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

Twenty-fourth meeting of the Animals Committee
Geneva, (Switzerland), 20-24 April 2009

International expert workshop on non-detriment findings

WORKING GROUP REPORTS

1. This document has been prepared by the Scientific Authority of Mexico, as chair of the workshop's international steering committee.*

2. Mexico organized an international expert workshop on non-detriment findings in Cancún from 17 to 22 November. It was attended by the following members of the Animals Committee: Ms Siti Nuramaliati Prijono (Asia), Mr Rodrigo Medellín (North America), Mr Rod Hay (Oceania), Ms Rosemarie Gnam (alternate member, North America), Mr Colman O'Criodain (alternate member, Europe) and Mr Radu Suciu (alternate member, Europe).

3. Five working groups on animal species were established during the workshop:

   - Mammals: co-chaired by Rodrigo Medellín (Mexico) and Alison Rosser (United Kingdom of Great Britain and Northern Ireland);
   - Birds: co-chaired by Rod Hay (New Zealand) and Philip McGowan (United Kingdom);
   - Reptiles and amphibians: co-chaired by Peter Paul van Dijk (SSC/IUCN) and Thomasina Oldfield (TRAFFIC);
   - Fishes: co-chaired by Glenn Sant (TRAFFIC) and Marcelo Vasconcelos (Brazil); and
   - Aquatic invertebrates: co-chaired by Vincent Fleming (United Kingdom) and Glynnis Roberts (United States of America).

4. The results of the work of each Working Group are shown comprehensively in Annexes 1, 2, 3, 4 and 5 to the present document. The 30 case studies discussed in the groups can be found on the workshop's website at: http://www.conabio.gob.mx/institucion/cooperacion_internacional/TallerNDF/taller_ndf.html

5. Appreciation is due for the contributions of the co-chairs, rapporteurs and participants in the working groups, and also of the authors who drew up and presented the 30 case studies on animal species that were reviewed during the workshop.

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* *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.*

6. The Animals Committee is requested to examine and discuss the results produced by the working groups with a view to preparing the relevant documents for CoP15 to respond to Decisions 14.135 and 14.143 addressed to the Animals Committee.

MAMMAL WORKING GROUP FINAL REPORT

Members

- Cecilia Lougheed
- Colman O´Criodain
- David Fraser
- David Morgan
- Dennis Ikanda
- Domingo Hoces
- Fernando Ugarte
- Jiang Zhigang
- Jorge Hernández
- Kathy Traylor-Holzer
- Lars Witting
- Nigel Leader-Williams
- Randall Reeves
- Rick Parsons
- Susan Fisher
- Teresa Telecky
- Wu Zhongze
- Yolan Friedmann

Co-chairs

- Alison Rosser
- Rodrigo Medellin
- Holly Dublin (not present at the meeting)

Rapporteur

- Gabriela López

Case Studies

Case Studies species	Country	Main characteristics of case studies
Narwhal *Monodon monoceros*	Greenland	Unsustainable subsistence harvest (export of tusks - not driving harvest)
Indo-Pacific Dolphin *Tursiops aduncus*	Solomon Islands	High level of harvest – lack of data
Leopard *Panthera pardus*	South Africa	Trophy hunting (recent CoP approved increase in quota Appendix I species)
Grizzly Bear *Ursus arctos horribilis*	Canada	Trophy hunting (long term harvest)
African Lion *Panthera leo*	Tanzania	Trophy hunting (long term harvest)
Crab-eating macaque *Macaca fascicularis* Rhesus monkey *Macaca mulatta*	China	Captive breeding non-native species (crab-eating macaque) and captive breeding native species (rhesus monkey)
Vicugna *Vicugna vicugna*	Peru	Live shearing

I. INTRODUCTION

To identify the most important variables for making Non-Detriment Findings for mammalian species, the Mammal Working Group reviewed eight case studies and the document *Factors to be considered during a CITES Non-Detrimental Finding* prepared by Uwe Shippmann (that compiled information from the IUCN Checklist, the EU guidelines and the ISSC-MAP). The elements to be considered when making NDFs were extracted from this background information and scored to determine their relative importance.

Elements considered to be most important included: population size, structure, trend, and range size, as well as information on the segment and proportion of the population harvested and on the type and magnitude of threats as well as the extent of monitoring of all these factors through time and space.

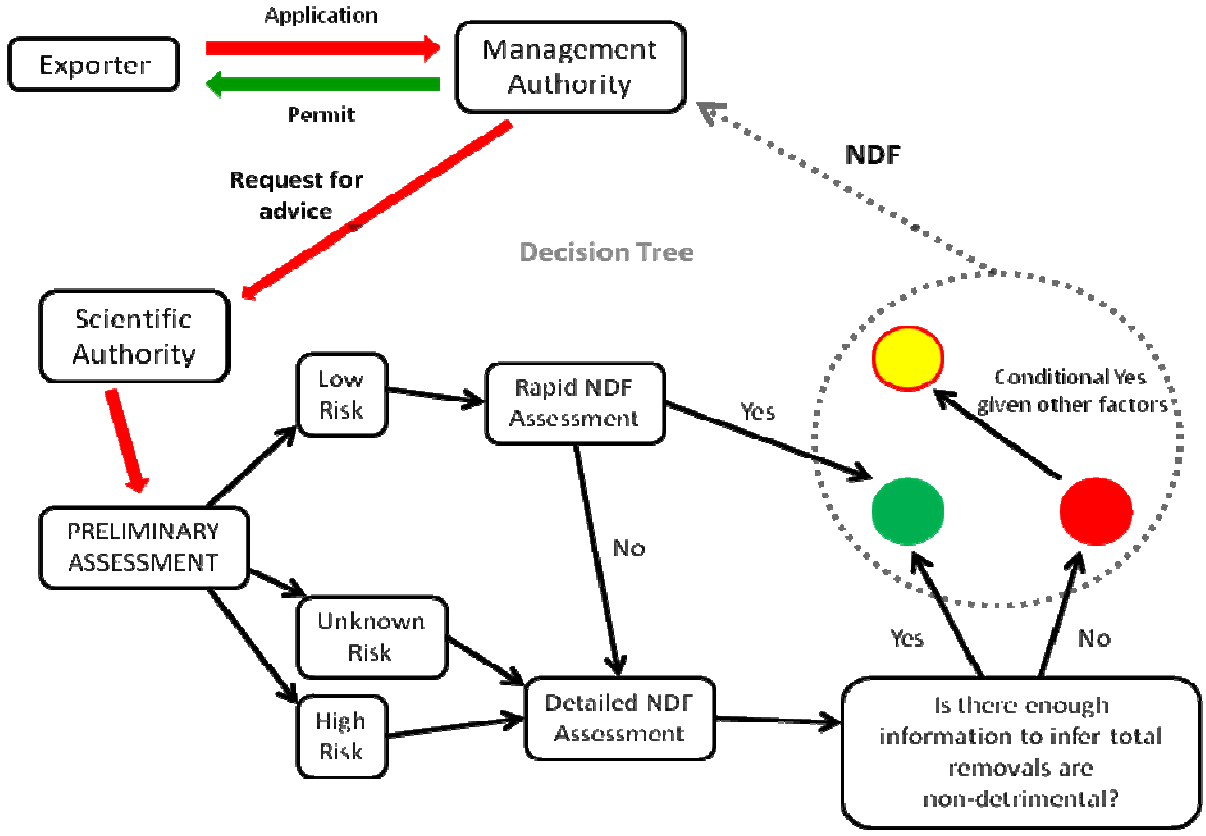
Additional discussions focused on need for guidance on several issues, including the need to take account of the population for which the NDF is being made, recognizing that whilst the harvest is from a local population, the Scientific Authority (SA) must consider the impact on the national population and, in the case of shared populations, on the regional scale. There was agreement that all types of removal from the population should be considered when assessing the likely sustainability of harvests, and that

the making of an nDF is a matter of judgment. But, the group recognized the need for further work on issues such as the role of the species in the ecosystem, and how to deal with the question of allowing trade in unsustainably sourced by-products from meat harvests.

To aid SAs in making a preliminary rapid-assessment, the working group developed a decision tree based on the risk that harvest would imply for the species, taking account of the level of harvest and general population characteristics. For trade likely to be of high or unknown risk to the species, a subsequent detailed-data-collection approach would be required. To assess the quantity and quality of information that is compiled to support a decision, the group recommended the use of peer review, technical assessment and expert opinion. Then, to integrate information in order to take the final NDF decision, methods such as risk assessment, expert assessment, modelling and consideration of the precautionary principle, were considered essential.

Throughout, adaptive management was agreed as the main approach to be adopted for future NDF making, as it will allow continuous improvement of Scientific Authorities work.

II. NDF PROCEDURE (Decision Tree)



III. PRELIMINARY ASSESSMENT

The following questions[1] are thought to be the first approach Scientific Authorities will take when receiving an nDF request from the Management Authority (MA):

1. What population(s) is the NDF process focused on?
2. Is it a shared, national or local population?
3. Does it involve removing animals from the wild population?
4. Is the species population considered widespread and abundant?
5. Is the species considered vulnerable (conservation status, threats)?
6. Is the harvest likely to have negative impact on the population?
7. Is the harvest likely to reduce the range of the species?

[1] Definitions of terms & benchmarks (e.g. Resolution 9.24)

These questions will help the SA to determine the risk that the harvest poses (low, high or unknown risk), so they can decide whether a rapid or a detailed assessment is necessary for the requested species. Additional references and data sources should also be consulted to help characterize the vulnerability of mammal species (see Future Work section below).

IV. OUTPUT FORMAT

When making a detailed assessment when an export is requested for species with a high or uncertain risk of harvest, the following points should be taken into account:

1. Information (elements) to be considered when making NDF for mammalian species

1.1 Biological and species status:
- Demographics (e.g. life history, etc.)
- Population size, trends, proportion of K (depletion level)
- Population range and structure
- Role in ecosystem and impact of harvest on it
- Global conservation status
- National conservation status

1.2 Takes/uses[2]:
- Demographic segment taken
- Number of individuals taken

[2] All types of removal (legal, illegal, unintended, bycatch, etc.) must be taken into account.

