MODULE 5: AQUATIC SPECIES

Contents

1. What is in this module?

This module provides additional details to support the making of NDFs for aquatic species, of which there have been increasing number of species listed in the CITES Appendices over the last three decades. It is complementary to the generic guidance contained in **modules 1** and **2**. Ensuring harvest and associated trade in aquatic species is legal, sustainable, and traceable can pose unique challenges for Parties based on life-histories, modes of trade and storage, and the fact that many people that rely on these species for their livelihoods often have limited resources.

1.1. NDFs for aquatic species

While the theoretical considerations underpinning NDF evaluations are the same, there have been different approaches developed to put NDFs into practice covering many of the aquatic species listed in CITES Appendix II. These are intentionally generic because they need to apply to many Parties, each with different situations and limitations. It is for Parties to decide which parts are appropriate and practical for their situation, and what thresholds are appropriate to determining the outcome of the NDF, so as to maintain or recover the species to well above the thresholds that meet CITES Appendix I criteria. It should be noted that fisheries, environmental, and other relevant authorities may already have relevant thresholds in place. One key consideration will be the availability, and reliability, of data. The availability of data is often hugely variable depending on the species and/or the Party making the assessment. For example, risk assessments may be more practicable to inform NDFs in situations of low data availability or certainty, whereas more comprehensive approaches can be used when more robust data (e.g., stock assessments) are available (see **Module 14 section 3.2**).

Different approaches to making NDFs can also be complimentary. For example, fisheries stock assessments can provide information on population abundance and trends, contributing to scientific advice used for managing fisheries. In addition, providing information on species' status, risk and/or conservation may also guide understanding on the likely vulnerability of fish stocks, with both fisheries and biodiversity conservation assessments providing complementary information to guide understanding on the likely status of the species.

NDFs can be made in data-limited situations, and – using conditions to improve data collection and adaptive management – Scientific Authorities can improve their assessments as they learn more. The more populations are under pressure, the more likely it is that NDFs will need to be revised. Further, the less confident Authorities are about the quality of information used in their assessment, the more precautionary they should be when assessing risk.

The NDF process for aquatic species requires coordination within countries - among local governments, ministries and agencies - between countries, and across relevant multilateral bodies (e.g., CITES, CMS, Regional Fisheries Bodies (RFBs) and in some regions, Regional Seas Conventions and Action Plans). Fisheries and aquatic biodiversity bodies need to play a central role in implementing CITES for relevant species, regardless of whether they are the designated national CITES Authorities. In particular, it is widely recognised that the engagement of

RFBs is of particular importance for the management of shared and straddling stocks of CITES-listed species (see **section 3.9**). Harmonising language and data collection methodologies used by fisheries and conservation bodies would support such coordination, not least because CITES Scientific Authorities are required to be able to interpret, compare, and/or analyse such data when undertaking NDFs. Data sharing among relevant government agencies would also support CITES implementation for listed species. Further, Authorities can partner with external stakeholders (academia, NGOs, etc.) to collect and analyse information, then collaborate on NDF assessments.

The importance of the species' role in the ecosystem has not yet been explicitly considered in existing NDF guidance for aquatic fauna. Generic guidance is provided in **module 1** and **2**, but developments specific to aquatic species would be helpful.

Table 5A summarises key considerations in relation to carrying out NDFs for aquatic species listed in CITES Appendix II. These are expanded on in **Section 2** onwards, and even further in the documents referenced throughout this guidance.

There have been several different approaches for putting NDFs into practice, but the considerations underpinning those NDF evaluations are the same. This table outlines these considerations, and summarises the key take home messages relevant to aquatic species that are discussed in more detail throughout **module 5** (noting that generalities are covered in other relevant thematic modules).

Table 5A. Key considerations for making NDFs for CITES Appendix II-listed aquatic species.

Considerations		**Aquatic take home notes/considerations**	**Relevant section of module 5**
Determine if an NDF is needed (pre-check)	Species ID	NDFs should be made at species level, with the scientific name agreeing with the CITES standard nomenclature. However, while it has been recognized that there may be cases where making the decision at the genus level is the only practical option; this should be the exception and not the norm. If the genus contains species known to be at different risks of extinction, or has some species more vulnerable to off-take than others, then suitable precautionary conditions will need to be applied to reduce the risks. Further, it will be important to ensure species specific data collection to ensure NDFs can be segregated as soon as possible (e.g., via traceability/monitoring schemes).	**Section 3.10**
	Is there a Legal acquisition Finding (LAF)	While making LAFs is a separate process to making NDFs, it is useful for Scientific Authorities to confirm that the LAF has been done, before developing an NDF. For example, Parties need to consider domestic laws (e.g., whether species are protected/conserved, catch suspensions/bans, fishing regulations, marine protected areas, etc.) as well as agreements they have committed to under other conventions (e.g., CMS), and regional fishery bodies (RFBs). If there is no LAF, export cannot take place, and precludes the need for an NDF.	**Section 3.6**
	Is export nationally prohibited or subject to CITES processes (e.g. Review of Significant Trade (RST))	Some Parties have stricter domestic measures that prohibit export of Appendix II species. In other cases, there may be recommendations to suspend trade resulting from CITES processes (e.g., RST).	
Determine the source of the specimens	Origin	It is important to know where the specimens were or will be caught - NDFs should ideally be issued before the specimens are taken – this helps informs LAFs (addressed above), but also what NDF processes need to be considered in cases of introduction from the sea (IFS) and international transshipment.	**Section 3.9**
	CITES source code	NDFs need to be made for all source codes other than O (pre-convention). Source codes need to be correctly identified on permits. Source code W (wild) is the most commonly used source code for aquatic species.	**Section 3.11**

Considerations		Aquatic take home notes/considerations	Relevant section of module 5
		CITES is reviewing source code R and its applicability to aquatic species. IFS is used for catches on the high seas (ABNJ) involving a single State. Source code X (specimens taken from the marine environment not under the jurisdiction of any State) is unique to aquatic species – and applies to specimens caught on the high seas (ABNJ), whether it involves a single State (i.e., IFS) or is caught on the high seas by one State and imported into another.	
Assess the vulnerability of the species/ population/ stock	Biological vulnerability *life history (growth, survival, reproduction and movement) *distribution *habitat *etc.	Aquatic species can have complex, often multi-stage, life histories that should be considered when making an NDF. For transboundary populations/straddling stocks/migratory species, the NDF will likely need to account for pressures and management information beyond national jurisdiction (see **module 6**)	**Section 3.9**
	Assessments of the status of a stock/species 1. population abundance measure and trend 2. distribution trends (extent of occurrence, area of occupancy / suitable habitat) 3. other relevant methods	Status of a species/population/stock may have been evaluated at local, national, regional and/or global levels. For aquatic species, stock assessment and conservation assessments provide complementary information to inform NDFs. Stock assessments, where available or can be completed, offer a key source of information. These assessments integrate sources of mortality to give a measure of stock health, but are not necessarily able to separate out the effects of individual pressures. Conservation assessments typically evaluate risk of extinction, accounting for a wide range of pressures. For transboundary populations/straddling stocks/migratory species it may be necessary to look at status across a species range.	**Section 1.1** **Section 3.9.1** **Section 4.** – see Queen conch, sea cucumbers, European eel, sharks **Module 14 section 3.2**
	Species' role in the ecosystem	This has not yet been explicitly considered in NDF guidance for aquatic species. Generic guidance is provided in **module 1**, but the development of guidance specific to aquatic species would be helpful. Research to better understand species' role in the ecosystem should be sought.	
Assess pressures NDF assessments should consider all pressures/sources	Fisheries (harvest/off-take)	Species can be caught by many gear types/fishing fleets – not just that which landed the specimens being considered for export. It is important to account for, and characterize, all relevant fleets that interact with the species and cause mortality, including of discards.	**Section 3.3** **Section 3.6** **Section 3.7**

Considerations		Aquatic take home notes/considerations	Relevant section of module 5
of mortality. Even very small export volumes could pose a problem if species are threatened in other ways. For transboundary populations/straddling stocks/migratory species, this includes pressures beyond national jurisdiction.		NDFs should account for all types of catch: target catch, secondary catch, bycatch/incidental catch. While it can be it more challenging to make NDFs when specimens are captured incidentally, the provisions of the Convention fully apply to bycatch. Illegal, unreported and unregulated (IUU) fishing, ghost fishing and discarding are possible hidden sources of mortality that should be considered. Monitoring for indicators of adverse impacts from fishing activities can occur on three levels: population (fisheries independent), fisheries (fisheries dependent, CPUE), and local & traditional knowledge.	
	Trade	Catch may be traded domestically or internationally, both legally and illegally – all should be considered when making an NDF. Trade can be in whole animals or in parts and derivatives (e.g., meat, fins, powders, shells). Several parts and derivatives could come from a single animal. Conversion factors are needed in the case of parts and derivatives in order to go back to the unit the species is assessed at (e.g., number of whole animals (abundance), biomass), as appropriate. Monitoring for indicators of adverse trade impacts requires monitoring trade volumes and characteristics through government data, field research and local & traditional knowledge.	**Section 3.5**
	Other	Human pressures on aquatic ecosystems leading to damage/destruction of key habitats should be considered (e.g., development, pollution, climate change, etc.). Other considerations include impact of invasive species and disease.	**Section 3.7**
Assess management measures – Assess if existing management is sufficient to mitigate the pressures identified, in support of sustainable trade. This involves considering whether existing management is appropriate for the pressures, if it has been implemented, and Is effective at mitigating risks.	Species specific	Species specific management measures are those directed at the species concerned (e.g., quotas on numbers fished, gear restrictions, seasonal restrictions on catch, size limits, etc.).	**Section 4.**
	Species relevant	Species relevant management measures are those put in place for an activity (especially fishing) that affects the species or an area where the species is found, and which may confer some benefit to the species (e.g., restrictions on relevant fishing activities and techniques, protected areas, habitat management measures, etc.).	**Section 3.12.1**

Considerations		Aquatic take home notes/considerations	Relevant section of module 5
For transboundary populations/straddling stocks/migratory species, this includes management beyond national jurisdiction.			
Determine the result of the NDF	Positive NDF	Can be made where pressures have been identified and are being effectively managed.	
	NDF with conditions	Allows for precautionary levels of exports (via quotas) while risks are reduced, gaps in management are addressed, and quality of information is improved. This is a very common approach to NDFs for aquatic species, where NDFs are combined with management plans – in the spirit of adaptive management.	**Section 3.2**
	Negative NDF	Should be made where pressures are not being managed with good results, or are unknown, and should ideally also identify conditions to address gaps information and/or management, where applicable.	**Section 3.2**
Recommend additional conditions	Address information gaps	NDF conditions can be designed to address information gaps. This is best done through research and monitoring (see below).	**Section 3.**
	Address management gaps	If management of any of the pressures is non-existent, unknown, inappropriate, unused or ineffectual, then there is a need to improve management .	**Section 3.**
	Monitoring and evaluation	Monitoring is vital to track population trends over time, and is essential to determine the effectiveness of any management intervention in addressing pressures to species populations. Authorities can find clues to the effectiveness of management measures by monitoring populations or catches over time for, or obtaining local & traditional ecological knowledge about changes in any of the following parameters: • Geographic distribution (presence/absence) • Relative abundance [population size and/or catch per unit effort (CPUE)] • Biological parameters (e.g., mean size of animals, sex ratio)	**Section 3.**

2. Limited capacity and technical resources to carry out NDFs for aquatic species

A lack of capacity and resources is consistently being raised as a barrier to producing NDFs, and directly links to limited data situations as discussed in **section 3.** Indeed, addressing this was a key recommendation to CoP15 after the 2008 workshop in Cancun. There has been general progress in building NDF capacity across Parties but in the report "Implementing CITES for seahorses – Asia region workshop", held in March 2023, the importance of building synergies was raised as fundamental for strengthening the assessment process. This report identifies several approaches that Scientific Authorities can employ when capacity is limited:

> *Authorities can partner with other government agencies and/or external stakeholders (academia, NGOs, etc.) to collect and analyse information, then collaborate on NDF assessments.*
>
> *Authorities should seek synergies with their CITES responsibilities for marine species, using research programs and management measures to improve knowledge and action for several CITES taxa at once.*
>
> *National NDF workshops could help* [with NDFs] *for several CITES listed taxa.*

For example, Scientific Authorities elsewhere in a region may have already prepared NDFs for the same species/population/stock and/or can collaborate in developing assessments to be shared and adapted to reflect each Party's specific situation. Regional workshops could help with the collation on information on the status of, and pressures on, shared and straddling aquatic stocks, in preparation for the development of national NDFs. It should also be noted that there are opportunities to improve communications and co-ordination within governments, as beyond the Scientific Authority, there are other relevant national bodies that play a role in fisheries, resource management and trade.

