008. Seychelles: A hotspot of sea cucumber fisheries in Africa and the Indian Ocean region. In: Toral-Granda, V., Lovatelli, A. & Marcelo, V., eds. *Sea cucumbers: A global review of fisheries and trade*. Rome, FAO. pp. 195–209; Ghallab, A., Mahdy, A. & Hussein, H.N.M. 2022. Distribution of seagrass communities and associated sea cucumbers in North Red Sea Protectorates, Hurghada, Egypt. *Egyptian Journal of Aquatic Biology and Fisheries*, 26(2): 17–29; Gilbert, A., Georget, S., Ton, C., Léopold, M., Purcell, S., Van Wynsberge, S. & Andréfouët,S. 2022. *Volet 1: État des lieux des stocks d'holothuries commerciales en Nouvelle- Calédonie (2021–2022).* Rapport détaillé des résultats. État Commanditée Par: ADECAL TECHNOPOLE Pour GINGER-SOPRONER. Projet PROTEGE; Hasan, M.H. 2019. Destruction of sea cucumber populations due to overfishing at Abu Ghosoun area, Red Sea. *The Journal of Basic and Applied Zoology*, 80(1): 5; Kinch, J., Purcell, S., Uthicke, S. & Friedman, K. 2008. Population status, fisheries and trade of sea cucumbers in the Western Pacific. In: Toral-Granda, V., Lovatelli, A. & Vasconcellos, M., eds. *Sea cucumbers: A global review on fisheries and trade*. FAO Fisheries and Aquaculture Technical Paper, No. 516. Rome, FAO. pp. 7–55; Moore, B., Bosserelle, P., Mailau, S., Vi, S., Fonua, S., Havea, T. & Malimali, S. 2017. *The status of sea cucumbers in the Kingdom of Tonga in 2016*. Pacific Community. 64 pp.; Muthiga, N. & Conand, C. 2013. *Sea cucumbers in the western Indian Ocean: Improving management of an important but poorly understood resource*. WIOMSA Book Series No. 13; Pakoa K., Friedman K., Moore B., Tardy E., Bertram I. 2014. *Assessing Tropical Marine Invertebrates: a manual for Pacific island resource managers*. Noumea, New Caledonia: Secretariat of the Pacific Community. 118 p. (https://www.spc.int/digitallibrary/get/pfj5w); Purcell, S., Gossuin, H. & Agudo, N. 2009. *Status and management of the sea cucumber fishery of La Grande Terre, New Caledonia*. Penang, WorldFish Center; Sornito, M., Leopardas, V., Arriesgado, E., Quiñones, M. & Tubio, E. 2022. Density and size distribution of the commercial bêche-de-mer, *Actinopyga echinites* (Jaeger, 1833) in Cabgan, Barobo, Surigao del Sur, Philippines. *Philippine Journal of Science*, 151(4): 1337–1347.

Figure 11. Commercial catch weight per day of two *Actinopyga* species in eastern Australia over time



Source: Queensland Sea Cucumber Association, unpublished data, 2025.

FAO EXPERT PANEL ASSESSMENT REPORT PROPOSAL 37: Golden sandfish, (*Holothuria lessoni*)

This proposal is for the inclusion in Appendix II of Golden sandfish, (*Holothuria lessoni*) in Appendix II, under Annex 2 (a) Criterion B.

EXPERT PANEL RECOMMENDATION

PROPOSAL 37	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
Golden sandfish (*Holothuria lessoni*)	X	–	–

The Expert Panel concludes that the best available scientific data and technical information presented in CoP20 Proposal 36 meets the criteria for listing in Appendix II.

This conclusion is based on information which indicates that *H. lessoni* is a medium productivity species with sparse records of localized severe declines with some documented local extirpations. These factors would not in themselves typically result in a broadly distributed species meeting Appendix II criteria; however, the high market value and natural rarity of *H. lessoni* – and its relatively shallow life habit – add to the need for precaution.

The Expert Panel stated that a listing on Appendix II will only provide potential conservation benefits for the species if fisheries and trade controls are supported with substantial resources for strengthened stock assessment and fishery management capacity, and if these investments do not negatively hinder the development of culture operations (e.g. active aquaculture production of *H. lessoni* in Indonesia and Tonga).

The Expert Panel highlighted that capacity and resources of authorities in smaller range states are constrained for managing trade and supply chains. Remote communities are often heavily reliant on sea cucumber resources, which offer one of their few opportunities for cash incomes. Appropriate support to comply with CITES requirements within the range states; as well as support for the introduction of livelihood alternatives for affected fishers would be needed if the listing were to be adopted by CITES Parties.

MAIN SUPPORTING INFORMATION

Section 1. Fishery, trade and utilization

1.1. Is the nature and scale of international trade well described?

Despite its rarity, fisheries taking H. lessoni are extensive:
Fisheries taking golden sandfish (*H. lessoni*) are widely distributed from eastern Africa to parts of Polynesia. The species is typically found in shallow tropical waters (< 30 m depth), making them accessible to breathhold divers and gleaners.

The trade in sea cucumbers in dried form (bêche-de-mer or *trepang*), a shelfstable product, facilitates easy long-term storage (stockpiling) and simplifies transport requirements between fishing areas and markets, which is particularly advantageous for remote fishing communities. Sea cucumbers can also be traded in salted and frozen forms.

Paucity of fisheries and export data:
The reporting of *H. lessoni* exports and imports is severely limited across many range states, hindering the identification of actual trends in trade. Export data was presented in the proposal for Indonesia (Wirawati *et al.*, 2021) and the Solomon Islands (Preston, 2023), noting that other range states continue to harvest and export. Overall, the scale of trade is uncertain as there are no reliable estimates of the volumes of *H. lessoni* passing through international markets. While an FAO 3alpha species code has been assigned for *H. lessoni* (BDG), no captures have been reported to FAO under this code. Additionally, there are no genus- or species-specific harmonized system (HS) tariff codes for any of the commercial forms of *H. lessoni* in trade. In the proposal, it was also noted that UN COMTRADE data related to trade in commercial forms of sea cucumber species was queried, but no conclusions could be drawn regarding the international trade of *H. lessoni*.

Further issues arise from the fact that many sea cucumber species are not classified to species-level, with the complication that *H. lessoni* is sometimes mixed with the closely related common sandfish, *H. scabra.* The formal recognition of *H. lessoni* as a distinct species was only published in 2009 (Massin *et. al.*, 2009). In addition, there are inconsistencies in the data reported by exporting countries and importing countries.

Informal trade (including illegal trade) is common:
The proposal noted that there were no specific reports focused solely on the illegal trade of *H. lessoni* available but stated that it was common practice to trade in sea cucumbers in bulk or processed forms. Mislabeling and underreporting of sea cucumber species in trade were common practices in illicit trade, which obscures the identification of individual species, while informal trade that goes unreported is also common.

1.2. How significant is the threat of international trade to species in the wild?

Fishing has a long history with *international trade is a significant threat:*
Overfishing is the primary threat to sea cucumber populations, driven by the high demand for bêche-de-mer in the international market (Mercier *et al.*, 2025; Purcell *et al.*, 2014). Kinch *et al.* (2008) gives details of Pacific Islands countries that export *H. lessoni*, whilst Purcell *et al.* (2023) also included Australia, Indonesia, Madagascar, the Seychelles, and the Philippines. The vast majority of sea cucumbers are exported to service markets in China and China, Hong Kong SAR (Fabinyi, Barklay and Ericsson, 2017). Other key consumers include Japan, Republic of Korea, Malaysia, Taiwan and Singapore (Louw and Bűrgener, 2020; Purcell *et al.*, 2014, 2025).