1.3 Management, monitoring and conservation:
- Separate population management
- Connectivity among populations
- Extent of time-space monitoring
- Conservation actions (e.g. protected areas, management plans, etc.)
- Harvest monitoring (all forms of removal)
- Tracking population origin of the specimen
- Historical effects of harvest and trade on the species
- Utilization trend
- Relationship between international trade and harvest (removal)
- Risk of mortality after harvest / before export

1.4 Threats
- Type
- Magnitude

2. Methods and sources of information

Due to the variety of life forms of mammal species, SA staff should consult references and data sources to determine the optimum methods to study particular groups of mammals (see Future Work section below). However, an Adaptive Management approach is highly recommended and the following are general lines to be considered when compiling information for the concerned species:

2.1 Biological and species status:
- Empirical data
- Modelling
- Experts opinion and assessments (all stakeholders)
- Literature review

2.2 Harvesting and trade data:
- Permit systems
- Monitoring export quotas and total removals
- Experts opinion (all stakeholders)
- Collecting biological data and samples from harvested specimens
- Periodic review of harvest

3. Data integration and analysis

Before taking any decision, the quantity and quality of information must be assessed (see next point). When integrating and analyzing information, the following approaches could be taken into account:

- Risk assessment
- Experts assessment
- Models
- NDF decision tree (see above)

4. Data quantity and quality assessment

- Peer review
- Technical assessment
- Experts opinion
- Different sources of data
- Transparent processes

5. Problems, errors, challenges or difficulties when formulating NDF

- Lack of information and limited access to it (biology, harvest, management, etc.)
- Improve reporting and standardization of units exported (conversion factors-CITES Database)
- Stockpile issues
- Need for capacity (cooperation between Parties, training, data sharing, funding, etc.)
- Lack of standardized process/guideline
- Costs
- Governance

6. Recommendations

- Need for guidance on basic principles (sustainability of harvest/export)
- Include in NDF decision documents a description on methods and sources of information
- Cooperation with other Parties or regions
- Documentation on the basis of NDF for routinely/significantly traded species (e.g. quotas)
- Need for mechanisms to satisfy validity of NDFs
- Need for proactive processes on CITES
- Consider incentives, benefits from harvest for communities
- Promote consumers to ask for NDF document when purchasing specimens
- Periodic data assessment
- Gain access to existing data, publications, etc.
- Evaluate alternatives to address real lack of information
- Precautionary principle when not enough information.
- Adopt adaptive management approach
- Harvest vs trade terms
- Take into account all sources of mortality.
- In case of captive breeding state the kind, extent, and importance of any existing ex-situ in-situ cooperation

7. Useful references and sources of information for future NDF formulation

- IUCN Checklist
- Future work to compile additional references (see next point).

V. FUTURE WORK

- Glossary to describe terms
- Compilation of helpful references and data sources
- Characterization of vulnerability for mammal species

BIRDS WORKING GROUP FINAL REPORT

Members

- Fatima Vanegas
- Martín Lezama-López
- Ron Orenstein
- Rosemarie Gnam
- Siti Nuramaliati Prijono
- Stuart Marsden

Co-chairs
- Phil McGowan
- Rod Hay

Rapporteur
- Adrian Reuter

Thanks to Vin Fleming and Fred Launay for case studies.

Birds on Appendix II

There are 1268 species, six subspecies and one population of birds listed on Appendix II. These contain a wide variety of life histories, significant variation in ecology and diverse data gathering contexts. For example, considering life-history, there are short-lived species and long-lived species that attain reproductive maturity after several years and a wide variety of reproductive strategies; considering ecology there are species that occur at naturally low densities, species that congregate, species that are patchily distributed, species that are very difficult to detect, and species that migrate and some of these characteristics may vary from season to season; and considering data gathering contexts, there are species that occur in habitats that are easy to survey and those that are very difficult to gather data in; and some species inhabit areas that are remote whilst others are in places that are easily accessible.

All of these factors affect the ability to gather data that can be useful in making Non-Detriment Findings. In order to explore these issues in more detail, several case studies were discussed:

- African grey parrot *Psittacus erithacus*
- *Cacatua galerita* and *Platycercus eximius* in New Zealand
- *Cacatua sulphurea* in Indonesia
- *Falco cherrug* in United Arab Emirates
- *Amazona auropaliata* in Nicaragua

- Assessing the status of raptors in Guinea
- Sustainable harvesting of birds in Mexico
- Collecting data in support of Non-Detriment Findings for parrots

- Considerations specific to songbirds

Challenges

Several common challenges emerged from these case studies and consideration of other bird taxa. These were explored both in the context of the need to make a Non-Detriment Finding in response to a specific application and also in the context of a longer term process to enhance a Scientific Authority's ability to make Non-Detriment Findings in the future. The case study that covered raptors in Guinea showed the potential value of the latter. The challenges include:

- The difficulty of locating existing data and having access to them;
- Gathering new data that are reliable and relevant is very difficult;
- Resources required for obtaining data ("cost of obtaining data");
- There is often a perceived lack of expertise available; and
- Having the confidence to interpret available data and making a Non-Detriment Finding. Some Scientific Authorities may find this daunting.

Therefore, there is a real need to make available guidance that shows how effort (and other resources) can be used to best effect. It was noted that making some Non-Detriment Findings can be very straightforward and a way of identifying these would be helpful. In contrast, other cases may be very complex and highlighting the difficulty inherent in making these Non-Detriment Findings (and how they can be tackled) would also be valuable.
These two extremes demonstrate the importance of striking the correct balance in guidance notes between providing prescriptive detail that might be helpful in complex cases and proposing broad steps that would be more generally applicable and would facilitate quick progress in straightforward cases.

Guiding principles

Some principles are common to all analyses of biodiversity data; they should underpin all Non-Detriment Finding processes. Three that were identified were:

1. Be precautionary
2. Be realistic about limitations of data
3. Feedback – learn lessons to improve process

The overall process

Given the large number of bird species contained on Appendix II and the diversity of life-histories, ecology and prospects for obtaining data, a simple scheme was constructed for working through the Non-Detriment Finding process. The purpose of this framework was to indicate stages where the complexity of each case could be assessed.

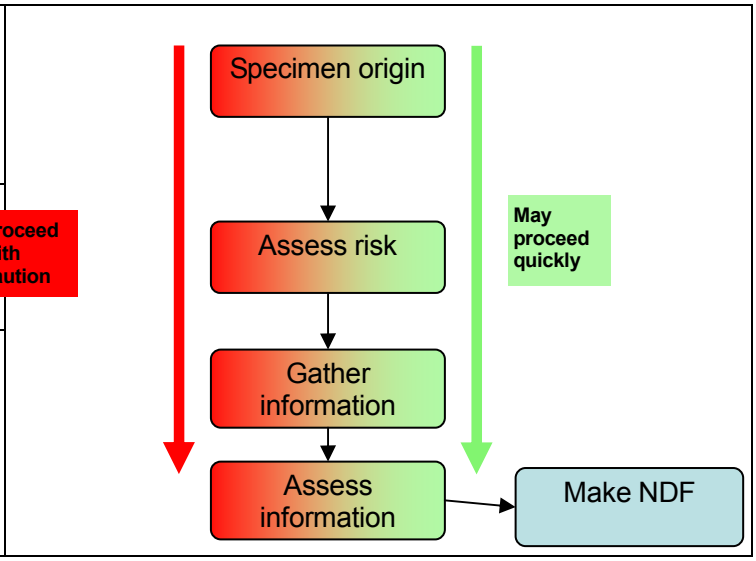
This step identifies cases concerning captive-bred specimens and those from introduced populations of low conservation value. These cases may often be fast-tracked.	
This step assesses the risk that the proposed harvest holds for the population given the vulnerability of the population and various proposed harvest characteristics.	
These steps considers the challenge of obtaining and analysing relevant data, whether in the short-term (i.e. already gathered) or in the longer-term (i.e. new fieldwork) for regularly traded species	

Table 1: The process of making a Non-Detriment Finding. In the flowchart, the red to the left of each box denotes cases that are more difficult, whereas the green to the right indicates cases that are more straightforward. Overall, this shows that some cases will be challenging because of where the specimens are from, the high risk of the proposed harvest and challenges in obtaining and analysing data.

Origin of specimens

The case studies and subsequent discussion indicated that there were some cases where Non-Detriment Findings could be quite straightforward. These are cases were the export is not likely to have an impact on the wild population in its native geographical distribution. They arise because of the long history of aviculture and captive breeding of birds and the large number of introduced species that have become established outside their native range. It should be stressed that some cases concerning both captive bred and introduced specimens will have consequences for the wild population in its native range, but this step allows for rapid identification of Non-Detriment Findings that are straightforward.

Risk Assessment

Most cases where a Non-Detriment Finding is being considered for birds have the potential to have an impact on the wild population. A risk assessment is a way to determine quickly where effort is best directed so that the conservation status of Appendix II species in not harmed by exports. This step assesses how big the risk is that the impact will be damaging to the wild population. Based on the outcome, a Scientific Authority can identify cases that should be subject to a relatively high level of attention and where a precautionary approach is especially required.

The following four criteria were considered important to take into account at this stage:

1. Vulnerability of the population;
2. General threats to population;
3. Potential impact of proposed harvest; and
4. Management of harvest.

The basic elements of the risk assessment system are:

1. Within each criterion there are specific factors that should be considered;
2. A simple scoring system, with one indicating a low risk of impact and five representing a high risk. Each of the four principal criteria was, therefore, given a score between one and five.
3. The four principal criteria may be weighted according to their overall contribution to risk of impact.

It must be stressed that whilst the general approach is considered robust, there is a need for refinement and testing of the detailed working of the risk assessment to ensure it achieves its full potential. This should include further consideration of the factors listed within each criterion to ensure that those selected are applicable to a wide variety of cases and identify the main factors to be considered. (It may be worth using terms and definitions from the IUCN Red List [and other global standards] where appropriate to avoid confusion.) It also includes further work on the weightings, scores and formulae used to calculate the overall risk assessment score.

The risk assessment can be created in a spreadsheet for easy use and an example is given in Appendix 2, with examples.

Gathering and assessing information

It is obvious that Non-Detriment Findings require data. Whilst in an ideal world there would be shortage of data, in the real world data are in short supply. The quality and quantity of data that are available influence the conclusions that can be drawn from them and an understanding of the limitations of different datasets may be helpful when making Non-Detriment Findings. This is because some datasets allow only the most basic interpretations to be drawn from them, whereas others may allow sophisticated analyses of varying levels of harvest and their impact on a wild population.