Scientific Authorities from Parties with experience in developing NDFs for aquatic species can assist by providing advice, support and training to help increase capacity for other Parties. Similarly, non-Parties with experience can be a source of assistance.

While there are many sources of guidance and information, three that may assist Authorities in undertaking NDFs for aquatic species are outlined below.

2.1. CITES NDF website/database

The dedicated NDF page and associated database on the CITES website. This has over 50 documents relating to NDFs for aquatic species from case studies submitted by Parties, guidance documents, and workshop reports. This provides a very useful starting point for Parties looking to make NDFs, and where possible sharing of case studies is strongly encouraged.

2.2. eNDF platform

The eNDF tool, using sharks and rays as model species, provides a stepwise risk analysis approach to making an NDF. The process provides an estimated impact level on the shark stock by making inferences on populations status and management risk of the species. Its steps are based on the CITES NDF Guidance for shark species.

Information input is through drop-down menus and selection of pre-populated information from external resources, where appropriate, making the process more structured and less labour intensive. Further, there are help sections that can advise at each step.

More recently BRT has provided development support to The Pacific Community (SPC) to adapt the shark eNDF for use with sea cucumbers. The same stepwise risk assessment approach was used with an added element to consider population dynamics relevant to sea cucumber and sedentary invertebrate populations. The approach also considers when information is unknown ("data-poor scenarios"), which is another important consideration when making an NDF, and can guide further work in key areas. This eNDF process greatly simplifies the NDF process for Scientific Authorities and advances an assessment of the overall vulnerability of the resource/population.

The three primary risk categories that current eNDF considers in a stepwise process are:

1. the intrinsic biological vulnerabilities (e.g., life history), population assessments e.g., stock assessment and extinction risk assessments e.g. IUCN Red List assessments,
2. total fishing, trade and other pressures on the entire stock and,
3. current management measures and their effectiveness.

When combined, these give a single (guidance) score for evaluating vulnerability in the NDF. Importantly, the eNDF allows the assessor to input when information is unknown in the assessment, which can be highlighted in conditions as an area that may need further work. Because the eNDF uses all information recommended to make an NDF and is built as a framework, it can be adapted to include other marine and aquatic species (and beyond).

Access to the eNDF platform can be requested here and the user manual can be found here. The eNDF for sea cucumbers can be found on the BRT eNDF website and SPC's coastal fisheries applications page here.

The online browser version of the e-NDF software is built with industry standard data protection protocols respecting data sovereignty of individual entities. Data access is limited to a user's administrator account, which only has access to their own portal. Upon request, the eNDF software can be provided to an independent server (including secure government servers). However, in such cases, any updates to the eNDF software held at Blue Resources Trust servers would not be automatically reflected in the offline/standalone installation.

2.3. Simplified guidance documents

The aforementioned regional workshop to improve CITES implementation for seahorses included "Easier advice for making seahorse CITES non-detriment findings (NDFs)" developed by Project Seahorse.

Their approach maps answers to five questions (5Q) in overlapping layers (**Fig. 5A**) and these could be tailored for use with other species:

- Where has the species been found?

Then, for those areas:

- What pressures do the species face?
- What measures are in place to manage the pressures?
- How well are management measures implemented?
- What is happening to wild populations?

By following this process, it was stated:

> *Answering the first four questions allows for a rough inference of possible population trends – and the capacity to make interim NDFs – even while monitoring is being developed to answer the fifth. Answering "what is happening to the seahorse populations" will provide new or strengthened information with which to revisit the first four questions, in an adaptive management framework.*

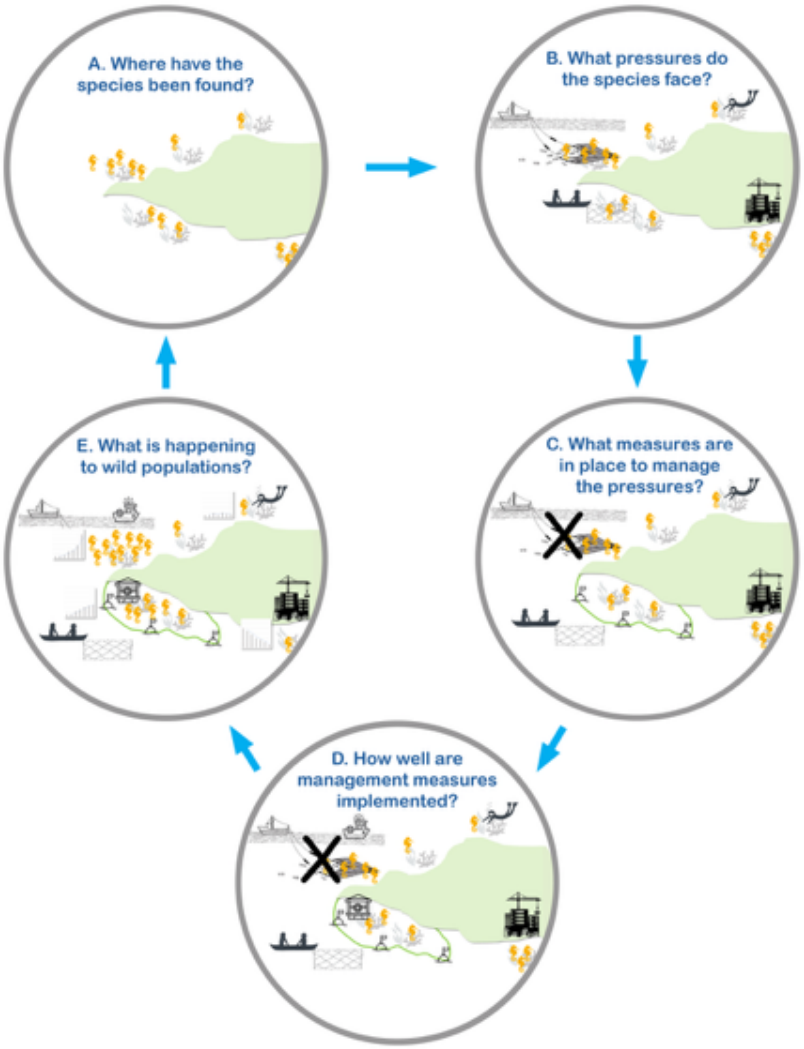

Figure 5A. A framework for making easier NDFs for seahorses.

3. How to address low/poor data situations

Limited data has long been recognised as prohibitive in the production of NDFs. For example, this may be an absence of catch data, temporal and/or spatial patchiness, or challenges relating to utilising available data for making NDFs. Further, many CITES-listed aquatic species are not the primary target of fisheries, and data on bycatch, in particular historical data, is often limited or non-existent, unreliable and/or has low taxonomic resolution.

In the absence of catch-dependent data to make an NDF, there may already be relevant actors and/or frameworks in place that can be used with limited time and resources to yield information to inform future NDFs. For example, while data specifically related to fisheries is valuable in the making of NDFs there may be opportunities elsewhere in the supply/traceability chain that could supply relevant data. Carrying out a mapping exercise of relevant actors within these chains could help to identify points of entry for data collection. One example that was highlighted was that issuance of licences/permits within the supply/traceability chain provide opportunity to have conditions relating to data submission that could inform NDFs. This could apply to fishers, but also consolidators, dealers and/or traders. As a condition of the hammerhead (*Sphyrna* spp.) NDF for trade from the Atlantic Ocean and Gulf of Mexico fishery in the United States of America (USA), both fishers and dealers are required to report catches and purchases respectively. Traders were interviewed in a 2019 study that aimed to understand the scale of illegal trade in dried seahorses in Hong Kong Special Administrative Region of China. It was highlighted that subjects such as this could put interviewees at risk and that appropriate confidentiality mechanisms should be put in place to ensure anonymity.
Low data situations have also been considered in the development of simplified guidelines for making NDFs for aquatic species (see **Section 3** above).

3.1. Use of risk assessments as the starting point of NDFs

Some Parties have utilised methods that implement a risk assessment approach as a starting point for NDFs of aquatic species. There are a number of these that can be applied in the context of aquatic species e.g., Productivity Susceptibility Assessment (PSA) and Ecological Risk Assessment (ERA). These assessments are intended to be rapid, semi-quantitative tools that utilise life history data to characterise the relative productivity and associated susceptibility of species to fishing pressure. They do not provide information on the current status of a stock or a sustainable management reference point but can help to identify which species / locations / fisheries are more or less resilient than others. Possible data inputs can be seen in **Table 5B**:

Table 5B. Potential data inputs for risk assessment analyses

Productivity Attributes	Susceptibility Attributes
• Population growth rate • Max age • Max size • Growth rate • Natural mortality • Breeding and reproductive strategy • Recruitment • Age at maturity • Trophic level	• Geographical overlap of fisheries • Geographic concentration of fisheries • Vertical overlap of fisheries • Seasonal migrations • Schooling behaviour • Morphology • Desirability (Value) • Management strategy • Fishing rate • Spawning biomass • Survival after capture • Impact on habitat

Examples from the USA and Mexico provide useful case studies of how PSA has been applied to sharks. **Module 14 section 3.2** includes a framework provided by Mexico on how data is assessed as part of the risk assessment process.

Additional information on the effectiveness of management can be incorporated in risk assessments. The M-Risk (1, 2, 3) framework, using sharks as a model taxa, uses attributes around three elements – stock status, species-specific management, and generic fisheries management – to assess how well a stock is managed (More details in **module 1** Box C). In 2023, 56 carcharhinid shark species - were analysed using the M-Risk framework. This could provide a useful starting point for Parties wishing to carry out NDFs for these species – these analyses can be accessed using the links above.

3.2. NDFs with conditions

Some Parties have approached uncertainties, risks and/or data gaps in the context of producing NDFs by applying associated conditions to trade. In so doing, they have allowed for precautionary levels of catch and associated exports while risks are reduced, gaps in management are addressed, and quality of information is improved. This pragmatic approach offers the opportunity to identify and implement effective management measures, rather than deferring to zero quotas or trade suspensions/bans, though there are circumstances when such stricter measures are needed. When this approach is adopted the NDFs should be time-bound with a view to revising in an adaptive management framework. NDFs with conditions are discussed in more detail in **module 1 section 7** and **8**.

conditional NDFs for sharks in the USA include providing data for management through mandatory species-specific reporting requirements linked to licences/permits, catch season and/or gear restrictions (including fish aggregating devices (FADs)), and size restrictions for whole sharks and/or fins. The USA also proposed that Scientific Authorities work with relevant domestic and international fisheries organisations in developing the conditions for positive NDFs. The need for such collaborations is addressed in **section 3.3**.