Sea cucumbers have been traded for millennia, but had a peak in demand during the late 1880s and early 1900s with demand remaining high until a virtual hiatus in the late 1930s followed by a resurgence in trade beginning in the early 1990s. Typical of most tropical sea cucumber fisheries, the harvesting of sea cucumbers, including H. lessoni, is predominantly undertaken by small-scale and artisanal fishers and is an important livelihood for coastal and island communities.

Reports of population and trade trends attributed to fishing:
Given the paucity of accurate current trade data on *H. lessoni*, it is difficult to determine the impact of trade on *H. lessoni* populations in their range states. Market pressures are likely high, despite costs associated with harvesting, processing, transport and so on incurred by buying and export companies (e.g. staff, building, utilities) which means that trading of *H. lessoni* is only commercially viable when there are sufficient stocks available for export. In Australia, the species is rarely targeted and mostly collected opportunistically due to the difficulties of finding the species reliably in abundance.

1.3. What is the importance of the species in local livelihoods and economies?

Domestic use of H. lessoni:
Inhabitants of many Pacific Island countries, Indonesia and Mauritius consume several sea cucumber species, including *H. lessoni,* for subsistence purposes (Kinch *et al.*, 2008; Wirawati *et al.*, 2021; Conand *et al.* 2022; Purcell *et al.* 2023).

Export markets of H. lessoni and livelihoods:
H. lessoni is considered one of the highest value tropical holothurian species, with an average price of USD 503/kg reported in China, Hong Kong SAR markets in 2022 (Purcell *et al.*, 2025). *H. lessoni* was considered scarce in the marketplace and demand is expected to continue to increase. Preston (2023) details the value at point of sale, export and retail in China, Hong Kong SAR for the Solomon Islands, with *H. lessoni* being USD 24.36/kg at first sale, USD 38.93/kg at export, and USD 448/kg at retail in China, Hong Kong SAR. From this assessment, it was assumed that fishers can receive around 62 percent of the export price which is consistent with what Kinch *et al.* (2008) noted for Papua New Guinea. However, since the export price is likely to be understated, fishers may not be receiving such a high percentage (Barclay *et al.*, 2016).

Establishment and commercialization of sea cucumber aquaculture:
The mariculture of sea cucumber species has increased, especially with production of *H. scabra* as well as *H. lessoni*. Hair *et al.* (2024) provides a detailed examination of mariculture efforts in the Pacific Island region. The mariculture of *H. lessoni* is ongoing in Tonga and Indonesia. Sea cucumber mariculture has the potential for substituting wild harvesting, diversifying livelihoods, and opening up opportunities for stock restoration in areas depleted by overfishing. However, this requires greater recognition of the legitimacy and value of aquaculture systems, and a cautious approach to the implementation of new administrative controls so unintended harm to livelihoods and industry development is minimized.

Section 2. Inherent biological productivity

2.1. Are inherent biological traits relevant to the species' productivity and resilience well described?

Available information on inherent biological traits is poor:
Data on biological traits of *H. lessoni* are generally sparse, with two studies in New Caledonia providing most information: the first from the mid1980s (Conand, 1989), and the second, a recent study (Djenidi, Purcell and Gossuin, forthcoming). Data from these two studies have indicated a moderate growth rate (K = 0.26/year), natural mortality (M) of 0.4–0.6, age at maturity of 4.5 years, high fecundity, and a longevity of about 15 years (Conand, 1989; Djenidi, Purcell and Gossuin, forthcoming). Although sea cucumbers can show some plasticity in these parameters on spatial and even temporal scales (e.g. see Asha, 2019), this information is nonetheless useful to underpin estimates of productivity with medium confidence (Table 23).

Monitoring of cultured individuals of the closely related common sandfish, *H scabra*, shows an average age at sexual maturity of approximately 10 months post settlement, with animals of approximately 160 g already spawning. Studies assessing the histology of *H. scabra* using gonadal sections indicate that this species reproduces year-round in the Philippines and likely most of the Indo Pacific region.

Population intrinsic growth rate (r) has not been estimated for *H. lessoni* (nor indeed for any sea cucumber). As for population generation length (G), applying the most recent estimates of longevity, age at maturity and *M* for *H. lessoni* in New Caledonia (Djenidi, Purcell and Gossuin, forthcoming), allowed an estimation of generation length of 7 years using the IUCN generation length definition and calculation approach (IUCN, 2025). This estimated generation length is somewhat in contrast to estimates of generation length used in the proposal of several decades, which relies on empirical data on several other species in the order Holothuroidea, mostly citing tag-recapture studies that have indicated slow growth, low mortality rates and decadal longevity. Developing aquaculture projects for this species is likely to provide more information on some of these parameters in the future (Hair *et al.*, 2024).

2.2. Is the species' inherent productivity appropriately categorized (low, medium, high) for the purpose of applying the CITES biological listing criteria?

"Medium-High Productivity" is supported by consideration of the full range of life history parameters:
The proposal primarily used mortality estimates of 0.4 and 0.6 (Conand, 1989; Djenidi, Purcell and Gossuin, forthcoming) to assess productivity as Medium-High, stating that "One possible guideline for indexing productivity is the natural mortality rate, with the range 0.2–0.5 per year indicating medium productivity" (p. 9).

In this case, estimated parameters for *M* of 0.4–0.6 and age at maturity of 4.5 years indicate a medium to high productivity, while longevity of 15 years, growth rate *K* = 0.26/year, and the estimated generation length of 7 years is characterized as medium. The Medium-High productivity classification in the Proposal was adopted by the Expert Panel as Medium productivity for the purposes of setting conservative decline thresholds (Table 23.), with the Expert Panel taking a precautionary approach despite some of the metrics (and those of the closely related species, *H. scabra*) indicating a high productivity.

Section 3. Evaluation of species status and trends in relation to CITES criteria

3.1. In application of the CITES biological listing criteria is the best available status and trend information considered, and is it sufficient to support a confident and well-substantiated determination?

Data paucity on population estimates and stock status assessments:
There is no global population size estimate for *H. lessoni*, and population size data at the national level is mostly lacking (Table 24).

The proposal details population trends for *H. lessoni* from several range states, which are ascribed to overfishing (i.e. to service international trade, with some domestic consumption). Conand *et al.* (2013) note this species has experienced population declines of at least 50 percent throughout its global range over the past 30–50 years, based on very limited population trends information, and the assumption is that *H. lessoni* is equally affected by overfishing as *H. scabra* throughout its range (which has an estimated > 50 percent decline over the past 50 years). The Expert Panel considered these statements of declines which were centred on limited specific locations, and comparison with the common sandfish, inappropriate for extrapolation to infer an overall population trend across its range.

Species-specific decline records are available from other range states. Declines in the density of *H. lessoni* in New Caledonia decreased from 82 ind./ha in the mid1980s (Conand,1990) to 1.5 ind./ha in 2022 (Gilbert *et al.*, 2022), a decline of 98 percent. It is however not known if the survey footprint, methodology, or habitat coverage was consistent for the comparison. Density records also show a decline in several regions in Tonga between 2001 and 2016, although the data was patchy and one area showed an increase (Moore *et al*., 2017).

Losses of *H. lessoni* from survey records in the Seychelles and Madagascar are noted, even though Seychelles still supports a significant fishery for *H. lessoni* (but at a lower TAC) (Skewes and Long, 2022). The proposal highlights recent (2016–2018) data from Indonesia that indicate a very low density of *H. lessoni* (0.3 percent of all surveyed sea cucumbers), however, this is from a restricted number of sites –, 23 sites from the approximate 17 000 islands of Indonesia. One recent study in Maluku, Indonesia showed a high density with no corresponding evidence of decline *per se* (Pattinasarany and Manuputty, 2018). In Papua New Guinea, monitoring of fishing activities in 2017 after a 9-year moratorium was lifted, found that *H. lessoni* comprised 3.3 percent of the catch by number and 6.3 percent by volume(Hair *et al.*, 2018).