The conclusions of the risk analysis should guide the way that data are assembled and analysed. For bird species that are currently traded regularly it is possible to take a longer-term view about data requirements so that efforts can be made to gather new data in carefully planned and systematic ways. If new data are being gathered, the following should be borne in mind:

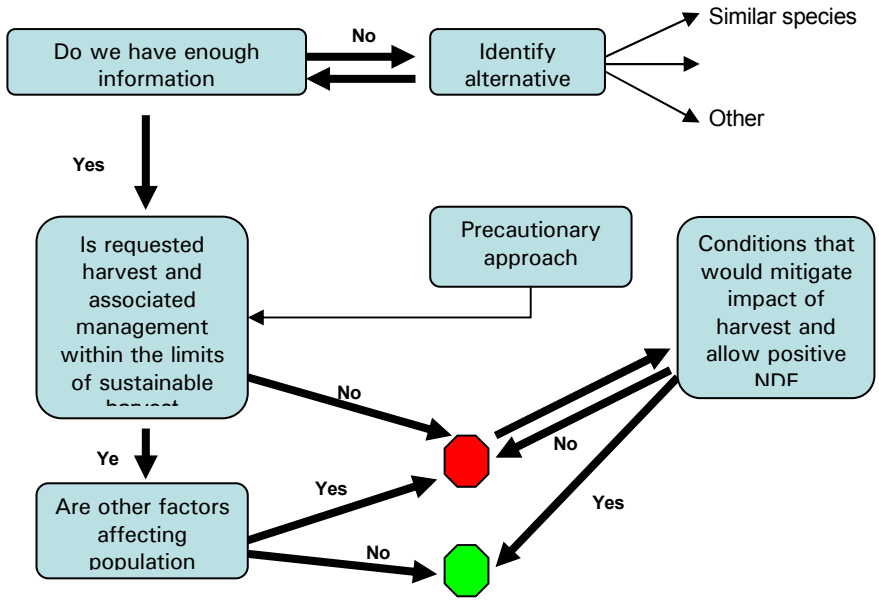
1. Different Non-Detriment Findings have different data requirements;
2. Type of data gathered determines what conclusions can be drawn;
3. Data gathering possibilities vary from situation to situation; and
4. Well-designed data gathering can greatly enhance Non-Detriment Finding process over time.

Because the availability of data is a key limiting factor in the making of Non-Detriment Findings in a wide variety of regularly traded bird species, this is an area that would benefit from detailed guidance. In order to help this process, approaches to bird survey and monitoring methods were identified and their applicability and usefulness in various situations considered. These are presented in Appendix 3 i).

The same issues (requirements, limitations and opportunities) hold true for the assessment of harvest of birds from wild populations. Therefore, approaches to providing appropriate data on harvest are provided in Appendix ii).

Making the Non-Detriment Finding

The flow diagram below depicts a decision-making process that has particular application to birds, though its elements would generally be consistent across most taxonomic groups.



The first step is an assessment of the adequacy of the information provided in support of the application. If it is not adequate, and the shortcomings are not readily redeemable by the applicant, consideration may be given to other sources of information such as readily available information from similar species, or consultation with relevant experts. This may enable the application to proceed to the next step, though, for some high risk species, a high degree of uncertainty may be sufficient grounds for a detriment finding.

The next step, which is the heart of the Non-Detriment Finding process, addresses the fundamental question of whether the harvest and export is within the limits of sustainability for the population and species concerned, in the context of any associated management programmes that may be undertaken. For some species, this may be straightforward, and a recommendation can be made. However, for the majority, other factors such as habitat loss, climate change, invasive species or additional sources of direct mortality such as illegal trade will have to be considered. Some factors may have a positive influence on the decision. For example, export of captive-bred specimens from closed-loop breeding facilities may reduce pressure on wild populations.

Once all of these factors have been assessed then a finding might be made one way or another. It must be stressed that a precautionary approach is desirable for most cases. One way of meeting such an approach is to set a sustainable harvest at the lower confidence interval of the estimated sustainable offtake. There are some situations where the analysis may be able to result in an Non-Detriment Finding if conditions (e.g. reduced quantity exported, or other mitigations of the impact of harvest) are attached to the permit.

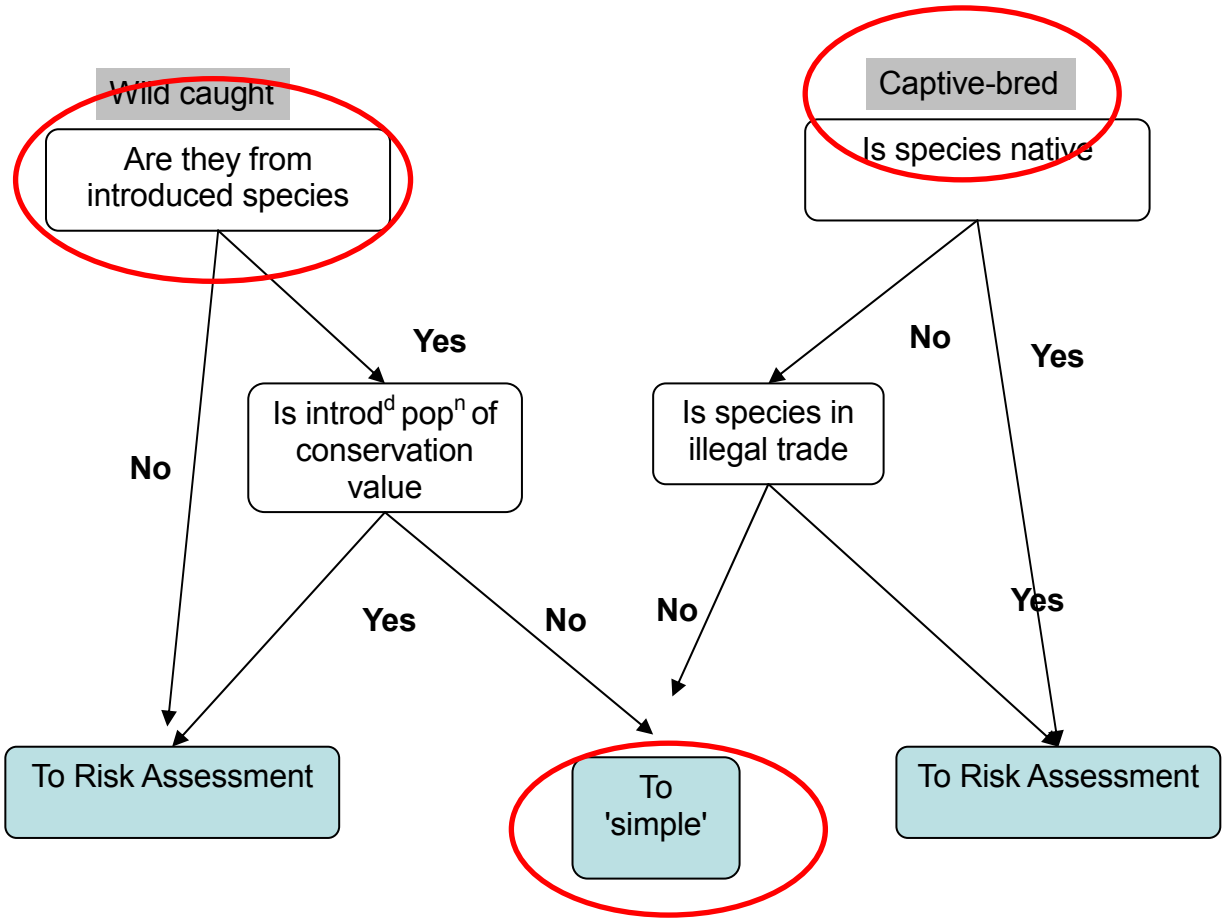
Of key importance, so that knowledge may be cumulative and decisions transparent, is documentation of the decision. The example from the US Scientific Authority provided in Appendix 5 illustrates a simple and standardised format.

Recommendations

1. **Non-Detriment Finding issues:** Examine past Significant Trade Reviews to identify technical issues
2. **Data requirements:** Technical advice from Scientific Committees and other bodies on data requirements for species subject to Significant Trade Review
3. **Data availability:** Provide a database (some publicly available sources already exist) of relevant biological information, e.g life history
4. **Data/expertise sharing:** Encourage sharing of these resources between range States, within regions etc
5. **Data gathering/analysis:** Technical advice from Scientific Committees and other bodies on use of approaches/methods
6. **Encourage bilateral support:** The UK-Guinea raptor assessment provided relevant information
7. **Added value:** Recognise that addressing many of these issues may have significant other benefits

Presentation and packaging of these ideas and guidance will be crucial.

APPENDIX 1: Origin of specimens



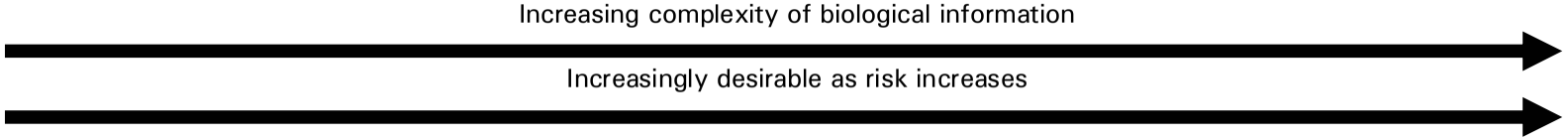
APPENDIX 2: Risk assessment template and rapid assessments of case study species and selected other cases. It must be stressed that whilst the general approach is considered robust, there is a need for refinement and testing of the detail. Please see text in main report.