Several of the NDFs for sharks and rays that have been shared via the CITES NDF database have come with certain conditions. For example, India's NDF for Silky shark (*Carcharhinus falciformis*) between 2019-2022 – note that this NDF assessment was carried out using the eNDF tool (see **section 2.2**):

> *This silky shark (*Carcharhinus falciformis*) NDF for India is "**positive with conditions**" to enable trade (of non-fin commodities) to continue for this newly-listed species while improvements are made to existing fisheries and trade management and monitoring frameworks, and while additional research activities and management measures are adopted... This NDF will be re-evaluated after 3 years, to gauge progress against the recommendations … and update it with newly acquired data, before agreeing to a new NDF for 2023-2026.*

Costa Rica similarly used time-bound NDFs for Thresher sharks (*Alopias* spp.) in 2020 in relation to compliance:

> *For its part, the Board of Directors of Incopesca must adopt this agreement within a period of no more than 6 months from the date of presentation of this NDF to the CITES Management Authority for species of fishery and aquaculture interest. For its part, the CAC-CITES shall meet before the expiration of this NDF, in a working session in which the only topic to be discussed will be the compliance of this recommendation. If positive, then the NDF term will be extended for an additional year.* (Translated from the original Spanish)**.**

While conditions are normally associated with a positive NDF, there are negative NDFs that outline key areas that need attention before trade would be permitted. For example, Indonesia produced a negative NDF for mako sharks (*Isurus* spp.) and had a number of conditions that would need to be met before catch and trade would be permitted, e.g., improving data collection and catch monitoring, strengthening implementation of management measures and developing appropriate policy. Indeed, in the report of the Asia regional workshop for seahorses, it was stated:

> *Authorities should consider working through the NDF framework even when they know the NDF will be negative. It helps in communicating the MAs decision to stakeholders. It also helps Authorities and stakeholders understand what is needed to move toward sustainable exports in the future, informing an action plan.*

3.3. Strategies to improve linkages between fisheries departments and CITES Authorities

The relevant government departments/agencies and CITES Management and Scientific Authorities that have oversight of CITES and carrying out NDFs, are often separate from those that are responsible for collecting fisheries data, assessing the status of stocks and developing/implementing fisheries management measures. This is obviously a fundamental disconnect that could mean relevant data and expertise is not being fed into the NDF process.

In CITES Res. Conf. 10.3 on *Designation and role of the Scientific Authorities*, there are several Recommendations that provide generic guidance in relation to this issue:

e) *neighbouring Parties consider sharing their resources by supporting common scientific institutions to provide the scientific findings required under the Convention;*

g) the appropriate Scientific Authority advise on the issuance of export permits or of certificates for introduction from the sea for Appendix-I or -II species, stating whether or not the proposed trade would be detrimental to the survival of the species in question, and that every export permit or certificate of introduction from the sea be covered by Scientific Authority advice;

h) the findings and advice of the Scientific Authority of the country of export be based on the scientific review of available information on the population status, distribution, population trend, off-take and other biological and ecological factors, as appropriate, and trade information relating to the species concerned;

Further, in on Conservation and management of sharks, it:

ENCOURAGES Parties that are members of or Parties to other relevant international instruments, such as RFMOs, RFBs or CMS, to improve coordination between the respective national focal points, where appropriate, and work through the respective mechanisms of these instruments to strengthen research, training and data collection and improve coordination with activities under CITES;

and

ENCOURAGES Parties, in close cooperation with FAO, RFBs and RFMOs, to undertake or facilitate continued research to improve understanding of the nature of illegal, unreported and unregulated (IUU) fishing concerning sharks, identify the linkages between international trade in shark fins and meat, and IUU fishing;

Similarly, in on Introduction from the sea it states:

RECOGNIZING the need for States to consult and cooperate with relevant Regional Fisheries Management Organizations and Arrangements (RFMO/A).

The United Kingdom of Great Britain and Northern Ireland (UK) NDF for the European eel (*Anguilla anguilla*) provides an example of where the Scientific Authority (Joint Nature Conservation Committee), Management Authority (Department for the Environment, Food and Rural Affairs) and organisations with oversight of fisheries management, and associated data collection and analysis (Agri-Food and Biosciences Institute, Centre for Environment, Fisheries and Aquaculture Science, Department of Agriculture, Environment and Rural Affairs and Environment Agency), were all involved in the developing the final assessment. This example provides a particularly complex case study, due to the nature of the species and associated trade, however, it highlights the value in including those beyond just the Scientific Authority and Management Authority in producing NDFs. This also applies to the NDFs produced by the USA for listed shark species, where the Scientific Authority (US Fish and Wildlife Service) works closely with the national body in charge of marine resource management and engagement with Regional Fisheries Management Organisations RFMOs (NMFS). Several examples of NDFs from the USA can be found in the CITES NDF database.

In addition to national level input from fisheries departments, there is also the possibility of including the expertise from international Regional Fisheries Bodies (RFBs), in particular for shared species that fall under their mandate – this is addressed in **section 3.9** below.

3.4. Use of Local and Traditional Knowledge

The use of local and traditional knowledge (LTK) is addressed in **module 3**, however, there are incidences where it has specifically been used in the context of aquatic resources. A number of CITES-listed species have been the focus of studies that collect and analyse LTK in the context of fisheries and trade management.

In absence of any national long-term monitoring or research programs for seahorses *(Hippocampus* spp.*)*, LTK has been a key source of the fisheries and trade knowledge used to inform CITES implementation for this group of fishes. For one example, a study was carried out to assess trends in fish landings and value in Viet Nam utilising fisher and buyer LTK. It was identified that seahorses are primarily caught incidentally using multiple gear types and have both cultural and financial value. Of significance to carrying out NDFs, fishers '*…reported that seahorse catch rates decreased by 86–95% from 2004 to 2014, while landed value simultaneously increased by 534%.*' This could suggest that, if the majority of off-take is for export, that the present levels are not sustainable.

In another study where seahorses were the focal species, four methods for inferring species spatial distributions were examined: (i) fisher interviews; (ii) government research trawls, (iii) scientific diving surveys, and (iv) citizen science contributions. Analysis indicated *'…that fisher knowledge provided more information on data-poor fish genus at larger spatial scales, with less effort, and for a cheaper price than all other datasets.'* One issue was that fisher knowledge was rarely to the species level and as such for data poor species, a mixed methods approach was suggested; *'…begin with fisher interviews and use these to inform the application of government research, scientific diving, or citizen science programs'.*
A recent study highlighted the value of the use of LTK to inform sustainable management of sharks – including CITES-listed species – in eastern and southern Arabia (Kuwait, Bahrain, Oman and Yemen). The work aimed to assess perceived trends in populations of hammerheads (Sphyrnidae spp.) and carcharhinids (Carcharhinidae spp.). Results inferred declines in abundance of sharks starting in the late 1990s to early 2000s. Hammerheads had the greatest mean perceived decrease (80%), while the least decline, for certain species of carcharhinids, was still 50%. The situation was complicated as export was primarily for fins but meat was often consumed domestically and thus the livelihood and food security benefits were combined.

A similar study of artisanal fisheries in the Bay of Bengal used LTK to characterise elasmobranch fisheries and evaluate their impact on threatened species, concluding that encouraging and facilitating the engagement of fishers in science (data collection), local governance (policy-making), and field implementation (bycatch mitigation) is vital.

A report was published in 2022 that blends the use of fisheries data and LTK to develop recommendations to reduce incidental catch of dolphins.

3.5. Conversion factors for derivatives/processed products

Where species are caught and/or landed whole and then processed prior to (re)export, it may well be useful to utilise conversion factors to ensure that catch volumes reported and domestic use/international trade are equivalent and link back to the source metric. Depending on the species, processing will take many forms – e.g., when not live, seahorses are generally traded whole but dried, whereas many other species may be dressed and/or filleted depending on the market. It is important to note that multiple derivatives may be yielded from an individual animal – e.g., shark fins, meat, cartilage, liver and leather – which may complicate conversions. Further, products may be traded fresh, frozen, dried or salted. Below are some examples of this but it is also important to note where Species-specific conversion factors don't exist and are needed e.g., shark meat/carcasses, shark leather, and mobulid gill plates.

3.5.1. Shark and ray fins

Arguably one of the most high-profile international trades in aquatic products of CITES-listed species is shark and ray fins – though the scale of the meat trade is larger. A number of Parties have submitted documents on conversion factors, that can be found on the CITES website. In addition to this, there have been several studies that have attempted to provide fin ratios for a number of shark species (**Table 5C**).

Table 5C. Shark fin conversion factors.

Resource	Species
ICCAT (2005); (2008)	Blue shark
Hareide et al. (2007)	Multiple species including *Sphyrna* spp., *Isurus* spp., *Prionace* spp. and *Lamna* spp.
Review paper (2012)	50 species including Carcharhinidae, Sphyrnidae, *Isurus,* Alopidae and *Lamna*.
New Zealand Government (2014)	*Isurus oxyrinchus (*Mako), *Lamna nasus* (Porbeagle), *Prionace glauca* (Blue shark) and others.
Indonesian research paper (2022)	*Sphyrna* spp., *Carcharhinus* spp., *Alopias* spp. and *Isurus* spp.
Guatemala Government (2023)	*Alopias* spp. and *Carcharhinus falciformis* – this document also includes leather conversions.

As a process of identifying the most useful metrics for their particular needs, the Mexican Scientific Authority provided the following case study:

In order to prevent a mismatch between landed catch (whole shark, undressed shark, fresh fins) and export volumes (mostly dry fins), the Mexican Scientific Authority implemented a stepwise methodology to select the most accurate conversion factors:

I. Compilation of papers, reports, theses on conversion factors between all the common shark specimens reported along the trade chain in Mexico (from landing to export).

II. Classification and scoring of all the information gathered within three successive categories:

   i. Taxonomic accuracy. A. Species-specific information, B. Information at gender level, C. Information at higher taxonomic level or with common name.

   ii. Regional precision. 1. A study made in Mexico, 2. A study made in America, 3. A study made in any other part of the world

   iii. Sample size. i. Sample size greater than 30, ii. Sample size lower than 30

III. For each species and specimen, we selected the conversion factor with the higher ranking of these categories (**Table 5D**).

Table 5D. Selection of the best conversion factor between fresh fin (FFN) and whole shark for *Sphyrna lewini* in Mexico. The conversion factor provided by Cortés and Neer (2006) was preferred because its precision level was species-specific (category A), it was a study conducted in the USA (category 2) and it included a sample size higher than 30 (category i).

Precision	% FFN by Whole Shark	Sample size	Place	Reference
A2i ✅	1.66	43	USA	Cortés and Neer (2006)
A3ii ❌	4.49	14	South-western Indian Ocean	Ariz, et al. (2008)

IV. All factors selected were validated in a joint workshop with academic experts and fisheries authorities and submitted to CITES. The most up to date version can always be found on the webpage of the Mexican CITES Scientific Authority (bit.ly/mitiburon).

3.5.2. Queen conch

With regard to conversion factors for Queen conch (*Strombus gigas***) meat fillets, there is a risk of introducing significant error when comparing total production of the species and the volumes in trade from a particular export – this is primarily due to the presence of the shell which accounts for 90% of the weight. The level of processing needs to be taken into account, as does the country of origin, in order to assess this risk due to differing procedures. As such, it was highlighted there was a need for regionally harmonised terminology and conversion factors for the species and this became a key activity post-CoP16 for CITES and FAO.

***Note:* The Queen conch has been renamed *Aliger gigas* but the CITES standard nomenclature at the time of writing remained *Strombus gigas.*

A document produced in 2014 used field testing to propose regional conversion factors for the Western Central Atlantic (**Table 5E**):

Table 5E. Conversion factors for Queen conch.

Processing grade	Conversion factor
Dirty meat (Animal without the shell)	5.3
50% clean (Removal of the operculum and the visceral bag)	7.9
100% clean (Only the white meat remains)	13.2

There is further discussion of conversion factors in both the 2019 and 2021 report of the CFMC/OSPESCA/WECAFC/CRFM/CITES working group on Queen conch, and an advanced copy is available here.

3.5.3. Seahorses

Dried seahorse trade is often reported as weight, most commonly kilograms. In such cases, conversion rates are needed to translate dried seahorse weights into number of individuals. Conversion rates have been established by Project Seahorse for various countries based on trade research carried out in the early 2000s (**Table 5F**, based on Evanson et al. (2011)) with the exception of West Africa for which the conversion is based on unpublished Project Seahorse trade surveys). While these provide a useful starting point, it is important to update these values as the species composition and/or sizes of seahorses may have changed within regions/countries over time.

Table 5F. Estimated average dry weight of seahorses in different geographies.