In Australia, the proposal (erroneously) misuses information from an inter-reefal survey to imply a decline in Torres Strait. No information for other regional fisheries in Australia were presented. New information from the Queensland East Coast fishery shows a stable trend in catch from 2007 to 2023 (data provided by Queensland Sea Cucumber Industry).

There are data gaps for most range states and generally there is much conflation of *H. lessoni* with *H. scabra* in fisheries data (even to this day). As noted by previous Expert Panels, trends in the documented trade flows do not necessarily reflect changes in species abundance in the wild, but can provide insights into harvesting trends, especially in data-limited contexts. It is common knowledge that sea cucumber stocks are susceptible to overfishing (Mercier *et al*., 2025), with the most valuable and accessible sea cucumber species at the greatest risk (Purcell *et al*., 2014).

Localized evidence of extirpation: At Ashmore Reef, a remote atoll reef on the edge of the continental shelf off the Western Australian coastline, *H. lessoni* is recorded as locally extinct due to heavy fishing pressure (Keesing and Bessey, 2025). This reef, which has historically been fished by Indonesian fishers, is isolated from replenishment from extensive coastal habitats of *H. lessoni*.

There are also some reliable indications of localized extirpation in Efate in Vanuatu (Ducarme, Dumas and Kaku, 2023) and in the north and east regions of Fiji (Preston, 2023). Note that the report of a local extirpation in Eastern Torres Strait, Australia, that is mentioned in the proposal is not supported by the data and is erroneous.

*3.2. What additional factors (*e.g. *vulnerability or resilience) should be considered in evaluating the species against the CITES biological listing criteria?*

There are a range of notable risk factors for *H. lessoni*, and sea cucumbers more generally, that may increase the risk of extinction or offer resilience.

Factors increasing the species' extinction risk:

- Poor understanding of the life history characteristics (e.g. fecundity, growth rate, age at first maturity) and poor knowledge of absolute numbers or biomass, selectivity of removals, age, size or stage structure of a population, social structure (e.g. sex ratio, etc.) makes assessment complex, while Allee ("depensatory effects") most likely negatively impact breeding success at low population densities.
- Ease of fishing and commodity storage with limited equipment. *H. lessoni* can occur in shallow waters at the depth for breathhold divers and it is easily processed into its dried form that be stored for extended periods without refrigeration (Purcell *et al.*, 2011).

- *H. lessoni* is considered one of the highest value tropical holothurian species, with an average price of USD 503/kg in China, Hong Kong SAR markets in 2022 (Purcell *et al.*, 2025) and demand is expected to continue to increase.
- The relative rarity of *H. lessoni* inherently increases vulnerability (Harnik *et al.*, 2012) as populations are more susceptible to the impacts of environmental changes, stochastic events or human activities (Musick, 1999; Courchamp *et al.*, 2006; Purcell *et al.*, 2014).

Factors increasing the species' resilience from extinction risk:

- Sea cucumbers have proven to have good resilience and recovery when overfishing ceases (Friedman *et al.*, 2011). The nature of echinoderm species in exhibiting rapid population growth has also been documented (Uthicke, Schaffelke and Byrne, 2009).
- There is the potential for enhancement of wild populations from developments in aquaculture for this species (Fonua and Gomez, 2019; Hair *et al.*, 2024).
- Juveniles are cryptic and are generally protected from exploitation (Purcell *et al.*, 2023).
- Some surrogate protection is gained from species at depths below 25 m. *H. lessoni* are generally found in deeper water than *H. scabra*, and remnant breeding populations are likely to exist in areas beyond ordinary breath diving snorkelers, although skilled breath hold divers can work to 50 m with fishing lines with a straightened weighted hook at the end.

On balance, it would appear that factors acting on global *H. lessoni* populations are likely to increase vulnerability overall.

Section 4. Management, conservation and potential impact of listing

4.1. Are national or regional management measures currently in place to conserve the species well described in the proposal?

National management:
Fishery management occurs predominantly at the national level, and regulatory measures are, for the most part, decided and implemented by national government fishery authorities. High exploitation and limited fishery data pose challenges to sustainable sea cucumber fishery management. The proposal provides a representative list of national management measures in several range states (noting that management regulations are also legislated for the other range states missing from the proposal, e.g. the Marshall Islands).

Two Pacific Island Territories report some successes in the co-management of sea cucumber fisheries between local communities and government in New Caledonia (Devez *et al.*, 2023) and French Polynesia (Stein, 2018). In French Polynesia, uncontrolled fishing for sea cucumber led to a production decline and the implementation of a national moratorium. In response, the government established a total allowable catch and restricted exports through a controlled channel. The introduction of harvest regulations for specific lagoons had several consequences: harvest rates sharply decreased where harvesting was allowed; product value increased because of the promotion of dried products; fishers processed the products themselves and benefited from the added value; wastage was reduced. Communities became involved and a database on harvested or marketed products by weight, number, species, and geographical origin was developed. There was a corresponding large decrease in fishing activity for many islands where previous harvests may have been unsustainable. In general, landings are held to much lower levels, but the value of the product increased 3–5 times that of the uncontrolled fishery. It should be noted that a major feature of the fisheries in New Caledonia and French Polynesia is the far higher capacity and resourcing of the respective fisheries authorities (being French Overseas Territories) to enforce management systems.

In Australia, there is an example of management leading the way in benchmarking stewardship for sustainable sea cucumber fisheries. A comprehensive harvest strategy for fished species includes a daily logbook monitoring programme, compliance strategies, a responsive harvest control rule (HCR), effort controls, gear limitations (hand collection), biologically appropriate and voluntary size limits, fishery dependent and fishery-independent indices, and model-based assessment methods (e.g. AFMA, 2019; DAF, 2021). Elements of the harvest strategies for each fishery are regularly discussed and updated at the species-level. In Queensland, compliance and management evaluation of the fishery is further controlled through the Queensland Sea Cucumber Working Group, which is an independent body comprised of scientists, managers, and policymakers that meets approximately quarterly.

The gold star standard for management recognition is Marine Stewardship Council (MSC) certification, which promotes sustainable practices in fisheries through the marketing of certified sustainable products (Davies, Quinn and Jardim, 2023; Cadrin and Nakatsuka, 2024). The world's only MSC-certified sea cucumber fishery is in Western Australia, targeting *H. scabra* and *Actinopyga echinites* using hand collection by diving (MSC, 2025). The reassessment for the sea cucumber fishery has shown that fishery-independent surveys provide reliable biomass estimates for a surveyed area, and that there has been substantial biomass recovery of these species to near unfished levels. In addition, the limited fishing effort and hand collection methods used make this a highly selective, relatively low impact fishery, with minimal impacts on the marine environment. Overall, the management system is effective for the size and scale of the fishery.

Regional or international management:
Currently, there are no regional or international management schemes for *H. lessoni* (or sea cucumber species in general), though it has been previously proposed that a similar arrangement to the Parties to the Nauru Agreement (established to manage tuna stocks and associated revenue) be established for Pacific range states. The Melanesian Spearhead Group (comprised of Fiji, Papua New Guinea, Solomon Islands, Vanuatu, and the Kanak and Socialist National Liberation Front of New Caledonia) have previously proposed several management measures, including the standardization of size limits across members.