Low = 1, High = 5	Cacatua galerita	Psittacus erithacus	Lophura eryhtrop	Falco cherrug	Padda	Amazona	MIN	MAX
1. Vulnerability of the population	1	3	3	3	5	3.5	1	5
Weighting = 3 Distribution - geographic range								
Abundance								
Reproductive capacity								
Ability to repopulate								
Habitat breadth								
Pop. Trend								
Complexity of life history								
Other								
2. General threats upon pop	1	5	3	3	5	4	1	5
Weighting = 1.5 Illegal trade								
Invasives, diseases								
Loss and degradation of habitat								
Domestic offtake								
Prop of range that is protected								
Conservation problems in other range States?								
Other threats								
3. Potential impact of proposed harvest	1	3	1	3	2	4	1	5
Weighting = 2 Quantity or proportion of population								
Life stage targeted								
Harvest method								
Will it stimulate further trade?								
Harvest area								
Importance of species in ecosystem								
Endemicity								
Other								

4. Management of harvest (1 = good)		2		5		2	3	1		3	1	5
Weighting = 1	Reliability of monitoring											
	Local community support											
	Effectiveness of regulation and management											
	Other											
Weighted risk assessment scores												
Low	**0 - 2.5**	1.1		3.7		2.3	3.0	3.7		3.7		
Medium	**2.6 - 3.5**	Low		High		Low	Medium	High		High		
High	**3.6 - 5.0**											

APPENDIX 3

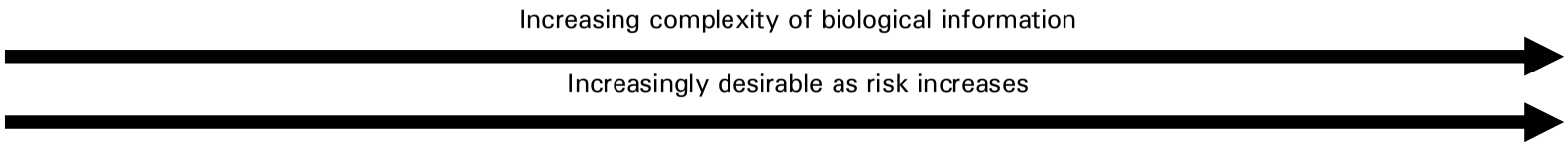
i) Gathering information on bird populations and applicability making Non-Detriment Findings for birds



APPROACH	Occupancy and other basic methods	Abundance indices and approximate density estimates	Reliable population size estimates	Harvest models
AIM/ QUESTION	Have occupancy rates or the range of the species contracted or become patchy due to excessive harvest?	Has the approximate abundance of the species changed at a site/sites due to excessive harvest?	How does the annual harvest of a species relate, as a percentage its overall wild population?	Are current/proposed levels of harvest sustainable based on known population dynamics and productivity?
FIELD DATA REQUIRED	Presence/absence of species at selected sites across range	Encounter rates or approximate population sizes at individual sites	Reliable estimates of actual population density and size across whole range/state	Detailed and reliable information on productivity and other population parameters – usually from selected sites
SUITABLE IN SITUATIONS	Species occurring at low density across huge ranges, in difficult locations	Species occurring at low density, which are difficult to survey, where expertise or resources are lacking	Species with relatively small ranges, occurring at reasonable densities, where quality fieldwork is possible	Relatively well-known species, where resources are available, stable locations
RESOURCES AND EXPERTSE	Possibly low although dependent on range size. Analysis usually simple but could be complex	Generally low level of resources and expertise needed.	Generally high level of effort and expertise needed	High level of effort needed. Modelling requires expertise but dependent on model used.
POSSIBLE FIELD TECHNIQUES	Ad hoc information, atlas-types data, birdwatchers' records, data from interviews with local communities, driving transects	Transect walks, Unbounded point counts, mist-net data, watches from vantage points, questionnaires, Roost counts, flyover counts	Distance sampling using VCPM or VWTM. Occasionally, actual counts, controlled roost counts or total nest counts (very rare /localised species)	Dependent on model used – in Potential Biological Removal model, detailed information on population size, proportion of population breeding, sex ratio, number of successful nests, fledgling production etc.

WEAKNESSES	Gives very sketchy idea of harvest impact. Other influences on population likely to be present. Tells us little about numerical decline. Serious data quality issues	Does not tell us about actual numerical decline. Open to bias due across observer and major detectability issues	Easy to make mistakes in data collection and analysis. Areas covered by survey small. Important assumptions may mean unsuitable for some species	Area covered small and hence problem of representativeness. Data may be imprecise. Model assumptions may be inappropriate.
STRENGTHS	Maybe the only possible technique. Looks across much of range. Involves stakeholders. New analysis tools available	Easy to perform and more area can b covered. Can be adaptable to individual sites/methods can be mixed.	Allows issues of detectability to be addressed. Actual population figures can feed into IUCN Red List classifications. Proper measures of error incorporated.	The most detailed and only direct test of sustainability of harvest. Data useful for other purposes. Surrogate information can be used in absence of species-specific data.
EXAMPLE SPECIES	Raptors, African grey parrot, rare species with large ranges	Saker falcon, Galliformes, cryptic species, patchily distributed/aggregative species.	Many: except extremely rare or highly clumped species. Not aerial species, raptors, waterbirds etc. Appropriate for many Parrots	Limited by resources. Cacatua, Amazona, raptors and a range of species. Data can be surrogate for some parameters.
KEY REFERENCES	Bibby et al. (1998; 2001), Danielson et al. (2005)	Bibby et al. (2001), Cougill & Marsden (2004)	Buckland et al. (2000) Marsden (1999) Buckland et al. (2008)	Beissinger & Bucher 1992), Bodmer (2004), Robinson & Redford (1991)

ii) Gathering information on harvesting of birds and applicability making Non-Detriment Findings for birds



APPROACH	Data from UNEP-WCMC Trade Database	Market/trade visits	Consultation with harvesters and brokers	Working with local communities	Direct monitoring of trade
SCOPE	Usually countrywide for export	In some cases regional, can be local, island- or countrywide	Generally local, specific to a defined site or handful of sites. Data collection slow so scope is local	Generally local, specific to defined site. Data relatively quick to collect so can be multi-community study	Generally local, but can include monitoring to fill existing country-wide quota
DATA/METRIC GATHERED	Usually Annual export or import	Numbers of birds entering/leaving market	Numbers of birds collected by individual harvesters over time. Locations of harvest	Numbers and origins of harvested individuals from area by a community	Direct total count of harvested individuals
METHODS	Trade data gathered by scientific authorities	Markets are visited periodically and throughput of specimens estimated	Interviews/information from harvesters and/or brokers. Visits to harvesting areas is important validation	Semi-structured interviews with community leaders and other key figures	On site count of harvest
STAGE OF TRADE	End point – post mortality at all previous stages	Mid-point. Pre-arrival mortality difficult to assess. Can yield data on in situ mortality	Start point to early stages. Mortality and other issues at capture point & early stages of trade can be quantified.	Start point. Mortality and other issues at capture point can be quantified.	Start point. Mortality and other issues at capture point can be quantified.
STRENGTHS	Long time series allowing trends to be examined. Metrics tend to be standardised across countries	Gives local patterns of 'visible' trade. Allows other data to be collected. Can be multi-species. Can be visible conservation presence	Can give reliable estimate of capture rates, methods of capture, effort, locations. Can link data directly with ecological conditions. If more than one stage of trade is studies, numbers can be cross-checked across stages and areas.	Can give reliable estimate of capture rates, methods of capture, effort, locations. Numbers harvested by individual communities can be can be validated through multiple interviews or visiting other communities.	Most accurate assessment of offtake. Most reliable for assessing mortality and management

WEAKNESSES	Coarse-scale disallowing local trends to be identified. Many anomalies/inconsistencies. Difficult to interpret	Requires careful approach to maintain accuracy of information. Seasonal patterns of trade need to be accounted for. Difficult to put data into regional or national context – requires some assumptions. Surveys can be ruined by enforcement actions	Requires suitable conditions to gain reliable information. Open to bias due to individuality of trappers. Translation, and cultural issues. Relationships can break down. Harvest from a defined area can be difficult to estimate unless all catchers are studied and the area can be defined accurately	Requires much caution in building trust – some organisations probably disallowed from collecting data – governments, foreigners. Difficult to assess reliability of data in some cases. Unless survey is complete and multiple communities surveyed it is difficult to estimate an absolute harvest from a geographical area.	May be a very sensitive issue. May require considerable effort
OTHER BENEFITS	Creates international cooperation and information/knowledge sharing	Price analysis may yield useful idea of ease of capture or market issues	Can be integrated with other ecological data to give information on nesting requirements, habitat associations, age structure, productivity etc	Can yield holistic data on livelihoods and aspirations. Can be used to develop partnerships with local communities. Gives information that can help to develop local harvest systems with enhanced benefits to local communities Can help to maximise the returns from the trade to the community	Can yield data on compliance with management procedures, mortality at various phases.
ILLEGAL TRADE	Does not represent well	Can yield data in some cases but this can be unreliable	Can yield useful data dependent on approach.	Can yield useful data dependent on approach	Can yield useful data dependent on approach

U.S. Fish and Wildlife Service
Division of Scientific Authority
Convention on International Trade in Endangered Species of Wild Fauna and Flora
Record of Advice on Export Permit Application

Application number: Date DSA:

Applicant: **Name**
City, State

Specimens and species:

Recipient: **Name**
City, State

Type of permit: Appendix II export

ADVICE

After examining the above permit application, we find that the proposed export is likely to be for purposes that are **not detrimental** to the species.

Basis for advice:

1. The applicant requests authorization to export **description of specimens**.

2. According to Resolution Conf. 12.11 (Rev. CoP13) (Standard nomenclature), species that are listed in the Appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) should have a valid CITES-recognized name, as reported in CITES-approved checklists. Nomenclature for the species included in this application follows **[*Checklist of CITES species and Annotated CITES Appendices and reservations* (Inskipp and Gillett 2005), *UNEP-WCMC Species Database: CITES-Listed Species* (UNEP-WCMC 2006), other]. Where appropriate, taxonomic names used in the application have been corrected to conform with CITES taxonomic references as follows: [if changes are too numerous to list here, refer to an Annex with the changes].**

3. **[Description of origin of specimens.]** According to the documentation provided by the applicant, the specimen**(s)** intended for export was/**were harvested by the applicant in (City, County, State)] on [date(s)];** was/**were purchased from [name of person(s)/establishment (City, State)] on (date), who harvested** the specimen**(s) in [(City, County, State)] on [date(s)]. Copies of receipts of purchase / collector's permit / landowner permission / applicable licenses included application.**

4. **[Brief summary of conservation status of species in the wild and explanation of why this *export* will not be detrimental.]**

5. **[Qualifications of applicant to harvest/maintain the specimen(s).]**

References Cited:

Inskipp, T., and H. J. Gillet. 2003. Checklist of CITES Species. CITES Secretariat, Geneva, Switzerland, and UNEP-WCMC, Cambridge, United Kingdom.

UNEP-WCMC. 2006. UNEP-WCMC Species Database: CITES-Listed Species. <http://www.cites.org/eng/resources/species.html>. [Accessed Insert Date].