Region/Country	Estimated average dry weight of an individual seahorse (g)
Australia	3.00
Latin America (Atlantic)	2.42
Latin American (Pacific)	3.51
Malaysia	3.18
Thailand	3.13 / 3.30
Philippines	3.33
India	1.38
Indonesia	2.00
Viet Nam	2.86

West Africa	5.29
Global	**2.69**

Seahorses are also traded in the form of prepared medicines, as powder mixed in with other ingredients. In such cases conversions are more complicated and research is needed to come up with reliable factors. Two examples come from a study analysing CITES trade records for seahorses from 2004-2011. First, China clarified that two records of derivatives represented individual capsules, each containing 1.4 mg of ground dried seahorse. Second, two records that had millilitres (MLT) as their unit (780mL combined) were assumed to be tonics, which were estimated to contain approximately 0.5 g of seahorse per 100 mL, based on the ingredients list of 'Gekko Hippocampus' tonic from Viet Nam.

Although seahorses are not traded internationally in dead, wet form, they are often landed that way, and purchased as such by primary buyers. In these cases, it will be important to establish conversion factors from wet to dried seahorse weight to support monitoring of fisheries and domestic trade.

3.6. How to account for non-target catch

Many aquatic species listed in the CITES Appendices are referred to as 'non-target', 'incidental' or 'by-catch' species, despite their sometimes long-ongoing and profitable commercialisation. This does not exclude them from CITES provisions – if they are traded internationally it is essential that LAFs and NDFs are carried out to ensure their catch is legal and sustainable, and appropriate management mechanisms are in place. Indeed, this was highlighted in the 2014 NDF guidance for sharks, and in the rapid guide for making LAFs in Resolution Conf. 18.7 (Rev CoP19) it was stated:

> *It is also important to note that for the authorization of trade in marine species under the Convention,* ***it is irrelevant whether the caught specimen was targeted or bycatch****. Both targeted catch and bycatch should be documented and reported.* ***The provisions of the Convention fully apply to bycatch****.*

For example, seahorses in international trade are primarily landed in non-selective fishing gear, particularly bottom trawls and gillnets (e.g., 4, 5, 6, 7), and an observation made at the Asia region workshop reported on in AC32 Doc 38.2 was that:

> *It will be more challenging to make NDFs when seahorses are captured incidentally. For non-target fisheries, the main management will be excluding gears from seahorse areas, in line with the many existing national decrees for no take marine protected areas and on bottom trawl exclusion zones.*

For species that are migratory, or that have transboundary populations, it is important to consider the catch, and associated management measures at the population level, and not just within Exclusive Economic Zones (EEZs). The USA has submitted a number of shark NDFs to the CITES NDF database, and incidental catch is specifically referenced. For example, in relation to shortfin mako catch in 2019-2020, the following was stated:

> *The shortfin mako shark fisheries on the high seas and in the EEZ of U.S. waters of the Pacific Ocean are managed under a system which allows harvest from directed, bycatch and recreational fisheries.*

In instances where there are mixed sources of species in trade e.g. incidental and targeted catch, it is important to ensure appropriate management measures are in place to account for this. It was stated in the 2014 NDF guidance for sharks:

> *'It is important to consider that* ***export quotas will not limit catches where sharks are obtained as bycatch****. In such cases any use of quotas should be combined with other precautionary measures, given the uncertainty as to how export quotas influence catches.'*

This has the potential to become further complex when applied to incidental catch in Areas Beyond National Jurisdiction (ABNJ).

It is important to note that all incidental catch mortality of a species should be accounted for in making NDFs, not just that which is landed. For example, if there are dead discards due to size, sex, condition, etc., this is still relevant to the assessment and associated management measures. Indeed, a recent paper suggested that dead discards of CITES-listed sharks could be at least 15 times larger than reported catches. Therefore, being able to

assess the proportion of the species catch that is landed and discarded is an important consideration. In their NDF for silky shark (*Carcharhinus falciformis*) in the Indian Ocean (2019-2022) India specifically state:

> *In India, most silky sharks are caught as secondary catch in longline and drift gillnet fisheries for large pelagic, with a small bycatch by trawlers. Size range in fisheries for the species 67 to 275 cm TL is recorded from the southwest coast of India.* ***Discard of silky shark in Indian waters is negligible as whatever caught is retained.***

This highlights that the landed catch of this species is representative of total mortality in the context of making an NDF.

In relation to discards from fishing operations, it is important to note that some individuals that are discarded alive may survive and go on to reproduce, and should not be counted in offtake. However, post-release survival of discards is highly variable even within related taxa. For example, amongst pelagic shark species caught by Atlantic Ocean pelagic longline vessels post release survival varies from 82% for the common thresher (*Alopias vulpinus*) to 8% for shortfin mako (*Isurus oxyrinchus*) (Cortes et al. 2010). Studies that estimate post-release survival rates may be helpful in cases where there are high release rates (e.g., species with size limits) to help inform total offtake.

Ultimately, understanding the source of the catch through monitoring will inform management in the context of whether it is targeted and/or incidental, and how this needs to be adapted and implemented to produce a positive NDF.

3.7. How to account for other sources of mortality of listed species

A fundamental component of the NDF process is to assess how international trade and associated catch, impacts populations of a species in the context of other threats. CoP11 Inf. Doc. 11.3 *CITES Scientific Authorities' Checklist to assist in making Non-detriment Findings for Appendix II Exports* stated:

> *It is vital to any evaluation of non-detriment that the Scientific Authority assesses the impact of trade in relation to other threats to the species.*

Similarly, the shark NDF guidance states:

> *The total level of mortality experienced by the stock is key to its past and future status, regardless of whether that mortality occurs as a result of targeted fishing or secondary catch as part of other target fisheries. The same is true whether that catch occurs within EEZs or on the high seas, and whether it is discarded, used domestically or exported.* ***In short, all mortality needs to be considered when making an NDF****.*

Further, a step-by-step framework for making NDFs for seahorses, makes the point that:

> *NDF assessments must consider ALL pressures facing your seahorses. So even very small export volumes could pose a problem – and potentially need reduction – if your seahorses are threatened in other ways. For example, if your seahorse habitats are in bad shape, or there is a large domestic or illegal trade, then any export might be unsustainable. That is why [the framework] will consider fishing pressures … and threats to seahorse habitats …. This is also why, when considering trade pressures … we consider domestic consumption, and illegal, unregulated and unreported (IUU) fisheries and trades; if either of these is big, then even a small international trade can be too much for a population to handle.*

If catch for international trade is the major threat to a species, then the production of an NDF is arguably simpler than if there are other primary, and/or multiple, stressors, the effects of which are not well understood. Other sources of mortality are addressed in the aforementioned CoP 17 Information Document 52 submitted by IUCN.

It is worth highlighting 'ghostfishing' - this is when species are caught in abandoned, lost or otherwise discarded fishing gear (ALDFG), and the impact of fish aggregating devices (FADs) in fisheries in ABNJ, particularly upon CITES-listed silky and oceanic whitetip sharks.

In 2009, the NDF from Colombia for Queen conch recognised that habitat loss and pollution were also threats, but a species that exemplifies the need to account for other sources of mortality is the European eel. In 2015, a workshop was held to identify criteria for use in making an NDF for the species, the report states:

> *The number of glass eels arriving in continental waters has declined dramatically since the early 1980s, although there have been increases from 2011 to 2013. The causes of this decline are uncertain but may include overexploitation, pollution, non-native parasites and other diseases, migratory barriers and other habitat loss, mortality during passage through turbines or pumps, together with oceanic-factors impacting migrations. These factors will have been more or less important on local production throughout the range of the eel and could potentially have cumulative and/or synergistic effects. Therefore, in the planning and execution of measures to ensure the protection and sustainable use of the European eel stock, management has to take into account the diversity of conditions and impacts.*

The UK NDF for the European eel sets fisheries mortality (∑F) in the context of other anthropogenic mortalities (∑H) to provide a total (∑A) – these metrics are used within the assessment of sustainability.

One continuing issue in relation to carrying out NDFs for all aquatic species is the challenge of accounting for illegal, unreported and unregulated (IUU) fishing and trade. By its nature it is extremely difficult to quantify IUU off-take and trade, and the scale and complexity will vary depending on the species and its range. The USA recently produced a report relating to IUU fishing of sharks, though this does not aim to quantify such activity, and the 2020 UNODC report used glass eels as a case study. These might provide useful case studies for Parties.

3.8. Monitoring to inform NDFs for adaptive management

Monitoring is a fundamental element of adaptively developing an NDF – from Resolution 16.7 (Rev. CoP17):

> *…the implementation of adaptive management, including monitoring, is an important consideration in the making of a non-detriment finding…*

Tracking populations over time is also important to: 1) indicate need for conservation and management intervention, and 2) understand effectiveness of management. **Module 1 section 9** has considered adaptive management in the context of making NDFs in greater detail, however, aquatic species-specific examples are presented below.

Monitoring should be carried out at geographically and temporally relevant scales which will vary between species depending on their life histories and the nature of the fisheries. At CoP17 in 2016, Inf. Doc. 65, developed by IUCN and FAO, specifically outlined minimum data guidelines to developing monitoring programmes for adaptive management. In relation to this the report of the aforementioned regional seahorse workshop stated:

> *It is important to note that even if they monitor differently, all jurisdictions/agencies/external stakeholders should collect, at minimum, an agreed set of metrics so data can be combined/compared across jurisdictions and even regions.*

As a basic, monitoring protocols need to include questions that drive reliable documentation of fisheries and trade effort.

The 2014 NDF guidance for sharks states:

> *In order to make robust evaluations of the pressures exerted by fishing on the stock of a shark species, in many cases there will be a need to **improve reporting** of catch, bycatch, discard and landings data by species and by weight, in order to determine contribution of bycatch and discards to overall shark mortality. Data should be both timely and standardised, to allow effective monitoring of the state of fisheries resources (see also **Step 6**) and to detect established and emerging trends.*

As such, catch and/or trade monitoring may be built into NDFs as a condition e.g., Sri Lanka NDF for *Sphyrna* spp. (2017-2019) (**Table 5G**).

Table 5G. Examples of conditions associated with Sri Lanka Hammerhead NDF.

Monitoring and data recommendations for Hammerhead Sharks	
Recommendation	***Potential leads***
Population monitoring: Maintain, and if possible, expand observer programmes on board and port sampling (data collection at landing sites) to improve species-specific data on composition of catches by size, sex and maturity (e.g. the programme recently implemented by Sri Lanka's NARA (National	NARA, DFAR in Sri Lanka (Also other Indian Ocean fishing States, IOTC, BOBP-IGO)

Monitoring and data recommendations for Hammerhead Sharks	
Recommendation	***Potential leads***
Aquatic Resources Research & Development Agency) and DFAR (Department of Fisheries and Aquatic Resources)	
Research: Investigations into key biological/ecological parameters, life-history and behavioural traits, and the identification of potential mating, pupping and nursery grounds. More data on species, size, maturity and sex structure of hammerhead landings. Socio-economic studies on shark fisheries, trade and alternative livelihoods	DFAR, NARA, universities, and NGO's in Sri Lanka. (Also other Indian Ocean fishing States, IOTC, BOBP-IGO) IGOs and NGOs
Fisheries monitoring: Improved species-specific fisheries data on catches and landings are needed to ensure harmonisation of data from different sources (e.g. IOTC and FAO).	Sri Lanka DFAR, NARA (Also other Indian Ocean fishing States, IOTC, BOBP-IGO)
Monitoring of domestic and international trade: Implementation of specific catch or trade documentation schemes for sharks. Pursue with Sri Lanka Customs the request to introduce HS codes for all shark products, to permit the collection of better data on imports and exports. Improve present methodology for the random sampling of fins for export, in conjunction with Sri Lanka Customs. New data collection initiatives to quantify more precisely hammerhead shark fin exports and identify and monitor hammerhead shark fins, and meat & other products (if any) at species level.	Sri Lanka Customs department, DFAR, NARA (Also other Indian Ocean fishing States) IGOs, NGOs

As stated previously, Indonesia produced a negative NDF for mako sharks (*Isurus* spp.) which included improving data collection and catch monitoring as a condition for any future catch and trade.