Establishment, commercialization and management of sea cucumber aquaculture: There is a need to develop national and regional regulatory frameworks that formalize and support aquaculture production. This would include strengthened traceability systems that increase the visibility and market legitimacy of farmed products, including potential market differentiation for sustainable and legally sourced aquaculture products. Establishment of culture production (and restocking of habitats depleted of wild populations) requires incentives from government, including preparation of policy, reforms around licensing, monitoring, and site allocation.

4.2. Would a CITES listing likely enhance conservation outcomes for the species?

A CITES Appendix II listing for *H. lessoni* might lead to restrictions on legal trade, at least initially, due to difficulties in establishing an adequate basis for NDFs. Putting such measures in place could positively affect species status if controls on illegal trade were also enabled.

There are also a range of intergovernmental, governmental and nongovernmental organizations with remits across *H. lessoni*'s range that can promote and support the research and governance of sea cucumber fisheries by range states. In addition, the IUCN has established a Species Survival Commission Sea Cucumber Specialist Group that is working to assess the conservation status of sea cucumber species, while offering support for sustainable use and management of these renewable resources (Pollom, 2022).

Improved management could assist with realizing better financial returns from harvested sea cucumber species, including the proposed *H. lessoni,* if capacity development, ongoing training requirements, and budgetary needs were supported.

Pressing issues are increasing quality of information on the status of the fishery resources and on processing, as well as for the stakeholders to know trade values. Increasing awareness in the value of conservation of the resource would ensure fishers receive a more enduring and fairer share of value of these renewable resources.

4.3. Could a CITES listing lead to unintended positive or negative consequences for the species' conservation?

Challenges in "formalizing" trade: CITES offers an opportunity for improved governance of legal trade of *H. lessoni*. Experience with previous listing of sea cucumbers shows that illegal, unreported, and unregulated trade in sea cucumbers is common; this is expected to continue unless there is significant improvement in transparency, traceability, and surveillance along the value and market chain.

For range states with fewer resources and less capacity, difficulties in delivering a positive NDF have been reported. This shows that a need for greater investment in collection of stock status information is needed to prepare NDFs. To assist parties in the Pacific Islands region, the Pacific Community has produced an online electronic tool to help authorities prepare NDFs (Shedrawi *et al.*, 2019). However, currently there are no sea cucumber NDFs available to serve as templates for fishery managers despite sea cucumbers being listed under CITES for multiple years. Australia, have posted their NDFs for teatfish species and the *Thelenota* genus online, however the CITES NDF portal holds no sea cucumber NDFs[1].

An issue, however, is the ability of many range states, especially those that are regarded as developing, to service the provisions of CITES, particularly with having the capacity and resources to deliver the required positive NDFs and legal acquisition findings (LAF) required. From experience, even in countries like Australia, time delays occur, and significant costs are diverted from other much needed management to service these needs: for example, NDF implementation costs were in the region of USD 195 000 per species (Queensland Sea Cucumber Fishery, personal communication, 2025 Pers. Comm). Because of difficulties in complying with the Appendix II listing provisions, several range states may resort to banning all exports of species listed in CITES. Such trade bans typically outweigh benefits because of the growth of informal trade to meet market demands.

An important part of any fishery improvement program is the requirement for extensive education and awareness raising to be conducted along the whole value chain (fishers, buyers and exporters). Challenges exist, however, in transmitting information of changes in international governance (e.g. a CITES listing), especially to remote communities that are largely unaware of international trade controls (Herath *et al.*, 2019). In these cases, a CITES listing can negatively impact the livelihoods of poor and remote small-scale and artisanal fishing communities, even when their fishing practices are sustainable and legal. In many

[1] See https://www.dcceew.gov.au/environment/wildlife-trade/publications/non-detriment-finding-cites-thelenota-sea-cucumbers and https://www.dcceew.gov.au/environment/wildlife-trade/publications/non-detriment-finding-cites-holothuria-sea-cucumbers. The CITES portal (see https://cites.org/eng/virtual-college/ndf).

cases, fishers first hear about governance changes when they experience added hurdles to accessing legal avenues to market products already taken and processed into the dry form, bêche-de-mer. For disadvantaged communities, challenges in overcoming barriers to market opportunities can lead to unintended negative consequences for both livelihoods and the health of aquatic resources (as fishers turn to other forms of income to which they are not suited). In many cases, fishers turn to the informal economy, which makes their catches invisible to authorities except through compliance surveillance.

If, through technical assistance to national fisheries and conservation agencies, data on the status of *H. lessoni* populations were collected, collated, and shared on a national or regional basis, all range states would benefit from having a clearer understanding of how stocks respond to fishing pressures and would be provided with an opportunity to develop reference density estimates of what constitutes a healthy stock for a given species and location. This could be utilized on a regional basis to improve management.

International market changes impacting fisheries:
As a caveat on the benefit of CITES listing, Purcell *et al.* (2025) noted that an increase in retail prices of sea cucumber species exacerbated by trade restrictions from previous CITES listings of the teatfish group (*H. nobilis, H. whitmaei,* and *H. fuscogilva*) and *Thelenota* spp. (*T. ananas, T. anax,* and *T. rubralineata*) can lead to a shift in target species, leading to others being given consideration for CITES controls. Listing sea cucumbers on Appendix II needs to be combined with support for strengthened fishery management measures, resource monitoring by fishery managers, and appropriate support to comply with CITES requirements within the range states, as well as support for the introduction of livelihood alternatives for affected fishers.

Concerns for the establishment, commercialization and management of sea cucumber aquaculture
For aquaculture operations, challenges of a CITES listing include:

- restrictions on wild broodstock collection, which may hinder hatchery development in countries without domesticated lines;
- trade delays due to compliance burdens that disproportionately affect small-scale and remote operators;
- weak enforcement capacity in some countries, risking inconsistent implementation and market disruption;
- potential livelihood losses if aquaculture products are not clearly distinguished from wild catch, including hybrids; and
- ambiguity and confusion around practical implementation, particularly regarding product identification and documentation.

A potential shift of focus to increased mariculture of *H. lessoni* could be hindered (or potentially helped) by a CITES listing, noting that the extra governance requirements for trade in CITES species could deter or spur such investment in the future.

