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OF WILD FAUNA AND FLORA

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SIMPLE IS GOOD: MOVING TOWARD PRAGMATIC AND EFFECTIVE MONITORING TO SUPPORT CITES IMPLEMENTATION FOR MARINE FISHES AND INVERTEBRATES ON APPENDIX II

This document has been submitted by the Secretariat on behalf of the FAO and IUCN, in relation to agenda items 15 (Capacity building) and 88 (Proposals to amend Appendices I and II).*

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

This document explores the challenges and opportunities of monitoring populations, fisheries and trade of marine fishes and invertebrates listed on CITES Appendix II, in support of ensuring sustainable trade through adaptive management. It addresses listings for a wide variety of species, including European eel, giant clams, humphead wrasse, queen conch, rays, seahorses, sharks and sturgeons. The term "marine species" is used to refer to this group of fully and partly marine taxa throughout the rest of this document. This document is intended to be an early step in a process that will create a set of tools and approaches for monitoring Appendix II listed marine species that Parties can deploy.

Monitoring in this context is the systematic collection of standardized information (data) for management purposes, and is a management cost that, if implemented wisely, offers useful signals for good management. The general principles outlined here can support monitoring to meet CITES obligations; monitoring populations, fisheries and/or trade is almost always necessary for effective implementation of Appendix II listings. While monitoring can seem daunting, it need not be a burden on resources or capacity. Parties commonly already have access to useful data and the collection of vital new information can be made tractable. The challenge is to plan the monitoring, data collection and analysis to be pragmatic and effective.

Carefully designed monitoring by Parties, and associated support for Parties, is vital for implementation of Appendix II listings for marine species. Without considered planning, there is a real risk of wasted effort where the wrong types of data are being collected; data are being collected using the wrong methods or at the wrong scale; collected data are not comparable or do not allow for robust analyses; and/or analyses are not mobilized for management. While these problems with data are a concern for all taxa, the risks may be particularly high for marine species because data from marine environment are difficult and expensive to gather. It is important to develop practical and affordable approaches that focus on the basics, to generate data that are reliable, comparable, and useful.

This information document highlights a few basic principles:

i) Good monitoring depends on clear goals and well-defined questions.
ii) Good indicators are needed to ensure monitoring does its job.
iii) Good methods for data collection can (and often should) be very simple, respecting a few basic principles.
iv) Good systems to store data are important, to allow information collation, extraction and sharing.
v) Good analysis and communication of findings/results are vital for data to influence decision-making.
vi) Sufficient resources are needed for Parties to establish and maintain monitoring that will guide export regulation.

CITES context

The document is intended to generate momentum toward the collection of simple yet rigorous data sets for assessment of populations/stocks, fisheries and trade of marine species, to promote their conservation and sustainable use. Such understanding will help address Parties' concerns about availability of data, challenges of implementing existing marine fish listings, and concerns about how to make non-detriment findings (NDFs) for marine species[1]. This should, in turn, further help Parties understand the implementation aspects of the listing proposals for marine species at the 17th meeting of the Conference of the Parties.

Monitoring is central to CITES effectiveness. Implementing Appendix II listings for marine species requires Parties to ensure non-detriment (as per Article IV, paragraphs 2(a) and 6(a) of the Convention[2]), legal acquisition (as per Article IV, paragraph 2(b) of the Convention), and humane transport of live specimens (as per Article IV, paragraphs 2(c), 5(b) and 6(b) of the Convention). Parties must also eliminate illegal trade in listed species (Article II[3]). None of this can be evaluated without monitoring. Further, well designed monitoring is vital to determine how measures taken under the Review of Significant Trade have affected a species. The focus of this Information Document is monitoring to support NDFs, but such monitoring will often meet other fisheries' needs as well.

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[1] *Vincent* et al. *2014. Fish and Fisheries.15: 563–592. DOI: 10.1111/faf.12035.*

[2] *A CoP17 Information Document for CITES Parties on important considerations when making NDFs for marine fishes is available as CoP17 Inf. 52: https://cites.org/sites/default/files/E-CoP17-Inf.-52.pdf.*

[3] *Article II, paragraph 4: The Parties shall not allow trade in specimens of species included in Appendices I, II and III except in accordance with the provisions of the present Convention.*