Box A. Monitoring seahorses to inform adaptive management

Project Seahorse has presented advice on monitoring seahorse populations in support of conservation and management, focused around three main approaches:

- Trade dependent – monitor domestic and international trade volumes, including illegal trade, often by asking questions of fishers, primary buyers, consolidators and/or exporters.
- Fisheries dependent – monitor catches (ideally) or landings, at ports or onboard vessels, paying critical attention to changes in fishing effort.
- Fisheries independent – underwater surveys of seahorse populations through snorkel or SCUBA, preferentially using timed swims for seahorses, rather than transects.

Project Seahorse noted that monitoring wild populations of seahorses *in situ* is difficult and not likely to be feasible for many Authorities. Instead, fisheries dependent port surveys may provide a pragmatic approach to sampling seahorse populations. However, workshop discussions among Asia Region CITES Authorities noted that port monitoring poses great challenges, especially as seahorses are often landed at many different sites (not necessarily official ports) along very long coastlines. Instead, data collection by or from primary buyers may be the most pragmatic approach because they generally gather seahorses from many fishers, often across multiple communities. Further, buyer surveys, if properly designed, would automatically provide information across time and space.

3.9. Straddling and trans-boundary stocks, the role of Regional Fisheries Bodies in making NDFs and species caught in ABNJ

The off-take and trade of aquatic resources is complicated by how they are managed in the context of national EEZs, RFBs and ABNJ. Many aquatic species listed in Appendix II are migratory and/or with transboundary populations and straddling stocks, therefore multiple Parties may be exploiting and trading the same populations both within EEZs and in ABNJ. One option to address this is the development of regional or 'whole stock' NDF advice (see **Section 3.12.2**), but other issues relating to shared and straddling stocks are discussed in this section. Note there will be a workshop in 2024 specifically to discuss non-detriment findings for species taken from ABNJ.

At sea, the 1982 United Nations Convention on the Law of the Seas (UNCLOS) establishes a legal framework regulating activities in all marine areas. In particular, UNCLOS established Exclusive Economic Zones (EEZs)

as the area of the sea in which a sovereign state has exclusive rights regarding the exploration and use of marine resources. In order to manage stocks effectively and equitably, it is necessary to enable consultations between national Management Authorities of adjacent EEZs at the bilateral or regional level. In practice, this is done through Regional Fishery Bodies that include Regional Fishery Advisory Bodies, providing non-binding scientific advice to assist management, and Regional Fisheries Management organizations.

Palacios-Abrantes et al. (2020) showed that 67% of commercially exploited marine species are transboundary (n = 633). Between 2005 and 2014, fisheries targeting these species within global-EEZs caught on average 48 million tonnes per year, equivalent to an average of USD 77 billion in annual fishing revenue. For select countries, over 90% of their catch and economic benefits were attributable to a few shared resources. The analysis suggests that catches from transboundary species are declining more than those from non-transboundary.

It is important to enable consultations between national Management Authorities of regional or adjacent EEZs to manage stocks effectively and equitably. In practice, this is done through RFBs which include Regional Fishery Advisory Bodies (RFABs), providing non-binding scientific advice to assist management, and RFMOs, which, in addition to developing scientific advice, also operate via binding management agreements.

3.9.1. Regional Fishery Bodies' role in the making NDFs

A RFB is a collection of States and/or relevant organisations that work towards the conservation and management of fish stocks. Within the RFB term sits the more specific RFMOs which in turn include tRFMOs which focus on tuna fisheries. The tRFMOs have the authority, if not an explicit responsibility, to manage bycatch of the Ecologically-Related Species (ERS) associated with these fisheries, including sharks and rays. These organisations often collect and analyse data that could be very useful in the context of carrying out NDFs, particularly for sharks and rays, indeed Res. Conf. 12.6 (Rev. CoP18):

> *INVITES Parties that engage in directed or non-directed shark fishing activities of shared stocks to collect and share, on a regional basis such as through RFMOs, RFBs or other regional collaborations, where they exist, data on effort, catches, live releases, discards, landings and trade (to species level and by gear type where possible), and make this information available to assist Scientific Authorities in the making of NDFs of such shared stocks;*

There is a specific document produced by FAO entitled '*Implementing the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) through national fisheries legal frameworks*' and section 4.3 (page 27) specifically addresses how RFBs might play a role in making NDFs. Although CITES and RFBs may apply different terminology, sources of data, tools and metrics for achieving common goals, these can be complementary and can provide mutual support.

Key to the RFBs playing a role in NDFs is the translation of relevant data and metrics used in fisheries management to the context of CITES, a challenge that a number of Parties identified. For example, fisheries bodies often base many decisions around the concept of Maximum Sustainable Yield (MSY) and their stock assessments identify specific points that trigger management actions. While these may not always translate into metrics that can be used in an NDF, the data used and principles applied may be extremely relevant. FAO host a portal where fisheries terminology is explained in multiple languages which may be useful in helping to better utilise this data.

In a number of the case studies that can be found on the CITES NDF database, RFMO data and/or stock assessments are referenced. For example, the Sri Lanka NDF for silky shark in the Indian Ocean includes numerous references to the Indian Ocean Tuna Commission (IOTC) RFMO.

It should be noted that RFBs may have management measures that relate to shark species – see page 27 of AC31 Inf. 18.

Ultimately, it was recognised that RFBs may hold data that could be very valuable in the making of NDFs and that engaging them where possible would be of value to Parties. A key step would be harmonisation of metrics in the reporting of harvest and trade of specimens of CITES-listed aquatic species to facilitate the making of NDFs. It should be noted that CITES Parties that are contracting or cooperating Parties (CCP) to a RFB could formally request that the relevant scientific body provides advice regarding the status of listed trans-boundary and straddling stocks taken by the fisheries under the mandate of that body, to support the making of NDFs.

3.9.2. Species caught in ABNJ – Source code X

For a number of species, catch takes place in ABNJ before being landed. If the State where the catch is landed differs from that which the vessel is flagged, this is considered a two-state transaction, similar to other CITES exports. However, if the catch from ABNJ is landed in the same State which the vessel is flagged, this is a one-state transaction referred to as Introduction from the sea (IFS). Resolution Conf. 14.6 (Rev. CoP16) specifically addresses IFS but it is an area of CITES that continues to present challenges to Parties. At SC74, Doc. 51 provided guidance on ten key questions relating to IFS, in which NDFs are referenced. These were recently reviewed at SC77 (SC77 Doc. 47), with consideration given to including some or all in an amendment of the Annex to Res. Conf. 14.6 (Rev. CoP16).

This highlights the absence of information relating to making NDFs under these circumstances and the need for increased co-operation relevant Parties and organisations. However, there are available NDFs for species that are likely to be part of shared stocks and/or caught in ABNJ in the CITES NDF database. Using shortfin mako (*I. oxyrinchus*), the second most commonly caught shark species ABNJ, as an example, Parties take different approaches to making NDFs depending on the circumstances.

Indonesia produced a negative NDF for both mako sharks (*I. oxyrinchus* and *I. paucus*) in its EEZ but noted that due to '*…limited data, there is still no information on whether the Indonesian stock shares with other countries.*' While the assessment *'…related to mako shark management at the national, regional and global level…'* and catch in ABNJ is acknowledged, there is no discussion relating to IFS.

New Zealand off-takes shortfin mako, primarily as bycatch in tuna and swordfish longlines within the EEZ. Off-take and export is permitted due to data indicating that *'…the New Zealand population has been stable or increasing in recent decades.*' It is noted *'…that New Zealand stocks of shortfin mako are shared with those of other nations in the southwest Pacific'* and that *'…because stocks are shared, both a local and a regional approach to mako shark fisheries management is required, and a formal stock assessment of the entire southwestern Pacific mako shark population is required to better elucidate its current status.*' As such, a quota was set for IFS based on a precautionary analysis of landings.

Similar to Indonesia, the UK also produced a negative NDF for shortfin mako, but at a larger scale that recognised ABNJ catch and thus incorporates the potential for any IFS trade: *the UK CITES Scientific Authority is unable to make a non-detriment finding for offtake of shortfin mako (*Isurus oxyrinchus*) sharks from all regions of the Atlantic and Indian oceans.*' It also recognised the variable status of stocks of the species – *However, in principle, the UK may be able to accept catch from the Pacific stock at current rates of offtake (i.e., not exceeding average of estimated total annual catch levels from previous 5 years) given the North Pacific stock is unlikely to be in an overfished condition and the South Pacific stock is reportedly increasing.*

The USA NDF for shortfin mako (2019-2020) specifically focused on shark off-take in the Pacific Ocean and references both the EEZ and ABNJ. A positive finding was issued based on data collected within the EEZ from US-flagged vessels and information from RFMOs, with the condition that off-take was in compliance with national species management plans. The NDF recognises the need for multi-jurisdictional co-operation – specifically in the context of UNCLOS and CMS – and notes that this is occurring to some extent through RFMOs. However, some Parties have raised the issue of dealing with catch of a species both within and outside of EEZs can be challenging.

Implementing CITES for scientific samples taken in ABNJ has been identified as a particular challenge for shark research. This subject, and many others relating to NDFs in ABNJ will be considered during a workshop in 2024.

In addition to species listed in Appendix II, under Article III of the Convention, IFS of Appendix I specimens would require an NDF. At present, most fish species listed in Appendix I are either freshwater or coastal, and as such IFS would not apply; however, IFS of cetaceans, birds and turtles requires an NDF.

3.9.3. Transshipment

Transshipment is defined by FAO as *'… the transfer of catch from one fishing vessel to either another fishing vessel or to a vessel used solely for the carriage of cargo…*' The practice is specifically referenced in the Annex to Res. Con. 14.6 (Rev. CoP16) relating to *Introduction from the Sea*:

1. In the case of an IFS, the transshipment would only serve as a means of transportation and the same considerations for IFS should apply. In this case, the IFS certificate should be issued prior to transshipment, or the Master of the vessel receiving the transshipped specimens should obtain satisfactory proof that the IFS certificate already exists or will be issued before the IFS occurs.

2. In the case of export, the export permit should be issued prior to transshipment, or the Master of the vessel receiving the transshipped specimens should obtain satisfactory proof that the export permit already exists or will be issued before the import occurs.

Catch, particularly in ABNJ, may be frozen, transshipped and landed a significant distance and time from the point of catch. This can present a number of potential issues in the context of making NDFs. Fundamentally, transshipment presents a monitoring and enforcement challenge as it may involve movement across multiple EEZs and ABNJ, and in some cases a vessel authorised to fish by one CITES Party may be flagged to another Party. There is opportunity for catches of species over wide spatial and temporal scales to be mixed which raises the question of whether this should fall under a single NDF or require multiple. By their nature vessels involved in transshipment have the potential to transport species through multiple jurisdictions. Therefore, relevant legislation and/or NDF findings may apply depending upon where fish are caught and landed, presenting a challenge to authorities charged with monitoring and enforcing CITES compliance.

There is a need to improve understanding of how trans-shipment could impact the making of NDFs - especially if stocks are landed outside of their natural range – and for greater transparency in existing routes and mechanisms that affect species included in the CITES Appendices. Ultimately, it is recommended to account for transshipment when making NDFs, wherever possible, recognising that in many cases this will be challenging.

3.10. NDFs at higher taxonomic level

Resolution Conf. 16.7. (Rev. CoP17) states that *'…the making of an effective non-detriment finding relies upon a correct identification of the species concerned and verification that it is specimens of this species that are to be exported.*' In exceptional cases, where there are limited species-level data, it may be necessary to make NDFs at a higher taxonomic level. It is important to highlight that this will not always be the case, however, below we outline certain scenarios where this strategy might be applicable.

In some cases, species are listed at higher taxa, but this does not therefore mean that NDFs should be carried out at that level – the ideal scenario is that assessments are made at the species level. Further, some species may be listed under the 'look-alike' provision – though this does not mean that they are not vulnerable to off-take for international trade in themselves. Ultimately, it should be the aim that after listing, data collection improves, for example through NDFs with conditions, allowing a move towards species-focused assessments.