BIOLOGIST:_____ CONCUR:_____.
DMA BIOLOGIST:_____
To be filed in: _____
DSA:[Your name]:[date finding was drafted]:[name of file]

REPTILES AND AMPHIBIANS WORKING GROUP FINAL REPORT

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Rapporteur

Paola Mosig

Additional Occasional Participants:

Hesiquio Benitez – Conabio; David Morgan – CITES Secretariat; Colman Ó Criodain – WWF International; Yolanda Barrios and Paola Mosig – Rapporteurs

List of Case Studies presented:

Crocodylus niloticus ranching in Kenya – KWS – Solomon Kyalo
Cuora amboinensis in Indonesia – TRAFFIC – Sabine Schoppe
Malacochersus tornieri in Kenya – KWS – Solomon Kyalo
Ptyas mucosa in Indonesia – TRAFFIC – Thomasina Oldfield
Uromastyx lizards in Israel – Simon Nemtzov
Cuora amboinensis in Malaysia – TRAFFIC – Sabine Schoppe

Main points of the outcome
The Reptile and Amphibian WG highlighted that these species exhibit a wide variety of characteristics of biology and life history, and are subject to a wide variety of production and utilization systems and practices; these are summarized in the Appendix.
The R&A WG considered that the NDF process needs to be practical and also have various degrees of rigour as appropriate. The NDF process needs to begin with a risk assessment process, to guide the different degrees of subsequent analysis of information. The group felt it was important to produce a proposed decision tree to guide a SA to making an nDF or rejecting the proposal.

The proposed decision tree developed by the WG consists of a two-step process, described in detail in the Appendix. **First**, a **Provisional Risk Assessment** (PRA) considers the intrinsic vulnerability of the species or population, the general threats acting upon the (National) population, and the potential impact of the proposal, and leads to categorization of a proposal to export as low, medium or high risk. A proposal ranked as 'High Risk' is rejected as detrimental. A proposal emerging as 'Low Risk' requires documentation of the elements supporting the low risk evaluation, and low-level monitoring of utilization and trade of the species. Proposals emerging from the PRA as 'Medium Risk' progress to the second step of the process. **Step Two** of the process involves **rigorous analyses of available data** to determine impact of past harvest and potential impact of proposed export, and determination of the extent and appropriateness of monitoring in place. Depending on the results of this analysis, and the rigour of the data available, an evaluation as non-detrimental or detrimental is arrived at and documented.

The WG concluded by highlighting general issues to improve implementation of the NDF process:

- The need to develop practical, scientifically acceptable monitoring programs, and to avoid incompatible methodologies which prevent consistent long-term assessment.
- The need to summarize and distribute field research methodologies.
- The desirability of establishing a repository of NDFs that have been made, so that they can be consulted by others for comparison and capacity building.
- The desirability of setting up web-based tools and information management systems where SAs can easily access pertinent information.

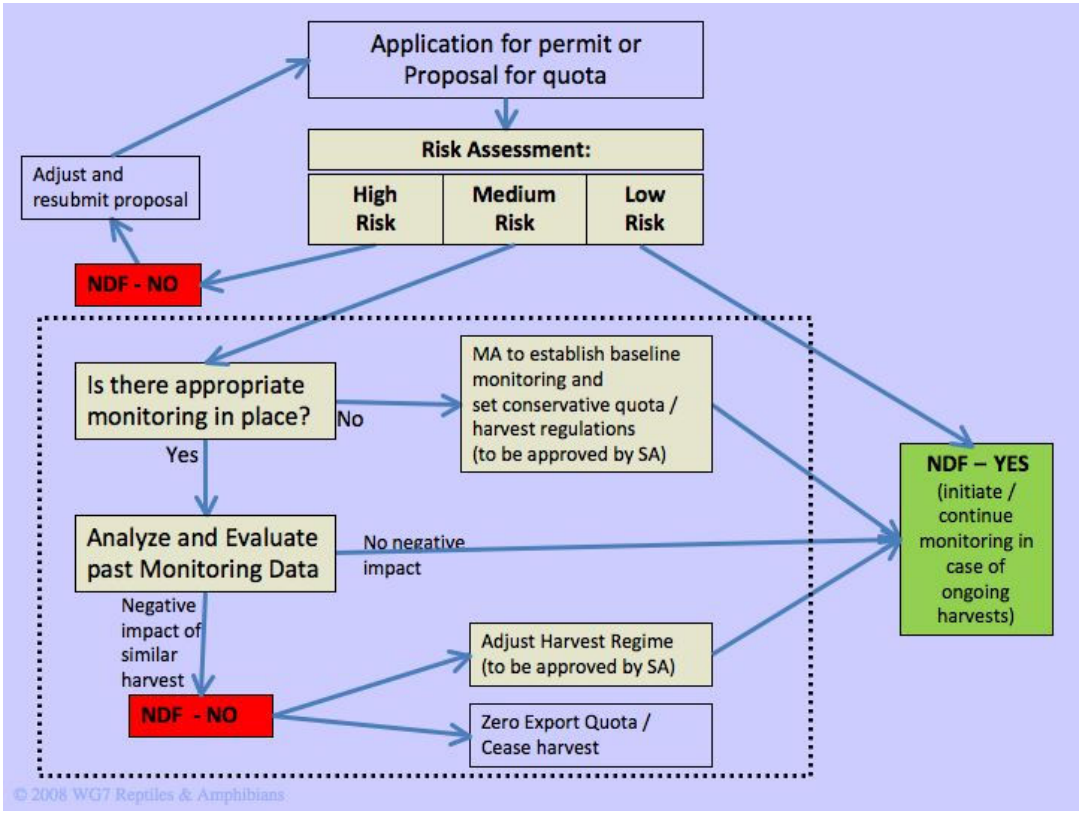

Figure 1. Outline flow chart of NDF process as developed by WG7 – Reptiles & Amphibians.

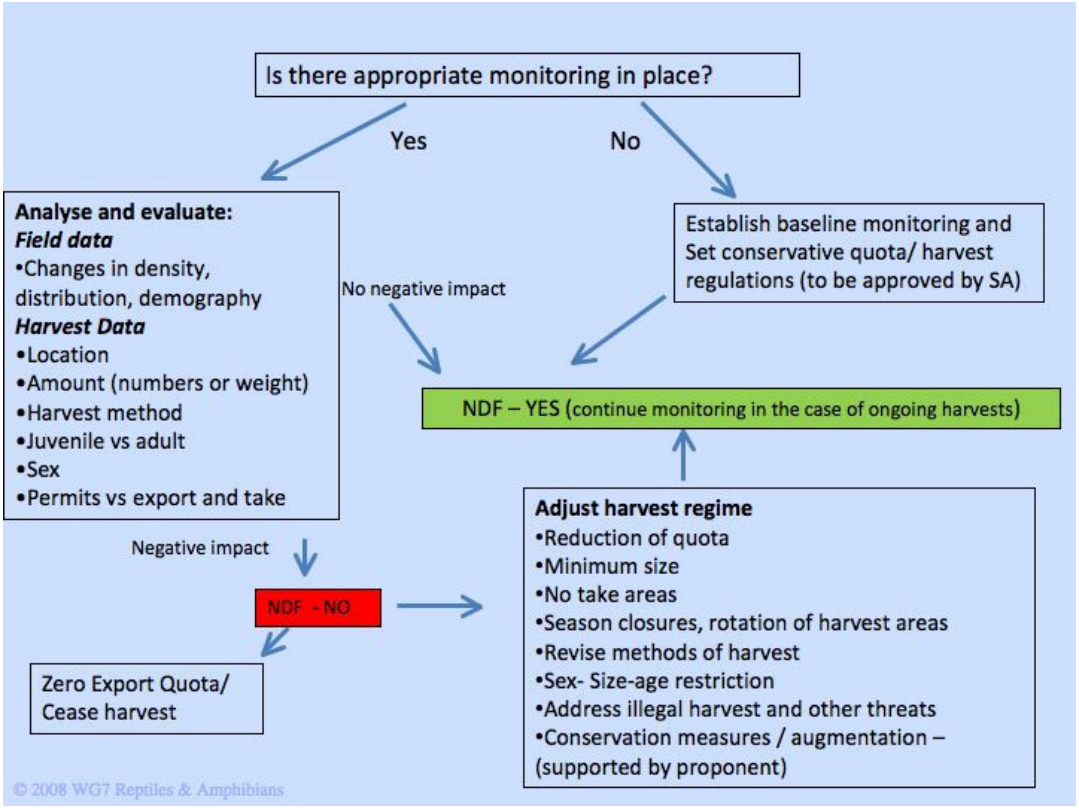

Figure 2. Flow chart of 2nd step of NDF process as developed by WG7 – Reptiles & Amphibians.

Appendix

Special considerations for NDFs for Reptiles and Amphibians

Reptiles and Amphibians exhibit a wide range of life history aspects, including species with characters that make them particularly susceptible to negative impacts from utilization, such as late maturity, long life span, and limited re-productive output (K-selected, slow), and habitat specialization. Other species display life history traits allowing them to recover from reasonable l.evels of utilization, such as high natural mortality at early life stages, high fecundity, and adaptability to human-altered biotopes. Most species have limited dispersal.

Extensive experience of production exists through ranching of crocodilian species and aquaculture of a few turtle and frog species. There is also an extensive history of reptile and amphibian populations and species that have been over-exploited, and/or subjected to the Review of Significant Trade process.

The WG considered that an NDF for reptile or amphibian species should consider the following biological and status elements: distribution and geographical variation; population size / density; vulnerability at the stage of harvest; size distribution, population structure; life history traits / reproductive capacity; ecological adaptability; dispersal capability; role in ecosystem; possible status of pest or invasive species.
The NDF should also consider the following data on utilization: Utilized population segment or life history stage (eggs/juveniles/adults, males/females) (size and weight limits); Production systems; Captive breeding / ranching; Nuisance animals; Legal and illegal trade issues; Utilization quantities; Collection methodology; Collection location; Tenure (exclusivity of utilization, jurisdiction over utilization, resource ownership); Closure periods; Effect of utilization. Finally, the WG considered that an appropriate monitoring program for a utilized reptile or amphibian population should evaluate one or more of the following elements:
Changes in Distribution; Changes in density; Changes in population structure; Collection areas (Proportion of total distribution, and change of areas); Catch per unit effort; Legal issues; and Other threats (habitat loss, climate change, pollution, etc.).
The WG recognized that reptiles and amphibians are subject to a variety of export proposals requiring NDFs, including ad-hoc / once-off permit applications and annual quotas. In addition, a number of Crocodile populations are subject to ranching systems following CoP approvals of proposals for downlisting populations from Appendix I to II for purposes of ranching. Trade in specimens from these systems is governed by Res.Conf. 11.16. The acceptance by the CoP of a proposal to downlist a population from Appendix I to II represents an NDF, and impacts and conservation benefits are monitored through the reporting requirements of Res.Conf. 11.16.
While much of the WG's deliberations were informed by the reptile case studies, consideration of some amphibian test cases indicate that our process and conclusions are applicable to amphibians as well.