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TABLES AND FIGURES

Table 23. Expert Panel assessment of inherent productivity of *H. lessoni*

PARAMETER	INFORMATION	COMMENTS	CONFIDENCE	SOURCE
Distribution	Widely distributed in the Indo-Pacific.	Some gaps in this wide distribution (e.g. India, Sri Lanka report *H. lessoni* as being absent). No high confidence information on species population structure. Well covered in proposal.	Medium Distribution gaps could be related to naturally low density and/or misidentification issues.	CITES proposal; Muthiga and Conand, 2014
REPRODUCTION				
Sex ratio	Not mentioned in the proposal.	Was close to unity (57 percent male) in New Caledonia – as *H. scabra var versicolor* (Conand, 1989).	Medium-High	Conand, 1989
Spawning	Seasonal spawning in the warm season/s.	Few local studies. New Caledonia, Australia, Madagascar only.	Medium-High	Conand, 1989; Purcell *et al.*, 2023
Larval duration and feeding mode	12–40 days, Planktotrophic.	No direct studies. Based on likely similarity to sandfish.	Low-Medium	Tanita *et al.*, 2023
Fecundity	High (several million oocytes).	Limited data (12 specimens in New Caledonia).	High Likely to be consistent across range.	Conand, 1990
Size/age at maturity	22 cm and around 480 g, 2–5 years.	Few local studies. Recent research estimates size at maturity of 4.5 yrs (Djenidi, Purcell and Gossuin, forthcoming).	Medium-High	Conand 1989; Djenidi, Purcell and Gossuin, forthcoming
MORPHOMETRICS				
Growth rate	No growth rates mentioned in Proposal, only that it reaches 22 cm and around 480 grams in 2–5 years.	Recent research estimated a moderate rate (K = 0.26/year) after which it slowed. L_∞ reached in approximately 7–11 years (Djenidi, Purcell and Gossuin, forthcoming).	Medium-High	Djenidi, Purcell and Gossuin, forthcoming
Natural mortality	Estimates of 0.6 and 0.4 mentioned in Proposal, the first based on general principles and the later on a recent study.	Likely variable with age and spatially. Juveniles highly cryptic, so early growth especially uncertain. Recent research for *H. lessoni* in New Caledonia suggests *M* of 0.4 (Djenidi, Purcell and Gossuin, forthcoming).	Medium-High	Djenidi, Purcell and Gossuin, forthcoming
Longevity	Not reported in Proposal.	Recent research for *H. lessoni* in New Caledonia suggests 15 years (Djenidi, Purcell and Gossuin, forthcoming).	Low (proposal); Medium-High (new information).	Djenidi, Purcell and Gossuin, forthcoming
Generation length	Proposal says "Estimated at several decades on the basis of empirical data on several other species in the order Holothuriida", mostly citing tag-recapture studies that have indicated slow growth, low mortality rates and decadal longevity estimates (e.g. for *H. whitmaei*: Uthicke *et al.*, 2004; *Bohadschia argus* and *Thelenota ananas*: Purcell *et al.*, 2016; and *Pearsonothuria graeffei*: Hammond and Purcell, 2023).	Using recent estimates of longevity, age at maturity and *M* for *H. lessoni* in New Caledonia (Djenidi, Purcell and Gossuin, forthcoming), estimated Generation Length is 7 yrs using IUCN calculator.	High (using new information).	Djenidi, Purcell and Gossuin, forthcoming
Average weight/ length	–	A recent study from 23 locations across Indonesian waters estimated the average length 13.14±5.70 cm, and average weight 102.45±92.09 g (Setyastuti *et al.* 2024).	–	Setyastuti *et al.* 2024
Max weight/length	No information listed	No information found.	–	–
Habitat	Inhabits a variety of shallow-water environments up to 30 m depth	Habitat preferences poorly understood. Generally inshore species. Juveniles likely have different habitat requirements. Small home range (< 20 m/year) for adults in New Caledonia (Djenidi, Purcell and Gossuin, forthcoming).	Low	Purcell *et al.* 2023; Djenidi, Purcell and Gossuin, forthcoming

Table 23 (Cont.)

PARAMETER	INFORMATION	COMMENTS	CONFIDENCE	SOURCE
PRODUCTIVITY	The proposal primarily used known mortality estimates of 0.6 and 0.4 to assess productivity as medium-high (based mostly on Resolution 9.24 (Rev. CoP17) that states that "One possible guideline for indexing productivity is the natural mortality rate, with the range 0.2–0.5 per year indicating medium productivity" (p. 9)	The recent estimate of *M* of 0.4 (Djenidi, Purcell and Gossuin, forthcoming) would indicate a medium Productivity.	Medium	Djenidi, Purcell and Gossuin, forthcoming
VULNERABILITY	The proposal states that "Holothurians are therefore generally believed to be vulnerable to overfishing, Studies suggest that sea cucumber populations can experience slow recovery after depletion due to a low density of spawners, reduced larval supply from another depleted population or naturally infrequent recruitment (Uthicke, 2004; Bell *et al.*, 2005)." (Purcell, 2010; Conand *et al.*, 2024; Mercier *et al.*, 2025) They also point to vulnerability related to climate change and impacts to seagrass beds, a critical habitat for juveniles.	–	Medium	Purcell, 2010; Conand *et al.*, 2024; Mercier *et al.*, 2025.
IUCN CLASSIFICATION	Classified as endangered (EN) by the IUCN.	IUCN classification based on a limited number of studies indicating > 50 percent decline and slow recovery, but also on similarity with Sandfish which are also classified as EN (with substantially more data).	Low-Medium	Conand *et al.*, 2013.
DENSITY AND TRENDS				
Density trends	There is no global population size estimate for *H. lessoni*, and population size data at the national level is mostly lacking. Proposal says *H. lessoni* populations across many range States have significantly declined. In New Caledonia, population density was > 100 ind./ha at 14 sites in the 1980s, with an average density of 82 ind./ha (Conand,1990). In 2007–2008, it was found at only 3 of 50 surveyed reef locations, and in 2022 it had a low overall density of 1.5 ind./ha (Gilbert *et al.*, 2022). Density had similarly declined in Tonga. Low density (with no corresponding evidence of decline per se) has been documented in Fiji, Samoa, Solomon Islands, Papua New Guinea, the Philippines and Vanuatu. A lack of recovery from low density was noted in Tonga, even after a 10 year closure. In Australia, the proposal (erroneously) misuses information from an inter-reefal survey to imply a decline in Torres Strait. No information for other areas, apart from Ashmore Reef off the Western Australian coastline, where it is likely to be driven locally extinct by heavy fishing pressure.	Lack of studies showing actual density decline reduces confidence in assessments based on trends data (e.g. stock status, conservation status). Conflation with *H. scabra* in fishery data (even to this day) is not helpful. Low overall density across range states is used as an indicator of depletion – while also acknowledging that *H. lessoni* appears to be a naturally low-density species. The proposal highlights recent (2016–2018) data from Indonesia that indicates a very low density of *H. lessoni* (0.3 percent of all surveyed sea cucumbers), however, this is from a restricted number of sites – only at 23 of approximately 17 000 islands (0.001 percent). In addition, at least one recent study in Maluku, Indonesia, showed a high density – 908 individuals were recorded in 2017 (Pattinasarany and Manuputty, 2018). The Queensland East Coast fishery shows stable trend in catches over 2007–2023 (data provided in confidence by Queensland sea cucumber industry).	Low-Medium	See CITES listing Proposal; Manuputty, 2018

Table 24. Abundance and density data from selected surveys of *H. lessoni*

Coverage	Indicator/Period	Abundance	Confidence	Sources
New Caledonia	1980s	82 ind./ha	High	Conand, 1990
New Caledonia	2021–2022	1.5 ind./ha	High	Gilbert *et al.*, 2022
Tonga (Ha'apai)	2014 and 2016	0.12–0 ind./ha	Medium	Moore *et al.*, 2017
Samoa	2019	0.7 ind./ha (125 sites)	High	Shedrawi *et al.*, 2021
Tonga (Tonga'tapu)	2010–2011 and 2016	3–5 ind./ha	Medium	Moore *et al.*, 2017.
Vanuatu (Avokh Island)	2011	6.53 ind./ha	High	Pakoa, Bertram & Teri, 2014
Solomon Islands	2010–2011	333.3 ind./ha in Star Harbour, 2.5 ind./ha in West Guadalcanal, 1.2 ind./ha in Marau (nonMPA), 2.1 ind./ha) in Chubikobi, 22.4 ind./ha in Taro, 5.2 ind./ha in Tapazaka and 6.9 ind./ha in Santa Cruz	High	Pakoa *et al.*, 2014
Madagascar (Beankiho)	2008	17 ind./ha	High	Muthiga & Conand, 2014

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FAO EXPERT ADVISORY PANEL ASSESSMENT REPORT PROPOSAL 39: South African abalone (*Haliotis midae*)

This proposal is for the inclusion in Appendix II of South African abalone (*Haliotis midae*) with an annotation "dried specimens only" under Annex 2 a, Criterion A and Criterion B.

EXPERT PANEL RECOMMENDATION

PROPOSAL 39	MEETS CRITERIA	DOES NOT MEET CRITERIA	OTHER
South African abalone (*H. midae*)	–	X	–

The Expert Panel concludes that the best available scientific data and technical information presented in CoP20 Proposal 39 on South African abalone (*H. midae*) with an annotation "dried specimens only" does not meet the criteria for listing in Appendix II.