In some cases, historic data has been collected at the genus level, making species level NDFs challenging in the short term e.g., hammerhead sharks (*Sphyrna* spp.). The US produced a positive NDF for *S. lewini, S. mokarran* and *S. zygaena* off-take in the Atlantic Ocean and Gulf of Mexico in 2017. Data relating to all three species was considered in the NDF, but in some cases pooled information for 'the hammerhead complex' is discussed. Indeed, the US has both a combined management plan and catch quota for all three species, the latter based on *S. lewini*, for which there is arguably the most data available. It is specifically stated that the quota is pooled *'…because it is difficult to differentiate among these three hammerhead species, particularly when dressed*.'

The positive NDF for hammerheads caught in domestic waters produced by India in 2017 contains a mixture of species level and pooled information. It was noted that for Asia, FAO capture data was only available at the genus level, and once again, that distinguishing between species could be challenging. Similar to their NDF for hammerheads, India considered the giant manta ray (*Mobula birostris*) and the reef manta (*Mobula alfredi)* at the genus level in their assessment for trade resulting from domestic waters. Both species-specific and generic data was used in the production of the NDF.

In their negative NDF for mako sharks in domestic waters (*Isurus* spp.), Indonesia stated:

Currently, the national data of mako sharks available until 2016 were a combination of shortfin and longfin mako. Although it is quite easy to distinguish the two species, species-specific data recording is not a primary concern in Indonesia. After 2016, national statistics only present sharks as a group without separating them into families, which can be accessed at https://data.go.id/home.. On the other side, mako species recordings were conducted in each Fisheries Management Area (FMA) in Indonesia, yet the available data could not

be accessed by the public, whereas it was needed to access some different portal data connected to the national data.

A specific recommendation of this NDF was:

The catch data must be recorded at each landing site or at least at priority locations that represent mako shark data from Indonesia waters. The data must be recorded up to species level, no longer at the group or family level...

It was highlighted that where there are national historical catch records of sharks at the genus level but some local level data relating to species catch proportions, it might be possible to use these to reconstruct catch at the greater geographical scale. Mexico has used this approach to improve their level of data analysis in their NDF making (see **Module 14 section 3.2**).

At AC18 a list of coral that could only be identified to the genus level was produced. This has been updated several times since that meeting, most recently at CoP16.

3.11. NDFs for trade in source codes R and F

There has been increasing attention paid to the source of species in trade, and this is important to consider in the context of producing NDFs. Resolution Conf. 16.7. (Rev. CoP17) states that *'...the methodology used to make a non-detriment finding should reflect the origin and type of specimen...'*. As such, an NDF for species off-take from the wild may not be the same as for one that is reared and/or born in captivity.

There are a growing number of situations where aquatic animals from captive facilities are being used for conservation translocations, reintroductions and restoration. The current situations mostly involve the use of surplus production of eggs or young from public aquaria. However, other situations are possible. Most of these animals are from parents that were taken from the wild, but others are from parents held in captivity for several generations. In these situations, a range of source codes may need to be considered, including W (for animals originally taken for the wild, or the offspring of wild caught parents), C (bred in captivity – parents were born in captivity in a contained system) and possibly others (e.g. F). This will primarily be addressed as part of **module 1** but below we outline considerations related to this for aquatic species.

3.11.1. Ranched species – source code R

Source code R – for ranching – was originally developed for use with reptiles but has since been applied to other taxa. Resolution Conf. 12.3 (Rev. CoP19) defines R as *'...specimens of animals reared in a controlled environment, taken as eggs or juveniles from the wild, where they would otherwise have had a very low probability of surviving to adulthood'*. While this definition can be applied with ease to some species, there have been challenges when it has been transposed to aquatic species. In particular, the term '*controlled environment*' needs to be clarified in the context of aquatic species production as systems are often fed with water from natural sources.

Off-take of juvenile eels (glass eels) is primarily to stock farming facilities for on-growing, prior to sale for consumption. This removal from the wild and growing in captivity could potentially be viewed as ranching and as such, trade and associated NDFs for the Appendix II listed European eel (*Anguilla anguilla*) could potentially be carried out in this context. In order to provide guidance to Parties on this matter, Decision 18.199 (b) relating to eels (*Anguilla* spp.) directed the Secretariat to:

...collate available information on the biology of Anguilla anguilla *in collaboration with experts, including the International Union for Conservation of Nature (IUCN) Anguillid Specialist Group, with a view to determining whether the glass eel (fingerling) life stage can be considered to have a "low probability of surviving to adulthood", and report its findings to the Animals Committee.*

Despite efforts to examine this question CoP19 Doc. 61 stated:

Concerning the implementation of Decision 18.199, paragraph b), in the addendum to document AC31 Doc. 22, the Secretariat reported that, following consultations with experts, it was determined that there is a lack of data collected over relevant spatial and temporal scales to calculate a natural mortality of juvenile eels. Therefore, the issue of whether the glass eel (fingerling) life stage can be considered to have a "low probability of surviving to adulthood" was determined to be complex and inconclusive.

As such, the appropriateness of the use of source code R for the European eel is still under discussion by the CITES Animals Committee; though it's use might be beneficial in the context of traceability of wild-caught vs fish on-grown in farms. The UK have produced an NDF for a very specific situation where glass eels are caught in two rivers in England, before being transported to Lough Neagh in Northern Ireland for on-growing to seed a fishery for larger eels which are traded for consumption. While the juveniles are not being grown in a controlled environment *per se*, Lough Neagh is a large eutrophic lake, ideal for the production of eels, but which is now - due to barriers to upstream migration - entirely dependent on stocking for recruitment. The NDF has been approached from the perspective of trade occurring under source code W, however, it does recognise that the capture, movement and subsequent growth of juvenile eels in a new system requires a tailored approach. As such, this could provide a useful case study when carrying similar assessments for other species that have some manipulation prior to trade.

More recently, the USA submitted AC32 Doc 25.02 entitled: *Considerations and recommendations for ranching of marine species.* This highlights concerns around the use of source code R for some aquatic species and uses humphead wrasse (*Cheilinus undulatus*) as a case study, based on a recent publication. The document highlights that off-take is occurring at a point in the life history when mortality is low and as such use of source code R would not be appropriate. Further, trade is occurring in some cases without an NDF, and it is re-iterated that NDFs are required for ranched specimens. The document proposes that:

- *guidelines for the making of NDFs for specimens of marine species sourced from ranching operations are needed; and*

- *the making of NDFs for specimens of marine species sourced from ranching operations be considered at the upcoming global CITES Expert workshop on NDFs and any recommendations put forward for the Animals Committee's consideration.*

These recommendations will help Parties to better apply source code R and produce robust NDFs. Ultimately, it is important for Parties to recognize that source code R may not be straightforward to apply to aquatic species, but NDFs are required in cases where it is appropriate.

3.11.2. Captive born - source code F

Source code F is defined as '*Animals born in captivity (F1 or subsequent generations) that do not fulfil the definition of 'bred in captivity'* [source code C] *in Resolution Conf. 10.16 (Rev. CoP19), as well as parts and derivatives thereof.*' But there can be some challenges in interpreting this and how Source Code F is used. For example, a non-range state augmenting its breeding stock with wild specimens from elsewhere is an example of where source code F might be appropriate. However, Res. Conf. 10.16 (Rev. CoP19) states that "*offspring of second generation (F2) or subsequent generation (F3, F4, etc.)" are specimens produced in a controlled environment from parents that were also produced in a controlled environment*. Therefore, even with no wild augmentation, source code F can remain appropriate even when generations have been bred beyond F2 if they are not being produced in a controlled environment (defined in 10.16 as *an environment that is manipulated for the purpose of producing animals of a particular species, that has boundaries designed to prevent animals, eggs or gametes of the species from entering or leaving the controlled environment, and the general characteristics of which may include but are not limited to: artificial housing; waste removal; health care; protection from predators; and artificially supplied food*;).

In addition to this Res. Conf. 10.16 (Rev. CoP19), regarding the term 'bred in captivity', states the breeding stock "*is maintained without the introduction of specimens from the wild, except for the occasional addition of animals, eggs or gametes, in accordance with the provisions of CITES and relevant national laws and in a manner not detrimental to the survival of the species in the wild as advised by the Scientific Authority*." Therefore, in some cases - where specimens are legally established and shown to be able to produce offspring to at least second generation in a controlled environment – even if there has been some wild augmentation, source code C may still be appropriate.

This means that F can be relevant in many different circumstances and the examples that follow focus on those that are most relevant to these aquatic species.

Corals - The majority of live coral traded internationally uses source code W, however, exports of maricultured specimens exported as F have increased in the past two decades. In 2022, the UK and Indonesia collaborated on producing '*…practical tools for CITES implementing officials to differentiate between maricultured corals and those which have been miss-declared as Source Code F.*' This guidance report can provide useful information for other Parties.

Seahorses - The vast majority of trade in live seahorses reported to CITES has been source code F, or F1 generation. In most cases, pregnant wild caught seahorses are brought into captivity to give birth, and the offspring exported under source code F. Sometimes the wild seahorses will breed in captivity, and in such cases their young will also be exported as source code F. Party documentation in support of the RST for seahorses revealed that sale of captive bred F1 generation animals was often erroneously implied to be exempt from the NDF processes. Yet export of seahorses determined to be source code F requires an NDF to be made prior to issuance of the export permit.

Project Seahorse has worked with CITES Authorities in Viet Nam to explore NDF options for their exports of source code F seahorses. Data generated by a national fisheries and trade study suggested that extraction of several thousand of wild *Hippocampus kuda* for broodstock each year (in total for the country, and not per aquaculture venture) may be tolerable, as long as there is oversight and adaptive management in response to indices relating to health of wild populations (notably CPUE). Project Seahorse and Viet Nam's Institute of Oceanography have developed protocols for tracking use of wild broodstock by seahorse farms in Viet Nam, which could be adapted to other national situations.

Giant clams - Depletion of the wild stocks have led to significant increases in aquaculture of these species for live trade and potential re-seeding. This often includes wild sourced broodstock being used which in many circumstances are kept in the wild and transported to a facility during the spawning process, being once again returned to the wild afterwards. In addition, the spat may be grown out in the wild. Below is a list of scenarios and associated source codes – these may be applicable to other listed species being cultured. These scenarios aim to clarify when NDFs are required and which source code is applicable.

1. Wild-sourced broodstock for spawning with partial cultivation in the wild:
Example: Giant clams sourced from the wild undergo controlled spawning in an aquaculture facility and are then reintroduced into the ocean. The resulting juveniles are raised in a sea ranch, not in complete isolation from wild stocks. Upon reaching a specified size, they are exported, requiring source code R. An export permit necessitates an NDF from the Scientific Authority, which should consider the impacts of removing and replacing adults, as well as removal of their spawn, on wild populations. The NDF should also consider whether traceability systems are in place to prevent the replacement of cultured individuals with wild stock.

2. Wild-sourced broodstock with cultivation of juveniles in complete isolation from the wild:
Example: Giant clam broodstock sourced from the wild undergo controlled spawning in an aquaculture facility, and the resulting spat are released into designated aquaculture ponds/tanks in isolation from the ocean. This requires the use of source code F, indicating captive-born individuals with wild-sourced parents. Export necessitates an NDF that considers similar concerns to those raised under scenario 1, above.

3. Captive-bred for F2 generation (closed-cycle in a controlled environment):
Example: Giant clams bred in captivity for the F1 generation within a closed aquaculture system. F2 juveniles from F1 adults (i.e., adults reared in complete isolation from wild stock) are bred in captivity until ready for export. This qualifies as "F2", signifying a fully captive-bred, second-generation situation, and source code C should be used. The same would apply for further generations (F2, F3, etc.) as long as they remain in a controlled environment.