The requirement to monitor CITES Appendix II species is referenced directly and indirectly in both the text of the Convention and Resolutions[4]. Article IV, paragraph 3 states that national Scientific Authorities (SAs) should monitor both export permits and actual exports, and advise the Management Authority (MA) if measures need to be taken to limit exports to maintain the species throughout its range at a level consistent with its role in the ecosystems in which it occurs, and well above the level that might result in a species becoming eligible for inclusion in Appendix I. Resolution Conf. 10.3, paragraph j, recommends that "*the appropriate Scientific Authority monitor the status of native Appendix-II species and export data, and recommend, if necessary, suitable remedial measures to limit the export of specimens in order to maintain each species throughout its range at a level consistent with its role in the ecosystem and well above the level at which the species might become eligible for inclusion in Appendix I*". A number of other Resolutions also support the Convention text with respect to monitoring. For example, at its 16th meeting, the CITES Conference of the Parties adopted Resolution Conf. 16.7 on NDFs (in support of Article IV, paragraphs 2(a) and 6(a)), which in paragraph a,viii states that "*the implementation of adaptive management, including monitoring, is an important consideration in the making of a non-detriment finding".*

Robust management of CITES-listed species requires being able to share, compare and integrate data collected within a Party's Exclusive Economic Zone (EEZ), and also across different Parties' EEZs. This is especially true for species where management needs to reach beyond national boundaries. For example, when undertaking NDFs for species or sub-populations/stocks that occur within the waters of more than one State and/or on the high seas (straddling stocks), CITES encourages an NDF to be developed and issued at a regional level (see AC28 Com. 9 (Rev. by Sec.)[5]; Mundy-Taylor *et al*. 2014[6]). Such an approach should help ensure a biologically meaningful integrated assessment of the entire sub-population/stock and all sources of take and mortality. However, robust NDFs are often hampered by the fact that for a single species, individuals/agencies/organizations – within and among Parties – collect different types of data, using different approaches and/or different metrics, the data are inaccessible, and/or the data go unused.

Core principles for good monitoring

With monitoring, management becomes an iterative and adaptive process, with an ever-improving level of confidence in the findings. For example it can provide information on (i) conservation and/or stock status of marine species, (ii) pressures species face in the wild, (iii) management opportunities for alleviating those pressures, (iv) effectiveness of management interventions, (v) possible modifications to management that might improve effectiveness. Indeed, well designed monitoring and associated analyses are at the core of adaptive management, whereby management is improved (e.g. quotas adjusted, MPA coverage expanded) by learning from management outcomes.

Monitoring in support of CITES obligations requires a core standard of minimum data, which can be developed and strengthened over time. **Five careful steps in designing and delivering monitoring will help to create that core standard within and across Parties:**

1. Define the **'Why'** of monitoring, articulating the question that needs to be answered.
2. Decide the '**What**' of monitoring, identifying data needs to answer the question of interest.
3. Plan the **'How'** of monitoring**,** collecting data in a consistent and robust way across time and space.
4. Establish and **maintain data systems for organizing, storing and sharing of data**, that are both pragmatic and cost-effective, ensuring data are accessible to managers at national, regional and global levels.
5. Carrying out robust but straightforward **analyses to turn data into knowledge that is shared** to inform management and trade decisions.

This document now analyzes each of these five steps toward sound monitoring, acknowledging challenges and noting ways forward. While most of the comments have general value for all species listed on CITES Appendix II, and are not unique to marine species, it is important to bring it together in the explicit context of marine species as most monitoring of these taxa has happened outside the CITES context.

[4] *E.g. Article IV, paragraph 3; Article VIII paragraph 6(b); Resolution Confs. 10.3, 12.6, 12.7, 14.6, 14.8 and 16.7.*

[5] https://cites.org/sites/default/files/eng/com/ac/28/Com/E-AC28-Com-09-Rev.%20by%20Sec.pdf

[6] *Mundy-Taylor* et al. *2014. Report prepared for the Germany Federal Agency for Nature Conservation (Bundesamt für Naturschutz, BfN). Version 2.0. 142 pp.* https://cites.org/sites/default/files/eng/prog/shark/docs/Shark%20NDF%20guidance%20incl%20Annexes.pdf.

1. Why monitor

The goal of monitoring must be determined before the monitoring is executed. It is vital that Parties start by identifying the key questions they need to answer – obtaining consensus on why they need to monitor – before designing and implementing a monitoring program. Different goals need different data. If the goal is not articulated before data collection begins, Parties may well collect the wrong types and amounts of data at the wrong places and times, wasting valuable resources.

Monitoring can serve many general purposes in implementing CITES Appendix II, including ensuring that:

- exports are not detrimental to wild populations of the species;
- specimens in export trade were obtained legally;
- live specimens are being humanely transported; and
- understanding to what extent illegal trade is impacting the species.