The species is endemic to South Africa but occurs in large numbers along extensive stretches of coastline (> 1 000 km), supports a socioeconomically important aquaculture and ranching sector and is assessed as having medium productivity. International trade of illegally caught abalone is the primary reason for decline in abundance (in places exacerbated by a regime shift effect), and some localized depletions are of concern. However, there is insufficient evidence provided to be able to conclude that the stock as a whole has been reduced below the Appendix II extent of decline threshold specified in the CITES Listing Criteria for a medium productivity species.

A CITES listing could in principle assist in reducing further stock declines by increasing disincentives for illegal take. However, there is insufficient evidence presented that a "dried specimens only" listing would be effective given a number of challenges identified, including concerns that it could inadvertently disadvantage legal operations in the wild and thereby fuel further illegal activity.

MAIN SUPPORTING INFORMATION

Section 1. Fishery, trade and utilization

1.1. Is the nature and scale of international trade well described?

The description of the fishery and trade is general, but also insufficient and arguably misleading at times because it is based on an incomplete analysis which also includes mainly old and dated references. The description does not evaluate or acknowledge the severe lack of up-to-date published knowledge on the status of fishery and abalone stocks, nor does it include any up-to-date information from consultations on the abalone fishery status and management with key stakeholders such as the management authority, abalone researchers and industry associations. This leads to some questionable conclusions in the proposal about the status and current management of the fishery.

An important issue is that the large geographical scale (> 1 000 km) of abalone habitat is not mentioned, nor are the differences between the distinct Eastern and Western Cape abalone subpopulations in terms of life history parameters, population dynamics and fishery characteristics.

In critical places, the Proposal uses questionably justifiable strong language in relation to the conservation status of the stock. For example, the impacts of illegal fishing are described as "devastating" on the abalone population. It is also stated that *H. midae* is under "high risk of extinction" given its IUCN Endangered listing, a conclusion which implies widespread recruitment failure. Both conclusions are not justified by the literature cited.

1.2. How significant is the threat of international trade to species in the wild?

International trade is the most significant threat to the species in the wild, as there is too low a demand for abalone within South Africa for that to be a serious threat. However, the predominantly illegal trade needs to be understood in terms of the failure of the fishery governance system to create an equitable and sustainable management system for what is a very valuable fishery with a high level of production that could generate substantial legal socioeconomic benefits. While the proposal focuses on a CITES listing as a management option to restore a legal and sustainable fishery, there is no balanced assessment of its potential efficacy in the context of the suite of other management options available.

1.3. What is the importance of the species in local livelihoods and economies?

South African abalone is a highly prized delicacy, especially in East Asian markets, making *H. midae* a valuable commodity for contributing to coastal economies in South Africa. In China, dried abalone is considered the most prestigious and traditional form; associated with luxury, wealth and important cultural events (e.g. weddings, Lunar New Year).

The abalone aquaculture sector provides jobs, particularly in rural coastal communities where alternative employment is limited. With one job generated per ton of farmed abalone, the South African abalone subsector remains the largest aquaculture employer, employing approximately 2 460 people in 2021 in the primary production segment (DFFE, 2023).

Commercial abalone farming and ranching are major economic contributors, offering a legal, sustainable supply that helps relieve pressure on wild stocks. Legal exports bring in substantial foreign exchange, contributing to national and regional economies.

Ranching combines conservation with income generation, supporting both wild stock recovery and economic activity. The potential for impoverished rural coastal communities to benefit economically from abalone ranching is high.

The economic importance of *H. midae* means that conservation efforts need to balance ecological sustainability with socio-economic realities. The proposal does not adequately consider the possible unintended implications for legal aquaculture and ranching. For example, there is no consideration of whether the sale of dried abalone from ranching areas where the wild population has been restored to provide a sustainable harvest will be negatively affected.

Section 2. Inherent biological productivity

2.1. Are inherent biological traits relevant to the species' productivity and resilience well described?

The distinct biological traits of the Eastern Cape and Western Cape abalone populations are conflated in the proposal. For example, Eastern Cape abalone in warmer water mature at 2–3 years of age (50–60 mm shell length), compared to 7 years for the Western Cape population in colder water, but the proposal assumes 7 years for the calculation of the population generation time.

The proposal cites references for mainly the Western Cape abalone subpopulation dynamics, which leads to a misrepresentation of the Eastern Cape abalone population status and dynamics. For example, in the Eastern Cape, the highly productive 20 km strip from Cape Recife to Schoenmakerskop at Port Elizabeth has been restored by abalone ranching and protection, resulting in a 53 tonnes TAC being allocated by DFFE in 2021. Similarly, the proposal states that abalone populations in all MPAs have been depleted including the Bird Island MPA in Algoa Bay, Eastern Cape. Bird Island was historically a hotspot for illegal fishing, but such fishing at Bird Island was effectively eliminated when SANParks incorporated the island into the Addo Greater National Park and appointed an anti-illegal fishing team in 2010. Surveys at Bird Island indicate that recruitment has been healthy (Raemaekers, 2009).

The proposal does not indicate the vast and variable habitat of *H. midae* which spans 780 km for the Eastern Cape and around 300 km for the Western Cape populations. These regions are characterized by areas of high productivity (which form the basis for fishing areas with TACs and scientific studies) interspersed with much smaller often not easily accessible abalone populations wherever there is suitable subtidal reef. These last-mentioned areas are for the most part not economically attractive or accessible to illegal fishers – particularly in the Eastern Cape. Thus, the abalone subpopulations are highly variable in size and localized over a vast area. There are heavily depleted areas in the traditional fishery TAC regions of the Western Cape, but also many subpopulations are in a relatively healthy state in the Eastern Cape.

2.2. Is the species' inherent productivity appropriately categorized (low, medium, high) for the purpose of applying the CITES biological listing criteria?

The proposal did not categorize the inherent productivity and hence the panel summarized the best available information as per Table 25, resulting in an overall medium productivity assignment.

The panel noted that there is geographic variation in life history parameters, given that these depend on environmental and habitat conditions, and considered the plausible range of values across the species distribution.

The panel also discussed broader indicators of the productivity, resilience and recovery potential of the resource (see Table 25).

Section 3. Evaluation of species status and trends in relation to CITES criteria

3.1. In application of the CITES biological listing criteria, is the best available status and trend information considered and is it sufficient to support a confident and well-substantiated determination?

No, the best available status and trend information is not used as the wild fishery has a long history of being monitored and quantitatively assessed, yet the fishery department reports and stock assessments are not directly cited as the basis for a status determination. Rather, the primary reference cited is Peters, Ralph and Rogers-Bennett (2024). This is a general overview of abalone stocks worldwide which uses inappropriate language to describe stock status scientifically by using phrases such as "almost to a footnote" (p. 1). The proposal does include several relevant references, particularly related to illegal fishing, but there are gaps in fully substantiating claims made as well as statements related to stock status, rates of decline or extinction.

The commentary related to the Betty's Bay MPA being the main MPA for *H. midae* conservation cites a dated paper (Tarr 1993), with considerable subsequent research having shown that other management actions were necessary there because of an ecosystem range shift by rock lobsters that was responsible for the decline of abalone across part of its range – that is, a separate and cumulative effect in addition to illegal fishing (e.g. Plagányi, Butterworth and Burgener, 2011; Blamey, Branch and Reaugh-Flower, 2011).

There is a paucity of information provided related to the eastern component of the population, especially given that approximately half the illegal catch may derive from this component.