The NDF Process as Developed by the Reptiles and Amphibians Working Group

Step 1 – Provisional Risk Assessment.

A 'quick and dirty' process to allow SA to make early assessment of the proposal.
The Provisional Risk Assessment examines three major areas:

- The intrinsic vulnerability of the species or population.
- General threats acting upon the (National) population.
- The potential impact of the proposal.

The Intrinsic Vulnerability of the species or population examines its distribution, dispersal, population size / density, reproductive capacity, niche width, and role in the ecosystem.
General Threats acting on population that should be considered are levels of domestic use, illegal trade, human-induced impacts (such as habitat loss, pollution, human-animal conflict), invasives, diseases, and any other relevant threats.

The potential impact of the proposal to export includes consideration of the quantity or proportion of population targeted, the life stage targeted, the harvest method, harvest purpose, harvest area, effectiveness of regulation and management, and consideration of monitoring data.

The Provisional Risk Assessment leads to categorization of a proposal to export as low, medium or high risk. This categorization is made through a simple scoring system, detailed in the full working group report. This scoring system requires further consideration, refinement and evaluation, but the WG felt it was important to demonstrate the concept. We felt that quantifying the initial risk was important as guidance to the SA to indicate those proposals that could be relatively easily processed, and not require the resources inherent in a rigorous NDF analysis. **Low Risk** – Non-detriment finding made. SA ensures that low level monitoring programme is instituted, comprising monitoring of permits vs. actual take, accumulation of permits, and a 'low-key' harvest impact monitoring program (trader interviews, casual field observations). These data should be evaluated for subsequent requests in future years.
High Risk – Unacceptable risk, leading to rejection of proposal; any amended proposal requires re-evaluation from the beginning of the provisional risk assessment process.
Medium Risk – goes into step 2 of the process.

Step 2 – Analysis of available monitoring data and management

This part of the process involves determination of the extent and appropriateness of monitoring in place and rigorous analyses of available data to determine impact of past harvest and potential impact of proposed export. For reptile and amphibian species, an appropriate monitoring program is considered to collect, analyse and evaluate data on parameters such as: changes in density, distribution, and demography of the harvested population, harvest location, harvest amount (number and/or weight), harvest method, demographic segments subject to harvest (age, gender), monitoring of permits vs. actual take, and accumulation of permits.

If appropriate monitoring is in place, the SA should analyze and evaluate past monitoring data to determine whether previous similar harvests have had negative or no negative impact; if no negative impacts are apparent, a positive NDF can be made for ongoing harvest at a comparable level.

If appropriate monitoring is not in place, the MA should ensure that an appropriate monitoring program is established. Once such a monitoring program is committed to, and subject to establishing a precautionary level of permitted harvest or quota, and subject to approval of these measures by the SA, a positive NDF can be made.

Once monitoring is in place for an appropriate length of time, the results of the monitoring program should guide/inform the decision process for ongoing or subsequent applications for trade in the species. In cases where the monitoring program documents a negative impact from harvest, the harvest regime must be adjusted by, for example: reduction of quota, imposing or changing minimum or maximum size or other restrictions on size, age or gender of individuals exploited, season closures, closed areas, rotation of harvest areas or other time/area restrictions, revising methods of harvest, measures to address illegal trade and/or other threats, and/or other conservation measures to protect and/or augment populations; support by the proponent for such measures is recommended. A (temporary) zero export quota or cessation of harvest is the other option. A subsequent NDF can only be made when the SA is satisfied that the adjusted harvest regime will represent no threat to the survival of the species in the wild and to recovery of the population to its pre-harvest level.

Sources of information on Reptile and Amphibian status, biological research and monitoring methodologies.

IUCN Red List of Threatened Species: http://www.iucnredlist.org

Crocodile information: http://www.flmnh.ufl.edu/cnhc/cbd.html

Turtle taxonomy, plus conservation biology accounts for selected species: http://www.iucn-tftsg.org/checklist/

Reptilian taxonomy and distribution: http://www.reptile-database.org/

Amphibian taxonomy and biology: http://www.globalamphibians.org/

Measuring and Monitoring Biological Diversity - Standard Methods for Amphibians. Edited by W. Ronald Heyer, Maureen A. Donnelly, Roy W. McDiarmid, Lee-Ann C. Hayek, and Mercedes S. Foster. 1994. Smithsonian Institution Press. 384 pages. ISBN 1-56098-284-5.

Sampling Rare or Elusive Species: Concepts, Designs, and Techniques for Estimating Population Parameters. William L. Thompson. 2004. Island Press. 429 pages. ISBN 1559634510, 9781559634519

Occupancy Estimation and Modeling: Inferring Patterns and Dynamics of Species Occurrence. Darryl I. MacKenzie, James D. Nichols, J. Andrew Royle, Kenneth H. Pollock, Larissa L. Bailey, James E. Hines. 2006. Academic Press. 324 pages. ISBN 0120887665, 9780120887668

Handbook of Capture-Recapture Analysis. Edited by Steven C. Amstrup, Trent L. McDonald, Bryan F. J. Manly. 2005. Princeton University Press. 313 pages. ISBN 069108968X, 9780691089683

FISHES WORKING GROUP FINAL REPORT

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The Fish Working Group (WG) considered five case studies produced for the workshop: seahorses *Hippocampus* spp., humphead wrasse *Cheilinus undulatus* from Indonesia, sturgeons from the North west Black Sea and lower Danube river, *Arapaima* spp. from Brazil and eel *Anguilla anguilla* from Sweden. An extra species group was considered for sharks given the presence of experts in the group. After examining case studies in detail the WG considered each case study against the areas of information on the species, harvest, management measures and monitoring methods (Annex 1). The group further considered the logical steps to be taken when making an NDF. A flowchart was constructed reflecting the group's view on how NDF would be made on the short term and on a rolling basis to review the integrity of management and information associated with a species (Annex 2). An attempt to prioritize the critical elements to be taken into account to complete an nDF for each species groups was made and is reported in Annex 1 and in Table 1 of Annex 2. In addition, the WG considered the main problems, challenges and difficulties found in the elaboration of NDF, and reviewed the available references for an NDF formulation (Annex 1).

In examining the way in which an NDF would be considered for fish species, the WG considered some underlying assumptions that would support the conclusion that the general guidelines constructed by the WG were true to life:

- Fisheries management has a long history of trying to understand how you can best manage the harvest of fish so it is not a new concept;
- Many training manuals and databases exist to support those making NDF;
- In terms of risk, fish listed on Appendix II of CITES have already been concluded by Parties to be vulnerable and trade is a particularly important threat;
- More uncertainty requires more caution and leads to more monitoring; and
- Experts, who understand the use of fisheries management tools, are available to Scientific Authorities.

The WG concluded the following were essential to enable the NDF process for fish:

- A need to consider all sources of significant mortality affecting species in trade
- A need to consider whether establishing harvest/export quota is enough to achieve conservation goals
- Collaboration between Scientific Authorities and fisheries experts
- Transboundary migrants and shared stocks require regional NDF cooperation
- Be cautious with fisheries dependent data, verify when possible
- When possible, base NDF on both fisheries independent and dependent information/data
- Need techniques and legislation to distinguish among farmed, captive bred and wild individuals
- Management on which NDF is based should employ principles of adaptive and participatory management
- Parties need to report to Secretariat methods by which NDFs are being made on an annual basis to enable transparency, learning between NDF processes and to ensure that fish species which range beyond the boundaries of one State are accounted for by all range States in there NDF processes

Annex 1. Main outputs of the Fish WG

1. **Information about the target species or related species. The minimal information considered essential to make a reliable NDF for each of the case studies is highlighted in bold. Also highlighted are the most commonly used management measures and monitoring methods.**

	General	Humphead wrasse	Seahorse	Sturgeons	Eels	Arapaima	Sharks
Biological and species status:	Taxonomy clarified Time-series of abundance Historical abundance Temporal and spatial distribution Size distribution Age distribution Sex ratio Maturity schedule Maternity schedule Recruitment Fecundity Type of reproduction Natural mortality rates/schedule Gamete viability (health) Critical habitats (spawning, nursery, feeding, overwintering, etc)	**Abundance** **Size distribution in wild** **Maturity schedule (size at first reproduction)** Temporal and spatial distribution Sex ratio Critical habitats Recruitment (SR relationship) Type of reproduction	**Size at maturity** **Taxonomy** **Critical habitats** **Temporal and spatial distribution** **Size distribution** Type of reproduction Time-series of abundance	**Age distribution** **Sex ratio** **Recruitment** **Critical habitats** Taxonomy Time-series of abundance Historical abundance Temporal and spatial distribution Size distribution Maturity schedule Type of reproduction Natural mortality rates/schedule	**Time-series of abundance** **Stage distribution** **Size distribution** **Sex ratio** **Recruitment** Natural mortality Temporal and spatial distribution Historical abundance Age distribution Gamete viability (health)	**Time-series of abundance (in one area)** **Size distribution** **Maturity schedule** Taxonomy clarified Recruitment Type of reproduction Air breather	Temporal and spatial distribution Age distribution Maturity schedule Maternity schedule Fecundity Natural mortality rates/schedule Critical habitats

	General	Humphead wrasse	Seahorse	Sturgeons	Eels	Arapaima	Sharks
Takes/uses (e.g. harvest regime):	Direct legal harvest by sectors (commercial, recreational, ranching, subs, etc.) Bycatch (post-capture mortality) Illegal harvest Collateral mortality (e.g. catch/release) Gear selectivity and impacts Market chain Harvest method	**Direct legal harvest by sectors** **Size distribution in trade** **Illegal harvest** **Market chain** **Harvest methods**	**Direct legal harvest** **Bycatch** **Market chain** **Harvest method**	**Direct legal harvest by sectors** **Illegal harvest** **Market chain** **Harvest method**	**Direct legal harvest by sectors** **Illegal harvest** **Collateral mortality (dams, etc)** **Market chain** **Harvest method**	**Direct legal harvest by sectors** **Illegal harvest (in unmanaged communities)** **Harvest method** Gear selectivity and impacts Bycatch	Direct legal Bycatch (post-capture mortality) (Basking) Illegal harvest Non-harvest related mortality (e.g. catch/release) Gear selectivity and impacts Market chain Harvest method
Other impacts	Habitat degradation (fisheries related or not) Habitat loss (dams, coastal development, navigation, etc) Environmental change Pollution Invasive species Genetic disruption (e.g. stocking, translocation) Hydro-power related mortality Water diversion Predator-prey dynamics	**Habitat degredation**	**Habitat degradation and loss (fisheries related or not)** Pollution	**Habitat degradation** **Habitat loss (dams)** Pollution (heavy metals, etc) Genetic disruption (e.g. stocking, translocation)	**Habitat loss** **Pollution** **Invasive species (parasite)** Environmental change Genetic disruption (e.g. stocking)	**Genetic disruption (e.g. stocking, translocation)**	Habitat degradation