All such monitoring matters but most of the focus in the context of CITES Appendix II has been on supporting NDFs. Monitoring of populations, fisheries and exports, with associated analyses and feedback, are essential components of a robust NDF process. Adaptive management is only possible with monitoring that assesses the status and demographic parameters of the wild populations or sub-populations/stocks, which may be inferred from fisheries and trade metrics/indicators (see next section). The usual focus is on tracking population size over time (often examined through proxies like catch per unit effort), but Parties may also have concerns about spatial distribution and demographic composition, or about particular sub-populations or fisheries.

2. What to monitor

It is vital that monitoring be designed to help achieve its goal. Once Parties have determined why they need to monitor, they can decide what information (indicators/metrics[7]) is needed to meet the goal. Different types of data collected at different temporal and geographic scales will help answer different questions. Good monitoring collects key information on a subset of indicators, in ways that are practical and cost effective.

Collecting more data is not the same as collecting better data. Parties should work with taxon and fisheries/trade experts to agree on the minimum data needed for effective CITES implementation of marine species, linked to questions and corresponding indicators. They could also agree on data that would be desirable without being essential, thus allowing for extra monitoring if time and resources allowed. Some data requirements will be general for all fishes and some will be species or taxon-specific. Guidance on minimum data requirements that are practical and fit for purpose could ease the job for managers who might otherwise be anxious about implementation of CITES Appendix II listing requirements for marine species.

Establishing minimum data requirements should include consultation and consensus building on key indicators by taxon, life-stage and type of fishery or trade. These discussions should engage Parties, Food and Agriculture Organization of the United Nations (FAO), the CITES Animals Committee (and the Standing Committee, in some cases), Regional Fisheries Bodies (RFBs) and relevant IUCN Species Survival Commission (IUCN SSC) Specialist Groups. Consultation would help mobilise diverse groups to collect comparable data across different spatial and temporal scales, using similar units, and thus facilitate information sharing and complementary decision-making based on integrated knowledge. It is particularly important to note that comparisons across different geographic areas can often serve as a substitute for comparisons across time where the latter are not yet available. Discussions and agreements should, wherever possible and useful, build on efforts to date so that new data are compatible with existing data. A good starting point would be for Parties to share information on their current monitoring, identifying the metrics currently used.

3. How to monitor

Monitoring is more likely to proceed if it is tractable and repeatable as opposed to elaborate and daunting. For most Appendix II-listed marine species, regular sampling of key metrics, at the right scale and at the right time, will be enough to inform management decisions. Such sampling need not be unduly onerous; the frequency, geographic spread and timing of monitoring can be adjusted to reflect available technical and financial resources, while still meeting monitoring goals. Parties need to have access to guidance on critical species-specific issues that affect data collection, to ensure that the right amount of information is collected in a

[7] *E.g. http://www.fao.org/docrep/w4745e/w4745e0f.htm; advice in Mundy-Taylor et al. 2014[6] and Foster & Vincent (2016) Project Seahorse, Institute for the Oceans and Fisheries (formerly the Fisheries Centre), The University of British Columbia. Version 4.0. 72 pp. www.projectseahorse.org/ndfs*

suitable way to achieve objectives. Parties can begin by mobilising existing life history information, population, catch or trade data and methods from published literature, agency databases, expert knowledge, stakeholder narratives and many other sources. They can also request data from other organizations such as FAO and RFBs. Scanning these sources can help inform Parties' own sampling regimes, as well as providing historic data to facilitate longitudinal comparisons.

Monitoring for adaptive management should take place over both space and time, and should include metrics on effort. This last point is important, as monitoring data are commonly only truly useful and dependable when they are accompanied by a measure of effort and how it changes. Differences over time in the number of fish each person caught or traded are only meaningful in conservation and management terms if the number of fishers and/or traders is understood. Otherwise, a halving in catch could merely reflect a doubling in the number of fishers active in an area (leaving catch-per-unit-effort, CPUE, unchanged), with no commensurate change in conservation concern. There are, of course, cases where it is not vital to track effort, such as when there is evidence of other clear metrics of overfishing or overconsumption (e.g. a dearth of mature individuals in populations) – but effort metrics are needed to properly interpret most monitoring data.