3.12. Geographic scale of NDFs

Ultimately, Parties produce NDFs at the national level, but as case studies in the document shown so far have indicated, the catch that supplies the trade may occur on scales greater/lesser than this. This may be to recognise good management at a particular site within a Party's EEZ, or to assess off-take and trade in the context of a species' multi-jurisdictional range. Indeed, it is stated in Res. Conf. 16.7 (Rev. CoP17) that NDFs may want to consider: '*…population structure, status and trends* ***(in the harvested area, nationally and internationally)****;'*

Geographical scale of NDFs was considered in the aforementioned CoP17 Information Document submitted by IUCN.

3.12.1. Sub-national NDFs

Invariably, NDFs at the national level for aquatic species will not be for all the available marine and/or freshwater systems under the jurisdiction of the Party. However, in the context of specific management situations e.g., devolved to the sub-national level, it might be necessary to develop an NDF that specifically recognises only a small part of a species range in domestic waters.

The recent workshop relating to trade in seahorses laid out some key points to consider in the context of spatial coverage of NDFs:

> *Making NDFs does not have to be a one size fits all situation. Authorities may use more sophisticated approaches in [domestic] regions where they know more, but should be able to do a first pass of the easier approach in most places, even with limited data.*
>
> *Authorities should be careful in extrapolating data for one region to other regions within their jurisdiction…*

It was further stated that there was a need to:

> *…provide guidance on the appropriateness of making positive NDFs for specific populations or regions in a country, when data are inadequate or management is too problematic to make positive NDFs in the rest of the country.*

The International Council for the Exploration of the Sea (ICES) hosted a workshop in 2015 that focussed on the realities of making an NDF for the European eel, a species with a complex life history. The species is panmictic – comes from a single spawning population – and breeds in the Sargasso Sea, however, it has a very wide continental range. This leads to questions of how sustainable off-take is across the range, and whether NDFs can even be carried out at the national level. As a consequence, one of the key objectives at the workshop was:

- *An assessment of the scale that could be used to make a Non-Detriment Finding.*

It was stated in the workshop report:

> *With respect to the spatial scale on which an NDF might be assessed, in the absence of decisive evidence on what part of the continental stock successfully contributes to reproduction, the precautionary approach is to assume that any or all parts of the continental stock might contribute to reproduction. Taking this point into account, it may be feasible to undertake an NDF-assessment at smaller spatial scales than the entire population (and there could be valid reasons for doing so) but the risks and benefits need to be considered.*

This reasoning has fed into the UK NDF for the European eel. This has been carried out at the level of two specific donor river systems and a single recipient system and it proposed that the NDF:

> *…demonstrates that regulated trade from specified fisheries is not only sustainable but also provides a conservation benefit by increasing production and associated escapement of silver eels above that which would have occurred without fishery-related interventions.*

Further, the assessment presents conditions on catch and trade:

> *The UK will use safeguards, such as export quotas, to restrict levels and purpose of trade to ensure that non-detriment continues to be achieved. These will be complemented by measures for fisheries management and traceability of supply chains.*

3.12.2. Multi-national NDFs

As was highlighted in **Section 3.9**, there are a number of species, primarily sharks, where multi-jurisdictional NDFs would be of value to inform national decisions and assessments. In some cases, the wider species range is accounted for in a national NDF e.g. the USA NDF for shortfin mako off-take in the Pacific Ocean.

After the listing of Oceanic Whitetip (*Carcharhinus longimanus*), Porbeagle (*Lamna nasus*), Scalloped Hammerhead (*Sphyrna lewini*), Great Hammerhead (*Sphyrna mokarran*) and Smooth Hammerhead (*Sphyrna*

zygaena) at CoP 15 in 2013, a report was submitted to the Australian Department of the Environment, which aimed to outline key information for the making of NDFs for these species but also recognised the value of a multi-national approach to this process:

> *This document considers the take, stock status and potential sustainable take levels of these species relative to the production of NDFs for these species. It also considers the broader Oceania region issues in relation to the production of NDFs because of the shared nature of the stocks of these shark species and the limited capacity of many Oceania nations.*
>
> *Given that Oceania nations share stocks of many of these shark species there are significant advantages to developing a regional level approach to the development of NDFs as well as the research and monitoring that underpin them. The document develops a model for the implementation of such a regional approach that would take best advantage of the limited regional resources and capabilities.*

A model for carrying out multinational NDFs was proposed in the document, and this could be modified and applied for species other than sharks (**Fig. 5B**).

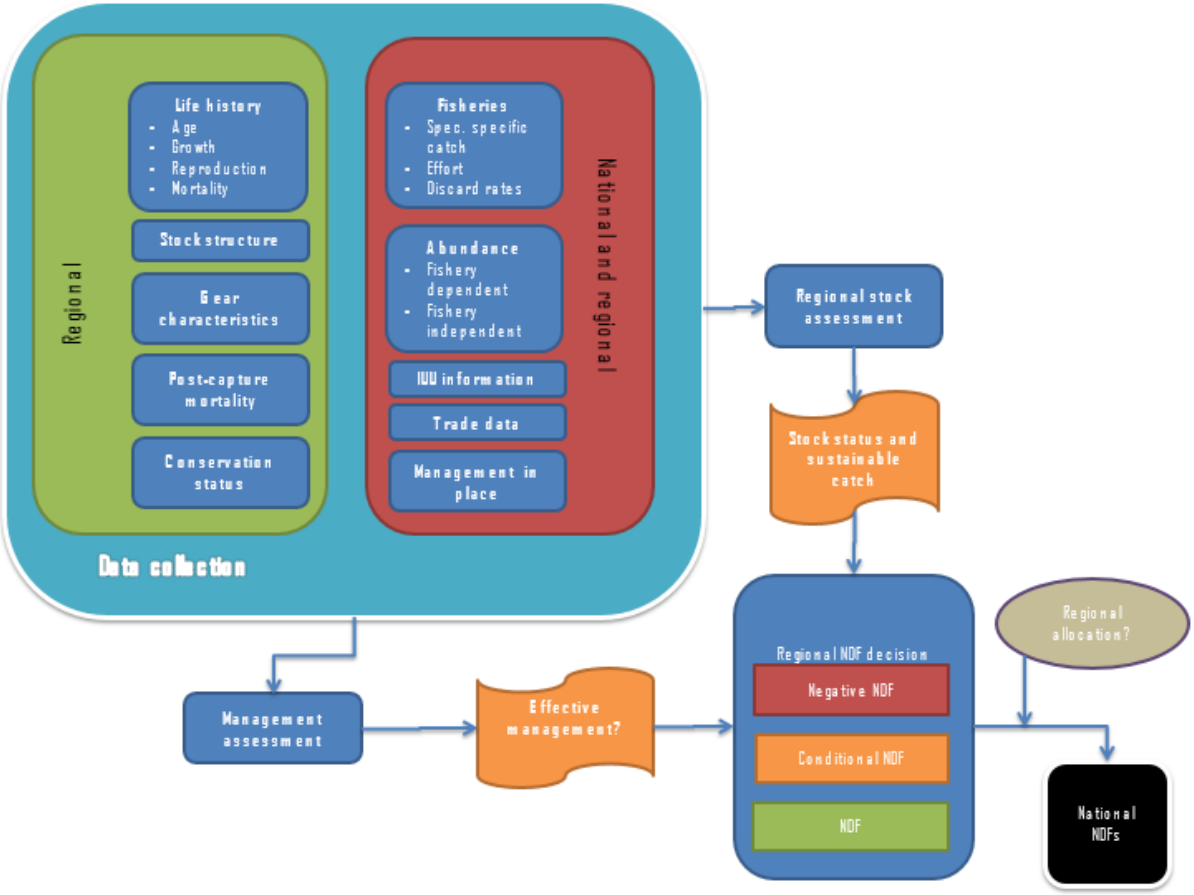

Figure 5B. Model for the development and ongoing maintenance of multi-national NDFs.

It's important to highlight that any regional NDF would have to be a voluntary agreement across Parties and that National Scientific Authorities ultimately have the legal mandate with regard to assessments.

It was also raised that there are already NDFs that take account of the regional scale, primarily for migratory sharks - e.g., the New Zealand and USA assessments for shortfin mako - and that it could be possible that these are used by less well-resourced Parties that catch in the same waters.

Outside of individual Parties, a number of RFMOs have stock assessments that cover appropriate scales. For example, WCPFC has a stock assessment for shortfin mako shark in the Southwest Pacific, which could be useful in making an NDF for the species. The Central America Fisheries and Aquaculture Organization (OSPESCA) have developed regional guidance for making NDFs for elasmobranchs.

4. Aquatic species and case study directory

4.1. Invertebrates

4.1.1. Corals

Precious (Order Antipatharia and family Coralliidae) and stony corals (Orders Helioporacea, Milleporina, Scleractinia, Stolonifera, and Stylasterina) are listed in the CITES Appendices. Both Antipatharia (Black corals) and stony corals are listed in Appendix II and four species of Coralliidae (*Corallium elatius*, C.*japonicum, C. konjoi* and *C. secundum*) are listed in Appendix III by China.

4.1.1.1. Precious Corals

With regard to Antipatharia, two species in trade from Hawaii were used as a case study at the 2008 Cancun workshop.

In accordance with CoP Decision 17.191 on Precious corals, FAO produced a report in 2019 relating to the biology, fisheries, and trade of these species. While it doesn't explicitly reference NDFs, it could provide useful baseline information for Parties wishing to carry out an assessment for these species. The document was submitted to AC31 and an intersessional WG proposed a number of recommendations that were supported at SC74. These included the following which could be considered in the context of making NDFs for these species:

> *For the CITES-listed black corals, the Animals Committee recognizes the need for better information on their conservation and sustainable use, and the need for strengthening data-collection and reporting from most areas.*
>
> *For species in Family Corallidae, the Animals Committee acknowledges that there have been advances and developments in fishery management and conservation arrangements in some regions, such as Japan's regulation in the Pacific, the adaptive management plan by the General Fisheries Commission for the Mediterranean (GFCM) for red corals (*Corallium rubrum*) in the Mediterranean Sea, the conservation measures by the South Pacific Regional Fisheries Management Organisation (SPRFM) and the North Pacific Fisheries Commission (NPFC), and others.*
>
> *The Animals Committee:*
>
> *encourages Parties to continue to strengthen their domestic management and conservation measures concerning all precious corals; and*
>
> *reminds Parties which export CITES-listed black coral species to make non-detriment findings (NDFs) and encourages these Parties to provide copies of the NDFs to the Secretariat for publication on the CITES website.*
>
> *notes the challenges of analysing trade in coral products since the current Harmonized System (HS) classification amalgamates them with other species due to the lack of specific custom codes;*
>
> *notes that there are many potential impacts on many coral populations in the wild (including climate change, ocean acidification, and others) which may affect precious coral too, which should be taken into account to understand the coral diversity within the marine environment.*

4.1.1.2. Stony corals

With regard to stony corals, two case studies from Australia and Indonesia were presented at the 2008 Cancun workshop.

Stony coral can take many forms in international trade, both live and dead, and there are significant issues in identifying to the species level. Resolution Conf. 11.10 (Rev. CoP15) on *Trade in stony corals* outlined this at a very high level, and recent documents at CoP19 and AC32 continue to examine these challenges – including proposing amendments to the Resolution. The aforementioned guidance document produced by the UK and Indonesia is a very useful tool in identifying corals to species or genus level. It also highlights the potential issues

around the use of Source Code F, how this might be mis-used to trade species collected from the wild and includes guidance on how to differentiate between wild-taken corals and corals from mariculture.

An issue that was raised in the context in trade of corals is the impact of climate change in the context of off-take and how this affects trade. For example, should mass bleaching events lead to a cessation of trade? Conversely, is reef health compromised by coral off-take and how does this effect the resilience of the reef and individual species to climate change? Parties may want to consider these when developing NDFs for stony corals.

4.1.2. Giant clam

One case study for the giant clam (Family Tridacnidae) was presented at the Cancun workshop in 2008.

4.1.3. Queen conch

This species has a high economic value, and cultural relevance, across its Caribbean range. It also has a complex life cycle which makes traditional stock assessments challenging. Queen conch has been listed in CITES since 1992 and two RSTs (1, 2) have been carried out in that time. Several NDFs have been made available for the species – Honduras, Saint Eustatius and Colombia - and a regional working group has produced a template for carrying out assessments. A regional management plan has been developed for the species, and it includes several recommendations that are highly relevant to the creation of NDFs.