	General	Humphead wrasse	Seahorse	Sturgeons	Eels	Arapaima	Sharks
Management, conservation	Management history (formal and informal) Protected areas Seasonal closures Bag limits Size limits Gear restrictions Rights-based management Community-based management Environmental education Capacity building Transport regulations Quotas Labelling/certification Product form regulations Enforcement	**Quota** **Size Limits** **Product form regulations (shipped alone)** **Protected Areas** **Protection of spawning aggregations** **Gear Restrictions** **Transport regulations (only by air)** **Stakeholder involvement**	**Protected areas (because of bycatch)** **Size limits (target fishery)** **Community-based management** **Capacity building** **Stakeholder involvement**	**Seasonal closures** **Size limits** **Quotas** **Transparency (website)** **Management history** **Protected areas** **Gear restrictions** **Rights-based management (licences)** **Environmental education** **Capacity building** **Labelling/certification (tagging, caviar labelling)**	**Size limits** **Seasonal closures** **Rights-based management (licences – effort control)** Gear restrictions Management history (formal and informal)	**Quotas** **Size limits** **Rights-based management** **Community-based management** **Seasonal closures** **Protected areas** **Product form regulations (whole animal)** **Gear restrictions** **Labelling/certification (tagged)** **Environmental education** **Capacity building**	Management history (formal and informal) Protected areas Size limits Gear restrictions Rights-based management (licenses) Community-based management Environmental education Capacity building (observers ID sharks) Quotas Product form regulations (fins attached to body, or fins to BW ratio)
Monitoring	Population monitoring Harvest monitoring Trade (domestic and international) monitoring Compliance assessment Ecosystem assessment Participatory monitoring	**Population monitoring** **Harvest monitoring** **Trade (domestic and international) monitoring**	**Population monitoring** **Harvest monitoring** **Trade (domestic and international) monitoring**	**Population monitoring (juveniles)** **Harvest monitoring** **Trade (domestic and international) monitoring** **Participatory monitoring** **Ecosystem assessment**	**Population monitoring** **Harvest monitoring** **Trade (domestic and international) monitoring** **Participatory monitoring**	**Population monitoring** **Harvest monitoring** **Participatory monitoring**	Population monitoring Harvest monitoring Trade (domestic and international) monitoring Participatory monitoring (log books)

2. Field methodologies and other sources of information.

Biological and species status data:	
Basic biological information (taxonomy and life history) (spatial/temporal approach)	DNA sampling Voucher (museum) specimens Age and growth methods Gonad sampling Measuring/weighting Life stage characterization Info on similar species Mark re-capture
Abundance and distribution (spatial/temporal approach)	CPUE (Fisheries dependent sampling) Visual surveys Recruitment indices Mark-recapture Interviews Fisheries independent sampling (See monitoring methods)
Population structure (spatial/temporal approach)	Length frequency analysis Age frequency analysis Genetic analysis (metapopulations structure) Sex ratio
Habitat and other impacts	GIS Remote sensing Visual surveys Substrate sampling Sonar Water quality assessment Temperature, salinity, turbidity assessment Ecosystem assessment
Harvesting and trade data:	Catch (port sampling, observers, trade data) Effort Market sampling Interviews Rapid Rural Appraisals Genetic analysis Catch and trade document schemes Databases Customs codes and Harmonized Systems (HS)

3. Types of approaches for data integration for NDF elaboration

- Analysis of time trends in biological/harvest data
- Analysis of spatial patterns in biological/harvest data
- Stock assessment methods
- Demographic analyses (e.g. life tables, matrix methods, etc)
- Rapid assessment methods

4. Approaches to assess data quantity and quality

- Transparency through peer review, stakeholder consultation, public communication, etc.
- Expert consultation/agreement[1]
- Statistical methods (e.g., power analyses, Bayesian methods)

[1] *Examples qualitative indicators to be used in the evaluation of the reliability of fish abundance data can be found in Table 1 of FAO. 2007. Report of the second FAO Ad Hoc Expert Advisory Panel for the Assessment of Proposals to Amend Appendices I and II of CITES Concerning Commercially-exploited Aquatic Species. Rome, 26–30 March 2007. FAO Fisheries Report. No. 833. Rome, FAO. 2007. 133 p.is*

5. Common problems, error, challenges or difficulties found on the elaboration of NDF

- Access to information - scattered, restricted, low level resolution
- Existing information very site/population specific
- Taxonomic uncertainty
- Challenge to monitor oceanic, large bodied, and low density animals in wild/harvest (e.g. sharks in wild, seahorses in bycatch)
- Lack of consistency in use of units in trade data
- Collection of trade data inconsistent among countries
- Lack of taxonomic resolution in trade data
- Expense of accessing trade data
- Reliability of fisheries dependent data
- Harvest effort not quantified/reported
- Lack of consistency of data from all range states of shared/migratory resources
- Lack of requirement to report NDFs
- Lack of mandated cooperation among range states for transboundary, migratory and shared stocks
- Illegal, unreported, and unregulated fishing (IUU)
- Cost of monitoring
- Lack of fisheries independent data
- NDFs not considering all sources of mortality (being made in isolation of all pressures on species)
- Lack of information on post-capture mortality
- Products in trade do not allow for easy determination of species/ quantities (e.g. shark fins, shark cartilage supplements, seahorses in prepared traditional medicines, canned glass eels, processed products)
- Introduction from the sea - who does the NDF?
- Accounting for intra-specific variability in life history (e.g. eel)
- Integration of diverse data sources into one assessment (e.g. eel)
- Lack of theoretical basis for establishing quotas (especially for eels)

6. Main recommendations which could be considered when making an NDF for this taxonomic group

- Must consider all sources of significant mortality when making NDF
- Consider whether establishing harvest/export quota is enough to achieve conservation goals
- Collaboration between Scientific Authorities and fisheries experts
- Transboundary migrants and shared stocks require regional NDF cooperation
- Be cautious with fisheries dependent data, verify when possible
- When possible, base NDF on both fisheries independent and dependent information/data
- Need techniques and legislation to distinguish among farmed, captive bred and wild individuals
- Management on which NDF is based should employ principles of adaptive and participatory management
- Report to the CITES Secretariat the methods by which NDFs are being made in order to improve transparency

7. Useful references for future NDF formulation.

Sharks

Musick J.A. and Bonfil, R. (eds.). 2005. Management techniques for elasmobranch fisheries. FAO Fisheries Technial Paper 474. 251 p.

FAO. 2000. 1. Conservation and management of sharks. FAO Technical Guidelines for responsible Fisheries. No. 4, Summl. 1. Rome, FAO. 37 p.

Humphead wrasse

Sadovy, Y., Punt, A.E., Cheung, W., Vasconcellos, M., & Suharti. S. 2007. Stock assessment Approach for the Napoleon fish, Cheilinus undulatus, in Indonesia: a tool for quota-setting for data-poor fisheries under CITES Appendix II Non-Detriment Finding requirements. FAO Fisheries Circular no. 1023 Rome, FAO, 71 p.

Sadovy, Y (Ed). 2006. Napoleon Fish (Humphead Wrasse), Cheilinus undulatus, trade in Southern China and underwater visual census survey in southern Indonesia. IUCN Groupers & Wrasse Specialist Group Final report, June 2006, 25 pp

Sadovy, Y (Ed). 2006. Development of fisheries management tools for trade in humphead wrasse, Cheilinus undulatus, in compliance with Article IV of CITES. IUCN Groupers & Wrasse Specialist Group. Final report, April 2006, 103 pp

Sadovy, Y., Kulbicki, M., Labrosse, P., Letourneur, Y., Lokani, P., & Donaldson, T.J. 2003. The humphead wrasse, Cheilinus undulatus: synopsis of a threatened and poorly known giant coral reef fish. Review in Fish Biology and Fisheries 13(3):327-364.

Arapaima

Castello, L. 2004. A method to count pirarucu *Arapaima gigas*: fishers, assessment and management. North American Journal of Fisheries Management **24**:379-389.

Castello, L., J. P. Viana, and M. Pinedo-Vasquez. In Review-b. Participatory conservation and local knowledge in the pirarucu fishery in Mamirauá, Amazon. Pages 00—00. in C. Padoch, M. Pinedo-Vasquez, M. L. Ruffino, and R. Sears, editors. Amazonian Várzea: diversity, management, and conservation. Springer Verlag.