Monitoring can be undertaken in a variety of ways, any one of which may be enough:

- **Population monitoring** using fisheries independent approaches (e.g. underwater visual census, research trawl surveys). Monitoring must collect information on survey effort such as hours spent surveying, the number and size of samples taken, or the gear deployed.
- **Fisheries monitoring** for catches and catch demographics (such as size or sex ratio), including discards where possible (but at least landings). Monitoring must collect information on fishing effort such as number of vessels, time spent fishing, or changes in technology.
- **Trade monitoring** for domestic and international volumes and characteristics. Monitoring must collect information on trade effort, such as the number of buyers or the catchment from which each buys.
- **Stakeholder interviews** for opinion on historic and current situations. Although directly monitoring populations or fisheries is ideal, it takes time to get results. For an immediate (and generally cheaper) assessment, one can survey stakeholders (e.g. fishers, buyers, exporters) for information about the populations, fisheries and trades. Here, too, monitoring must include information on effort, such as changing numbers of fishers or buyers.

To make monitoring tractable, **Parties may choose to track specific "sentinel" or indicator populations, fisheries and/or trades for Appendix II listed marine fishes.** Frequent monitoring of these populations, fisheries or trades, in a consistent manner, will allow Parties to evaluate the impacts of exploitation on particular wild species or sub-populations/stocks. Parties will want to evaluate the feasibility of different sampling protocols used by different jurisdictions, trying for high frequency and consistency over time.

4. How to collate, curate and store data

Plans for monitoring need to include explicit consideration of data and information collation, curation and storage, taking into account advances in technology. It is vital that data be managed so they can easily be mobilized for analyses and decision-making over long periods of time. Paper copies, shared spreadsheets and online databases all have a range of benefits and costs. The key is to plan the flow of data from collection to deployment to ensure that nothing is lost and everything can be accessed and easily understood. In this context, Parties will benefit from understanding success and failures in data entry, storage and reporting systems.

Decision-making would be greatly enhanced if all sources of information were linked and accessible. Many different government agencies, organizations and institutions (nationally, regionally and globally) may be involved with monitoring for CITES marine species. Monitoring should be planned with a view to sharing information across databases and jurisdictions for use in holistic assessments that will help facilitate sound management decisions. These decisions, especially in the early years will benefit greatly from spatial comparisons, as temporal time-series datasets take a while to accrue.

5. How to analyze data and disseminate findings

Data must be mobilized and communicated for it to be useful. **Too many data never get used.** It is a great waste of resources – and, sometimes, stakeholder goodwill – to collect, collate, transcribe and store data if they are never applied to resource management challenges. Worse, failure to deploy data compromises fisheries, management and policy decision-making. The reasons for an untapped or underused reservoir of data are varied, and include:

- a mismatch between the problem and the data (see 1, above);
- lack of confidence in the quality or quantity of the data;
- genuine problems with the data (such as a lack of effort metrics) (see 3, above);
- changes in methodology over time without due consideration of implications for comparability;
- difficulties with data access and sharing (see 4, above);
- uncertainty as to how to use the data;
- inadequate human and financial resourcing; or
- anxiety about how to analyse and interpret data.

Many of these problems can be averted with good planning as outlined in this document. However, anxiety about deploying the data requires special attention.

Adaptive management requires that existing data be used even as new information is collected. Hesitation about interpreting data and applying the resultant knowledge may partly arise from unrealistically high expectations of what is needed. Simple analysis of carefully collected data is often sufficient to guide management decision-making … and can even be far better than waiting for more or better data[8]. Moreover, advances in data-poor fishery assessment techniques[9,10,11,12] mean that rich data sets and complex analyses are not the only option to support effective decision-making about fisheries or trade management. New approaches that include building simple automated routines to be run on command, using systematically collected data, can help greatly with making NDFs. Such routines can result in data and products that are communicated broadly, especially if cooperation agreements have been established between range State actors.

As with data, analyses are commonly most valuable when they are shared, whether in published literature, at expert gatherings, in CITES processes or through RFBs. It is vital that key stakeholders be aware of information, not least because evaluation of existing situations helps guide new decisions, in the best spirit of adaptive management.

Recommendations to help support Parties in monitoring

The commentary in this Information Document leads to eight recommendations that together should help advance data monitoring, evaluation and analysis for marine fishes and invertebrates listed on Appendix II. Monitoring systems and capacities are fundamental in the delivery of the CITES Convention and the foundations of fisheries management. It is important to develop principles and approaches to ensure information on CITES Appendix II-listed marine species is available to support effective management, trade, and implementation of the Convention.

It would be most helpful if the CITES Secretariat were to work with FAO on a range of ventures for marine species, all intended to maximize the gains from these agencies' involvement with these taxa.