Although there is sufficient information provided to substantiate both trends in and the magnitude of the illegal catch, there is insufficient provided to confidently assess the impact of a listing decision on the other affected sectors (wild, aquaculture) or its potential efficacy in reducing illegal fishing.

3.2. Do the scientific data and technical information on historical extent of decline and the recent rate of decline in conjunction (Appendix II) meet the CITES biological listing criteria?

Based on current scientific evidence and the CITES listing criteria, *H. midae* does not meet the criteria for Appendix II – the applicable extent of decline criterion is 10–15 percent for species with medium productivity. The species is relatively long-lived but overall has medium productivity (higher in some regions), and stock assessments are above the specified thresholds.

The species is endemic to South Africa but also occurs in over a thousand kilometres of coastline. There is a clear link between international trade and population decline because most of the decline is due to the trade of illegally caught abalone. There are no updated data or stock assessments available for the recent period (since 2016) and illegal fishing has been continuing; hence it is possible that *H. midae* may now meet the decline criteria, but this cannot be determined conclusively based on the information provided. Although the declines are largely due to illegal fishing (and therefore trade-related), a regime shift has exacerbated declines across a small part of the range of *H. midae* (local depletion), but the associated rates of decline are independent of international trade.

The proposal states without substantiation that "Since 1990, *H. midae* has suffered a 90 percent reduction in abundance" – this is inconsistent with the most recent stock assessments for the main Zones A–D (Brandão and Butterworth 2016) with the exception of Region C, for which a regime shift effect is recognized as having contributed to the decline (e.g. Blamey, Branch and Reaugh-Flower, 2011; Blamey, Plagányi and Branch, 2013, 2014).

H. midae declines have been variable across the range due to a combination of illegal fishing and the regime shift. There have certainly been large declines in some regions in the past, most notably over 1995–2005 as a result of illegal takes in combination with the lobster range shift The Brandão and Butterworth (2016) assessment estimated depletion for Zones A–D respectively as 25 percent, 23 percent, 8.5 percent and 20 percent of their pre-exploitation levels. However, these levels (with the exception of Zone C – which includes the Betty's Bay MPA) are above the CITES extent of historical decline threshold. With illegal fishing ongoing, it is possible that the stock has declined further since then, but any inferences in that regard would first require further analysis.

From Figure 8 in the proposal document, it follows that the estimated annual amount of abalone caught illegally has remained approximately constant from 2014 to 2021 (being sourced from stocks around the country). This, together with some level of increase relative to the 2005–2013 period, suggests that the stock has not decreased to very low levels across the full geographic range – i.e. there have been fairly consistent illegal catches, noting that model estimates (which were validated against trade data) suggested a range of 900–1 700 tonnes annually (1995– 2008) (Plagányi, Butterworth and Burgener, 2011) and 1 100 tonnes in 2016 (Brandão and Butterworth 2016) from the Western Cape, with a similar quantity from the Eastern Cape (Raemaekers and Britz 2009). There consequently seems to be a conflict in the information available: if the reduction in the abalone population has been greater than 90 percent from the time when there was a 500 tonnes commercial fishery, how then can the resource have supported a 2 000 to 3 000 tonnes illegal fishery over a substantial period? In other words, one cannot have both an illegal fishery continuing at 2 000 to 3 000 tonnes per annum, and a reduction of 90 percent in densities on a broad geographic scale at the same time. This strongly suggests that there still needs to be substantial wild stock present to support the illegal fishery; any contrary explanation would need to be backed by a credible population dynamics model fitted to the data.

Growth rates of *H. midae* along the west coast (i.e. northwest of the main A-D Zones of the Western Cape) are known to be slower than in those main Zones. The west coast has historically been considered a less productive region of the fishery, although some stock assessments have been attempted.

Stocks along the South African southeast coast are also generally considered to have declined in response to illegal fishing but their exact stock status is unclear, noting also that the growth rates are faster in the east and that these stocks have supported a large illegal fishery over recent decades.

*3.3. What additional factors (*e.g. *vulnerability or resilience) should be considered in evaluating the species against the CITES biological listing criteria?*

There are a range of notable factors that influence *H. midae*'s vulnerability and resilience:

Vulnerability
The biology of abalone makes it susceptible to an Allee effect negatively impacting recruitment at lower abundances. Such "depensatory effects" negatively impact population growth at low densities more than for most animals.

Resilience
The life history style and habitat of *H midae* appears to impart an inherent resilience to fishing pressure. Thus, while a large portion of its population biomass of emergent adults (that had been banked over more than 20 years of recruitment) may have been removed, the consistent illegal fishery yield indicates that recruitment and substantial production of emergent harvestable abalone continues. Specific characteristics include:

- Abalone is a mass spawner with pelagic larval dispersal. Thus, small patches of abalone inaccessible to fishing can provide recruitment over a relatively large area.
- There is a cryptic juvenile phase until 70–100 mm shell length (0–4 years old). Thus, small abalone in crevices and under rocks are not accessible to fishers. When an area is depleted of emergent abalone, these small abalone gradually grow and emerge.
- The abalone population consists of widespread scattered populations over a > 1 000km range, many of which are inaccessible or not economically attractive to fish due to the remoteness, small size or location in high energy wave zones.

Section 4. Management, conservation and potential impact of listing

4.1. Are national or regional management measures currently in place to conserve the species well described in the proposal?

The description of fishery governance and management does not evaluate or acknowledge the severe lack of up-to-date published knowledge on the status of fishery, abalone stock status, and recent management developments. Specific points in this regard are as follows.

The proposal lacks a coherent description and analysis of the governance of the fishery, the reasons for failure of the rights-based TAC fishery management system and what recent management innovations (or lack thereof) have occurred. Although the consistent illegal catch of 2 000–3 000 tonnes is well referenced (which is "50–60 times the legal TAC") there is no evaluation of why the governance of the most productive wild abalone fishery in the world has failed to create a sustainable, equitable and profitable legal management framework. For example:

- There is no analysis of why the TAC is no longer an effective management instrument and what the short-comings of the traditional quota management system are (e.g. nonviable quotas and no incentive or powers for quota holders to protect and rebuild the resource).
- The apparent resilience of the abalone population to sustained uncontrolled fishing effort, as evidenced by the consistently high illegal fishery yield of 2 000–3 000 tonnes for over 20 years, is not discussed.
- There is no evaluation of how the abalone ranching system is a promising management remedy to stop illegal fishing and re-establish a legal and sustainable fishery (e.g. the successful protection leading to restoration of the 18 km ranching zone at Port Elizabeth which was allocated a 53 tonnes TAC in 2021) (Witte, 2022).
- The "compulsory specification" standard for the export of dried abalone which is about to be implemented as an instrument to curtail the export of illegal abalone is not discussed. This is an important management instrument negotiated between government and the abalone culture industry, which will potentially have a similar effect on international trade to the proposed CITES listing.
- There is a singular focus on the CITES listing as the only management option to restore a legal and sustainable fishery, with no balanced assessment of its potential efficacy in the context of the suite of other management options available.

The proposal does not acknowledge that dried abalone is one of the main legal aquaculture products: The Proposal states that "most of this abalone produced is exported in fresh, frozen or canned form", and omits mention of legal dried abalone. However, the DFFE Aquaculture Yearbook (2023) states that smoked and dried *H. midae* are the most traded types with China, Hong Kong SAR which imported 77 percent of the legal 2021 export value.