- *Harmonized and simplified categories of Queen conch meat conversion factors*
- *Improvement of catch and effort monitoring programmes*
- *A synchronized regional closed season*
- *NDF for export of Queen conch meat and its by-products*
- *Licensing of all Queen conch fishers, processors and exporters*
- *National level Queen conch conservation and management plans*
- *Traceability of Queen conch throughout the value chain*

There is a wealth of information available for this species on a dedicated page on the CITES website.

It was highlighted that the most valuable Queen conch product is the pearl but this often gets overlooked as the scale of meat trade is much greater. At present, CITES permits and associated database reports only includes information on weights (kg), where numbers would be more useful in the context of sustainability of off-take and trade, and prevent underestimating volumes which is believed to be occurring.

A draft version of an NDF process for Queen conch can be found here.

4.1.4. Sea cucumbers

Sea cucumbers are primarily traded dried as bêche-de-mer and they are an essential livelihood for many small-scale fishers in range states. However, due to their large size and sessile life history, they are vulnerable to over-exploitation. Since 2019, there have been six species of sea cucumber (Class Holothuroidea) listed in CITES Appendix II (2019 - *Holothuria fuscogilva*, *H. nobilis* and *H. whitmaei*; 2022 - *Thelenota ananas, T. anax* and *T. rubralineata*); one species is listed in Appendix III (*Isostichopus fuscus*). Due to the relatively recent listing of these species, the available resources are limited, but issues that could be useful in the context of developing an NDF include:

- Fisheries management measures
- Characterisation of the supply chain
- Relevant RFBs
- Data sources
- Summaries of key teatfish harvest and trade countries
- Implementation challenges

In the context of NDFs, the Philippines and Yemen have banned trade. Papua New Guinea (PNG) produced an assessment in 2020, which included NDFs for *H. fuscogilva* and *H. whitmaei* found in the Pacific. The assessments used information on each species' intrinsic biological vulnerabilities, population structure and distribution, and status from fisheries resource assessments. The status assessments included recent and historical harvests and the fisheries management measures enforced by the PNG National Fisheries Authority (NFA) under the gazetted 2018

National beche-de-mer Fishery Management Plan. The preliminary NDFs were developed before the fishery was open for the harvesting season and were conditional on re-evaluation by ongoing stock assessments over two years. The assessments concluded that harvesting levels at the set TACs did not pose a threat to the survival of the two species populations in PNG.

For a number of other countries there was a need for more support. Indeed, at CoP19 in 2022, when the Genus *Thelenota* was proposed for listing, that due to challenges in developing NDFs for the three *Holothuria* spp.:

> *The Maldives, Sierra Leone, Samoa, Vanuatu and the Pacific Regional Environment Programme (SPREP) requested technical and financial assistance from the Secretariat for implementation of any listing, drawing particular attention to the need to support the development of non-detriment findings.*

Australia has published a document relating to the three listed *Holothuria* species – a positive NDF for *H. fuscogilva* was produced for harvest in Queensland but not for the other two species.

As stated in **Section 2.2**, the eNDF platform has been adapted by the Pacific Community (SPC) and Blue Resources Trust (BRT) for use with sea cucumbers.

4.2. Vertebrates

4.2.1. Sturgeon

Two species of sturgeon (family Acipenseridae) are listed in Appendix I of CITES (*Acipenser brevirostrum* and *A. sturio*) with the remaining species in Appendix II and Res. Conf. 12.7 (Rev. CoP17) specifically focuses on '*Conservation of and trade in sturgeons and paddlefish'.*
The Resolution outlines the need for appropriate fisheries management, co-operation between range states, registration of facilities producing caviar and a universal labelling system for caviar. Illegal off-take and trade are of significant concern for the species due to the high value of caviar.

Sturgeon species were included in RST in response to Decision 11.95 and a number of recommendations were proposed as a result of this. Progress towards these was summarised at SC47.

4.2.2. European eel

One case study for European eel was presented at the 2008 Cancun workshop.

As stated previously, the European eel has a complex life history, which can make the production of NDFs challenging. This was the subject of a Master's thesis produced in 2014 entitled: *An assessment of the challenges faced in making a Non-Detriment Finding (NDF) for* Anguilla anguilla. The thesis outlined a number of reasons why this is this case:

- *It is considered to be panmictic i.e. from a single population.*
- *It has a complex life-cycle with multiple life stages.*
- *It has an extensive range crossing three continents and multiple regional bodies and/or management regimes.*
- *There are fundamental knowledge gaps in the biology and management of the species that hinder stock assessments, such as:*
    - *An estimate of spawning biomass*
    - *The scale of density dependent mortality*
    - *Sex ratios*
    - *The relationship between recruitment and spawning stock*
    - *The effectiveness of management interventions e.g., EU Council Regulation (EC) No 1100/2007*
    - *The effectiveness of re-stocking on the replenishment of the spawning stock*
- *There are multiple threats to the species that may impact the species cumulatively and/or synergistically and assessing the impact of exploitation and associated trade in isolation is very difficult.*
- *It is traded both live and processed in a number of different forms all of which can be reported in multiple formats.*

- *There is evidence of significant illegal fishing and trade which confound attempts to assess existing legal fisheries and trade.*
- *As wild stock has to be used to seed farms around the world (and often in non-range States), monitoring of the input and output of farmed eels is challenging.*

These points should be considered by Parties producing an NDF for these species. For example, as stated above, the species is harvested for trade both as juveniles and larger eels, though the former tends to be for on-growing, and the latter for direct consumption. Parties should thus consider whether NDFs for different life stages would be appropriate.

Historically, the demand for much of this off-take was from East Asia, but in 2010, the European Union's (EU) Scientific Review Group (SRG):

> *...agreed that it was not possible to perform a "non-detriment finding" for the export of European eels, i.e. that it was not possible for the SRG to consider that the capture or collection of European eel specimens in the wild or their export will not have a harmful effect on the conservation status of the species or on the extent of the territory occupied by the relevant population of the species.*

Consequently, a zero-import/export policy was set which remains in place at the time of writing. As a result, patterns of off-take and trade of the species, and anguillids more broadly, have shifted.

While the European eel is the only species in the genus *Anguilla* that has been listed in the CITES Appendices, in recent years it has been recognised that trade in the taxa as a whole is interlinked and as such there has been a broader examination of off-take and trade. A key recommendation relating to NDF from (1, 2, 3) is that the development of a stock-wide NDF and/or the harmonisation of making national NDFs for this species could be useful.

These reports also highlight the significant scale of illegal trade in European eel and other anguillids, and the challenges relating to addressing this, particularly for glass eels where differentiating species is hugely challenging, and in a number of cases, only possible using molecular technologies.

At present six range States are commercially trading the European eel - Algeria, Egypt, Morocco, Tunisia, Türkiye and the UK (trade also occurs between EU Member States). The UK's NDF has been presented previously in the document, but at present, no other NDFs for the species are publicly available. Algeria and Tunisia are presently in a Review of Significant Trade (RST) for European eel (It was agreed Morocco could be removed from the RST process at SC77) and have provided a wealth of information relating to sustainable management of the species in support of their trade. As mentioned in **Section 3.12.1**, ICES produced a report in relation to carrying out NDFs for the European eel.

4.2.3. Seahorses

All species of seahorses were listed in CITES Appendix II in 2002 and came into force in 2004.
Two Parties have shared their NDFs for seahorses, both in response to Notification 2020/015, Australia and the USA, both for their small quantities of live exports.

- For Australia, exports of both captive bred and wild seahorses are only allowed from pre-approved operations with very detailed criteria for their approval. At the time of writing, one captive breeding program and two fisheries are approved for export of seahorses, managed by quotas on wild individuals.
- In the USA, NDFs for the export of live seahorses from the state of Florida are based on three management measures: (i) recreational and commercial bag limits; (ii) large areas of quality habitat closed to commercial and recreational off-take; and (iii) a limited-entry fishery for the commercial take of these species. Export of one species, *H. zosterae*, is also regulated by a minimum size limit, appropriate to the species.

Project Seahorse has applied their NDF advice in two case studies focused on Thailand and India.

Seahorses were the focus of the first RST for fully marine fishes, with three rounds initiated in 2008, 2011 and 2014. A total of eight species were investigated, accounting for the vast majority of seahorse exports reported to CITES. From the 78 range States selected for review, the AC decided that four should be given recommendations

for action, across five species. Such RST recommendations, issued at AC26 and AC27, provide useful guidance toward scientifically defensible NDFs.

The RST process brought to light three common issues that Parties encountered when making NDFs:

> i) Protected areas were often assumed to provide automatic conservation benefits to seahorses, although the presence of seahorses in these protected areas were not confirmed prior to establishment and the benefits to seahorses were not analysed or presented.
> ii) Party documentation in support of the RST revealed that sale of captive born (source code F) animals was often erroneously implied to be exempt from the NDF processes.
> iii) Haphazard releases of captive bred seahorses were mistakenly cited as a tool for the conservation or management of wild populations.

Project Seahorse has developed an easy approach to making NDFs for seahorses, applicable to many taxa, using an approach that maps answers to five questions in overlapping layers. This easier approach is covered above, in **Section 3.5.3**.

The IUCN Species Survival Commission Seahorse Pipefish and Seadragon Specialist Group has provided Parties with the tools and information needed to inform NDF development and guide adaptive management for seahorses. These have been compiled online and include guidelines for species identification, monitoring seahorse populations (details in **Box A**), country specific resources and information and NDF guidance, *inter alia*.

4.2.4. Sharks and rays

Sharks and rays are arguably the best resourced aquatic taxa with a specific guidance document, the eNDF platform, and many shared NDF case studies. At the time of writing, 41 NDFs or guidance for making NDFs for Elasmobranchii species have been shared by Parties, as well as many other resources. We have presented many of these elsewhere in the document, and the CITES NDF database has further examples.

There are Parties that share resources relevant to shark NDFs:

- Australia have a page dedicated to NDFs for sharks.
- **Module 14 section 3.2** outlines a national case study from Mexico.
- Costa Rica have produced reports relating to traceability and catch documentation (English / Spanish), and have a page dedicated to CITES and associated NDFs.

4.2.4.1. Stock assessments

Where stock assessments exist for listed shark species, at either the regional, national or sub-national scale that can provide very useful information for the production of NDFs. For example, for the blue shark, there have been a number of stock assessments made by RFMOs – Indian Ocean, North Pacific Ocean, Atlantic Ocean – that might prove a useful start point for carrying out NDFs for this species.

4.2.5. Cetaceans

Resolution Conf. 11.04 (Rev. CoP12) on *Conservation of cetaceans, trade in cetacean specimens and the relationship with the International Whaling Commission* (IWC):

> *RECOMMENDS that the Parties agree not to issue any import or export permit, or certificate for introduction from the sea, under this Convention for primarily commercial purposes for any specimen of a species or stock protected from commercial whaling by the International Convention for the Regulation of Whaling;*

As there is presently a moratorium on commercial capture of whales under the IWC, there are only a few circumstances under which permits should be issued e.g., movement of scientific samples. Trade in narwhal tusks derived from aboriginal off-take presents a useful case study.

Certain dolphin species are still traded live for under purpose codes Q (circus or travelling exhibition) T (commercial) and Z (zoo). No NDFs for such trade have been shared on the CITES NDF database, though an

NDF for *Tursiops aduncus* from the Solomon Islands was used as a case study in Cancun in 2008. It was stated that, '*Harvesting and Export Permits can only be held by persons or tribes of dolphin harvesting communities*… A study carried out in the Solomon Islands in 2007 on removal of live dolphins for trade stated the following:

> *In order to ensure the persistence of Solomon Islands* Tursiops aduncus *in the long term… …no removal should be allowed outside the study area without further biological assessment. Future quotas should be species-specific and refer to the number of captures rather than the number of export because the last does not account for mortality during local captivity.*

The Solomon Islands banned live dolphin export in 2017 under a national regulation.

5. Module 5 references

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