1. **Seek external funding to support Parties** in collecting, collating, curating and centralizing critical data sets that will inform the making of NDFs for commercially exploited aquatic species included in the Appendices. Parties commonly highlight their need for support for fundamental monitoring as a notable management challenge.
2. **Bring Parties, RFBs and other experts together to explore (i) indicators and systems for monitoring, and (ii) ways to share resultant data**. They should start by identifying good current practices in information collection, and then consider how to enhance these practices. The goal is to collect data in ways that promote harmonized integration of stock, fisheries and trade statistics for CITES Appendix II-listed marine species. One result should be a common set of generic guidelines for monitoring marine species that Parties can use and adapt. This would offer advice on why, how, what, when, where, and how frequently to monitor. Such guidance should be added to CITES Virtual College

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[8] Johannes, R. (1998). The case for data-less marine resource management: example from tropical nearshore fin fisheries. Trends in Ecology & Evolution. 13(6): 243-246.

[9] Honey, KT., Moxley, JH., Fujita, RM. (2010). From rags to fishes: data-poor methods for fishery managers, Manag. Data-Poor Fish. Case Stud. Model. Solut. 1: 159–184.

[10] Fujita R, Karr K, Battista W, Rader, DN. 2013. A framework for developing scientific management guidance for data-limited fisheries. Proceedings of the 66th Gulf and Caribbean Fisheries Institute, 83-90.

[11] FISHE: Framework for Integrated Stock and Habitat Evaluation by the Environment Defense Fund – https://www.edf.org/oceans/fishe-framework-integrated-stock-and-habitat-evaluation.

[12] Walters, CJ and Martel, SJ. (2004). Fisheries Ecology and Management. Princeton University Press.

for any Party wishing to engage in monitoring marine species. Harmonising monitoring approaches will allow spatial comparisons to provide feedback where temporal time-series information is not sufficiently robust. Another result might be for all existing (national and global) data for a taxon to be made accessible through centralized data storage.

3. Include IUCN SSC Specialist Groups and others to assist in reaching agreement on **taxon-specific advice for monitoring** goals, metrics, methods, and analysis of data relating to particular CITES-listed species and communicate it across CITES Authorities[13].
4. Conduct a comparative study, across Parties, Intergovernmental Organizations (IGOs), and other relevant organizations to **identify practical solutions to problems for the full life cycle of data** (from data entry to reporting and long term storage). Highlight solutions for data collection, curation and sharing for adoption amongst range States, with targeted products, processes and formats for marine species on CITES Appendix II.
5. Support Parties' efforts by helping **develop and implement effective technology and processes** for collection, curation and use of data on CITES Appendix II-listed marine species. This means creating and offering tools, training and follow-up for long-term improvement in monitoring capacity.
6. Hold a workshop with experts on data-poor fisheries, Parties, and IUCN SSC Specialist Groups to **evaluate current data-poor fishery tools, methods and frameworks** that are being (or could be) adopted for CITES-listed marine species. One result might be a toolkit for guidance in monitoring methods for data-poor fisheries to support CITES implementation. Another would be simplified analytical routines that use data from identified metrics to generate understanding and advice.
7. Look for ways to **develop appropriate databases and accompanying analytical tools** that maximise the value of minimum monitoring data. Link the database to replicable routines for simple data analysis, facilitating improved data management, analysis and identification of signals for active adaptive management.
8. **Establish a joint Working Group on monitoring** CITES Appendix II listed marine species**,** with an emphasis on pragmatic and effective approaches across the entire life cycle of data. This group would advise CITES Parties on monitoring systems and capacities that would be key contributions to delivery of the CITES Convention and of sound fisheries management. Ideally it would have input from representatives of the RFBs, IUCN SSC Specialist Groups and others.

This Information Document was prepared by Project Seahorse (www.projectseahorse.org), acting as the IUCN SSC Seahorse, Pipefish and Stickleback Specialist Group (SPS SG) (www.iucn-seahorse.org) and the Food and Agriculture Organization of the United Nations (www.fao.org), with generous support from the Paul G. Allen Family Foundation (www.vulcan.com/areas-of-practice/philanthropy) and Guylian Chocolates Belgium (www.guylian.com).

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[13] *As one example, Project Seahorse has made efforts to support Parties with monitoring of seahorses,* Hippocampus *spp., with the development of toolkits to support effective underwater and fisheries monitoring. These toolkits provide tractable advice about data collection – the how, when and where – and include regional species identification guides, as well as downloadable spreadsheets to facilitate data storage. The toolkits and associated files are available at www.iseahorse.org/trends.*