4.2. Would a CITES listing likely enhance conservation outcomes for the species?

It is uncertain that a CITES listing of dried abalone would enhance the conservation outcomes of *H. midae*. In principle it should assist, but in practice there are various challenges:

- Illegally taken abalone are typically declared as a legal product (having been diverted through a third country), especially for money laundering purposes. The CITES listing could well result in illegally taken abalone not being declared as an import into China, Hong Kong SAR, and push the illegal trade directly into black markets. Effective implementation of the listing will require on the ground education, enforcement and buy in at the retail level throughout China and the other receiving countries. The practicality of successful implementation of this are not considered in the proposal.

- Compliance burdens for legal producers with small-scale aquaculture or ranching businesses may face delays or additional costs to meet CITES permit requirements, harming livelihoods.
- In terms of distinguishing between legal and illegal dried abalone, there is potential duplication between the proposed CITES listing and the South African compulsory specification for the export of farmed dried abalone. The preferred instrument of the abalone farming industry is the compulsory specification (J. Heckroodt, CEO, Abalone Farmers Association of South Africa, personal communication, 12 July 2025).
- A CITES listing for dried abalone could possibly enhance conservation outcomes by closing key regulatory gaps and improving trade transparency, but it would need to be carefully implemented. Without robust enforcement, source ID capacity, and support for legal producers, the listing could inadvertently disadvantage sustainable operations and thereby further fuel illegal activity.

4.3. Could a CITES listing lead to unintended positive or negative consequences for the species' conservation?

A potentially positive outcome of a CITES listing would be the increased opportunities to control documented import of dried *H. midae* from countries other than South Africa, thus dis-incentivising trade through illegal supply routes.

Potential negative consequences include:

- Under an Appendix II listing, a legal acquisition finding (LAF) and a non-detriment finding (NDF) would be required for legal export. Currently, legal harvesting is permitted in certain areas. However, it is unknown whether the more qualitative assessments of the status of abalone stocks applied for those areas would be sufficient to satisfy a NDF. Furthermore, in practice, such a listing will result in substantial NDF development requirements. Due to capacity and time constraints, this will likely result in much of the wild fishery being closed in the Western Cape, even in legally harvested areas where a conservative take is being well managed. Similarly, the ranching fishery in the Eastern Cape may also need to be closed, at least in the interim while an NDF process is formalized and completed.
- An absence of legal fishers, who are protective of their resource, is likely to result in increased illegal fishing. Conversely, empowering legal fishers with an economically viable TAC, and the right to protect their stock against illegal operators, has been demonstrated to lead to the suppression of illegal fishing and a sustainable legal catch. The restoration of the abalone population through ranching at Cape Recife, Eastern Cape Province, which resulted in the allocation of a 53 tonnes TAC provides a good example of this (Witte, 2022).
- A CITES listing would remove this option arising from aquaculture and ranching practices, potentially leading to loss of income and resentment toward conservation efforts.
- Anticipation of trade restrictions can lead to stockpiling, creating artificial scarcity, and thereby inflating market prices and encouraging illegal harvesting.

A balanced approach that combines trade regulation with local stewardship and economic alternatives is essential.

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TABLES AND FIGURES

Table 25. Expert Panel assessment of inherent productivity of *H. midae* as medium productivity based on available information for both western and eastern components of the total population

Parameter	Value	Productivity	Notes	Source
M at age	0.14–0.33	Low-Medium	Zones A-D: 0.33/year for 0-year old *H. midae* through to 0.14/year for age 11; Eastern areas will be towards higher end of this range	Plagányi & Butterworth, 2010.
r	–	–		
k (von Bertalanffy)/year	0.186–0.249	Medium	Based on estimates from Betty's Bay, Robben and Bird Island	Tarr, 1995.
t_{mat} (years)	7	Medium-High	Range for western and eastern stocks	Tarr, 1995; Wood & Buxton, 1996.
t_{max} (years)	> 25	Low-Medium		Tarr, 1995.
G (years)	> 10	Low-Medium	Computed using suggested method: *G* = Age at First Reproduction (*AFR*) + 1/Adult Mortality Rate (*M*)	This panel based on above.
Other resource productivity indicators	–	Medium	Broadcast spawners but potentially Allee effects at low densities; spawn more than once; endemic but wide distribution around South African coast and for a range of depths; long history of consistently sustaining legal and illegal catches, and although some of this represents serial depletion, overall it suggests an underlying productivity that is substantial	This panel.

Sources: Plagányi, É.E. & Butterworth, D.S. 2010. A spatial- and age-structured assessment model to estimate the impact of illegal fishing and ecosystem change on the South African abalone *Haliotis midae* resource. *African Journal of Marine Science*, 32(2): 207–236; Tarr, R.J.Q. 1995. Growth and movement of the South African abalone *Haliotis midae*: a reassessment. *Marine and Freshwater Research*, 46(3): 583–590; Wood, A.D. & Buxton, C.D. 1996. Aspects of the biology of the abalone *Haliotis midae* (Linné, 1758) on the east coast of South Africa. 2. Reproduction. *South African Journal of Marine Science*, 17(1): 69–78.

APPENDIX A

TERMS OF REFERENCE FOR AN "AD HOC EXPERT ADVISORY EXPERT PANEL FOR ASSESSMENT OF PROPOSALS TO CITES" (FAO, 2003)

1. FAO will establish an Ad Hoc Expert Advisory Expert Panel for the Assessment of Proposals to Amend CITES Appendices I and II.

2. The Expert Panel shall be established by the FAO Secretariat in advance of each Conference of the Parties, according to its standard rules and procedures and observing, as appropriate, the principle of equitable geographical representation, drawing from a roster of recognized experts, to be established, consisting of scientific and technical specialists in commercially exploited aquatic species (CEAS).

3. The Expert Panel members shall participate in the Expert Panel in their personal capacity as experts, and not as representatives of governments or organizations.

4. The Expert Panel will consist of a core group of no more than 10 experts, supplemented for each proposal by up to 10 specialists on the species being considered and aspects of fisheries management relevant to that species.

5. For each proposal the Expert Panel shall:

- 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; and
- 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.

6. In preparing its report, the Expert Panel will consider the information contained in the proposal and any additional information received by the specified deadline from FAO Members and relevant regional fisheries management organizations (RFMOs). In addition, it may ask for comments on any proposed amendment, or any aspect of a proposed amendment, from an expert who is not a member of the Expert Panel if it so decides.

7. The Advisory Expert Panel shall make a report based on its assessment and review, providing information and advice as appropriate on each listing proposal. The Expert Panel is requested to finalize the advisory report by X, X days before the start of the CITES Conference of the Parties where the proposed amendment will be addressed. The advisory report shall be distributed as soon as it is finalized to all Members of FAO and to the CITES Secretariat with a request that they distribute it to all CITES Parties.

8. The general sequence of events will be as follows:

- Proposals received by CITES;
- Proposals forwarded by CITES Secretariat to FAO;
- FAO forwards proposals to FAO Members and RFMOs and notifies them of deadline for receipt of comments;
- Member and RFMO comments and input received by FAO;
- Expert Panel meets and prepares advisory report on each proposal; and
- Expert Panel report reviewed by FAO Secretariat, published and forwarded to FAO Members, RFMOs and CITES Secretariat.

APPENDIX B

LIST OF EXPERT PANEL MEMBERS, OBSERVERS, AND FAO STAFF PARTICIPANTS

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The Eighth FAO Expert Advisory Expert Panel for the Assessment of Proposals to Amend Appendices I and II of CITES Concerning Commercially-exploited Aquatic Species was held at held at the FAO Regional Office for Asia and the Pacific from 7 to11 July 2025 and FAO headquarters from 21 to 25 July 2025. 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 to the endorsement of 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 assess each proposal from a scientific perspective in accordance with CITES biological listing criteria (Resolution Conf. 9.24 [Rev. CoP17]; and 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 eleven proposals submitted to the Twentieth Conference of the Parties to CITES.

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