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Seahorses

Hippocampusinfo.org

General

Fishbase.org

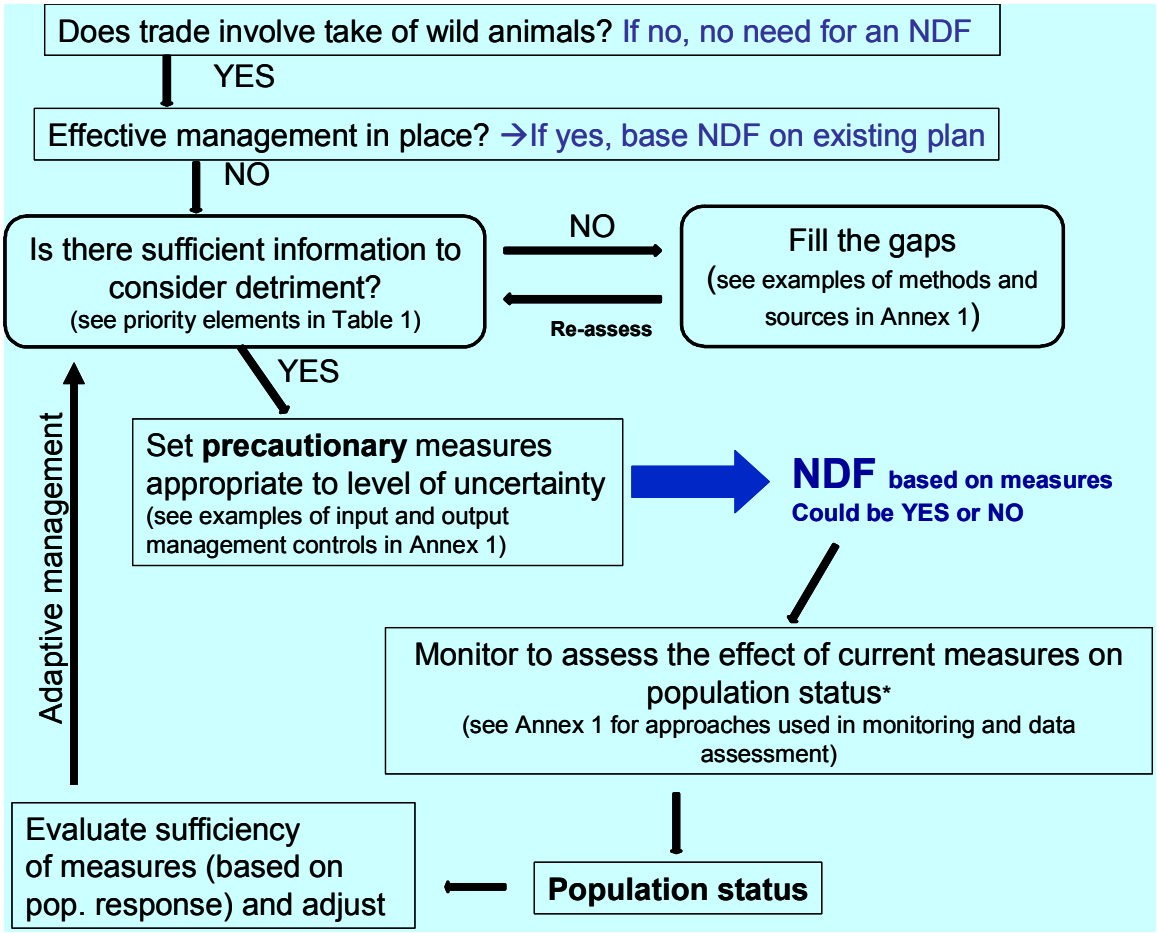
Databases and guidelines available in the UN Food and Agriculture Organization (www.fao.org)

Information on marine species and fisheries available in the Sea Around Us project of the University of British Columbia (www.searoundus.org).

IUCN Species Specialists Groups

GoogleEarth

Annex 2. Flowchart describing the logical steps for making an NDF for fish species in trade.



*Level/frequency of monitoring depends on life history, level of interaction and uncertainty (Annex 1 includes approaches for evaluating the quality and uncertainty in data).

Table 1. Biological characteristics, harvest and other impacts to be considered when making an NDF. All significant sources of mortality should be considered when making an NDF, including from legal and illegal direct take, bycatch, non-harvest related mortality and due to habitat loss.

Information needed	**For what**
which species	taxonomy
where (locations, depth, habitat)	spatial distribution; habitats
when (time of year)	temporal distribution
how many	abundance (preferably over time)
size/age stucture	size/age distribution; growth; mortality
sex (male, female, juvenile)	sex ratio
mature (yes/no)	size/age at maturity; maturity schedule
all significant sources of mortality	make NDF in context

AQUATIC INVERTEBRATES WORKING GROUP FINAL REPORT

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Taxa: all CITES-listed aquatic invertebrates

1. Information about the target species or related species

1.1. Biological and species status:

- Biological parameters: reproduction, growth, age at sexual maturity, longevity, productivity, resilience (or vulnerability) to harvest, r or K strategists
- Measures of population size and trends in these – numbers, biomass, age distribution and boundaries/definitions of populations (whether within national jurisdiction or not) etc
- Transboundary populations: identify and define populations which are shared across political boundaries, understanding any biological connectivity or distinctiveness of populations (or conversely whether populations are isolated)
- Local population (relevant for NDF). International population (part of the discussion) –
- Record and understand threats to populations – both direct and indirect and cumulative impacts

1.2. Takes/uses (e.g. harvest regime):

- Harvest scale:
  - proportion of the population subject to harvest
  - proportion of harvest destined for export
- Harvest characteristics: season, extractive, non extractive, methods, illegal harvest
- Drivers (causes) of harvesting pressure – commodities in demand, social economics, value of commodities, market trends
- Impact of removal on the wider ecosystem function including impact on non-target organisms through bycatch and any genetic impacts of selective harvest
- Sources of the specimen (wild, captive bred, ranched, other production systems) and their different impacts on wild populations (e.g. how often are specimens taken from the wild for use in captive production systems)
- Meaningful metrics (conversion factor) for measures of the trade or harvest (e.g. converting weight of conch meat to number of individual animals removed)

1.3. Management, monitoring and conservation:

Management

- Understand current and anticipated trade
- Licences (feedback: landing reports, certificates, use permit conditions to require reporting and / or as a means of distributing effort or regulating harvest means)
- Regulations
- Quotas (justified/adaptive)
- Training of harvesters (experience in harvest – health and safety)
- Types of harvesters
- Controlling harvest effort, input and output
- Tenure - is the resource owned or open access.
- Considering differences between measures in different jurisdictions
- Use of specimen size limits to reduce impacts on populations (noting reasons for size limits and what is aimed to be achieved)
- Limits on sex / life history stage
- Build cooperation between range countries, especially where stocks are shared.

Monitoring

- "Stock" assessment (condition assessment)
- Identify and use indicators as proxies for biological characteristics
- Set reference point or thresholds and use these to trigger management interventions

Conservation

- Ecosystem function (how harvest may affect this)
- Effects of the harvest on species
- How much of population is really protected (what is the confidence in any refugia / no take/ no entry zones)
- Measures to avoid localized depletion / concentration of effort

2. Field methodologies and other sources of information

2.1. Biological and species status data (fishery independent data):

- Field surveys
- Local knowledge

- Repeatable standardized surveys
- Understanding the limitations of the information (and risks of any extrapolation)

2.2. Harvesting and trade data (fishery dependent data):
- Identify units of management)
- Distinction between data
- CPUE
- Indicators / proxies of trends in populations
- Market trends – e.g. in prices for commodities
- WCMC trade databases
- Customs data
- Seizures data

3. Data integration for NDF elaboration
- Information generated for other places/species could be helpful
- Enhance data sharing and communications
- Seek expert consensus where data quantity and quality is poor.

4. List and describe the ways <u>data quantity and quality</u> may be assessed
- Size of the population vs size of the harvest indicates risk
- Scale information
- Mechanism to evaluate data quality (specially fishery dependent data) – cross references data sets
- Are different data sources converging or diverging?
- Feedback between management / scientific authorities, experts, over data sources and quality

5. Summarize the common <u>problems, error, challenges or difficulties</u> found on the elaboration of NDF.
- Limitation of information (see 2.1)
- Limited datasets / small sample sizes (risk of extrapolation)
- Distribution and species patterns (e.g. patchiness of distribution in some species), relative abundance
- Taxonomy
  - Identification of the taxa (enforcement people – fisherman and scientist)
  - Lack of availability of identification experts (few people knows)
  - Differences between taxonomic level data is gathered at compared with level that has to be used under CITES
- Dealing with multispecies fisheries
- Identification of gender of some species (clams)
- Taking wider ecosystem view of impact of the fishery
- Bycatch impact on non target organisms
- External factors / events (no way to estimates real effects – risk analyzes) P. e. hurricanes, new parasites (diseases), invasive aliens – seek to anticipate and respond to future threats
- Cumulative effects e.g. climate change.
- Indirect / unintended consequences – e.g. impact of bombing or cyanide fishing
- Concentrated impacts of harvests leading to localized depletion
- Fisherman perceptions lead to targeting certain types of individuals (queen conch pearls – thought to be found more often in juvenile specimens)
- Verifying sources specimens (illegal take) / specimens may be routed through least strict controls
- Difficulty of tracking specimens in trade through chain of custody (harvester to trader to export etc)
- Expense and difficulty of acquiring relevant information (may cost more than value of fishery)
- Shift from wild harvest to captive production systems (depending on risk)

6. Summarize the main <u>recommendations</u> which could be considered when making an NDF for this taxonomic group.
- See Annex for recommended guidance for non-detriment findings for aquatic invertebrates
- Adaptive approach based originally on little/poor data may enable, over time, better data / confidence in being able to set higher quotas (incentive for fishers to cooperate with data provision)
- The rationale for any NDF should be documented and the sources of information (experts / literature) should be cited.

- Generating databases available
- Parties should identifying gaps and research needs and publicize them to seek support for funding or to encourage research by specialists
- Need to limit and spread effort of fishery
- Need for good outreach (to harvesters, industry, consumers and public) at both domestic and international level over reasons for fishery and need for controls on management

7. Useful references for future NDF formulation.

- Fish Base (www.fishbase.org)
- Reef Base (www.reefbase.org)
- Original CITES listing proposals
- Significant trade reviews
- CITES trade database and UNEP-WCMC
- FAO and related reports including technical consultations on CITES criteria for commercially exploited aquatic organisms
- Global Biodiversity Information Facility (GBIF www.gbif.org)
- Hexacoralarian of the world (www.kgs.ku.edu/hexacoral/index.html)
- Global coral reef monitoring network
- IUCN red list

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Guidance to Parties on making non-detriment findings for aquatic invertebrates

Approach based on a suggested cyclic 4 step process

- Risk assessment
- Regulating harvests
- Record harvests and population responses
- Review, revise and refine measures and risks

Risk assessment (issues to consider when assessing the risk to the species/population of any harvest with a component destined for international trade)

- Proportion of the population subject (based on data or guesstimate) to harvest whether for domestic or international trade or consumption (based on current or anticipated levels of trade)
- Value of the commodity in trade [**value**] and what are the drivers for the trade (is trade likely to be one-off or ongoing)
- Governance of the resource, if any and whether this is robust or weak – and the risk of any management measures being breached [**violability**] – whether illegal take / trade is significant
- Degree of tenure / ownership of the resource and incentives for stewardship
- Whether the harvested population is derived from wild harvests or a form of captive production system
- Biological characteristics of the population / species / taxon – especially productivity and resilience to harvest and known / perceived trends in species. In multi-species fisheries identify most vulnerable taxa. [**vulnerability**]
- Are stocks shared (by different countries or different authorities within a country) and subject to multiple harvests across their range?
- External factors affecting population – e.g. hurricanes, climate change, invasive alien species, pollution, habitat loss or damage
- Ecosystem impacts – will the fishery affect other non-target species and / or habitats and the services they provide
- Document or record rationale for risk assessment – may be qualitative or quantitative - and determine review period (if required)

[NB three '**V**s' in bold derived from 1st FAO consultation on CITES criteria for commercially exploited aquatic organisms]

Regulate the harvest – based on assessment of risk above, consider appropriate management measures (suggested toolkit of approaches below) which are proportionate to the risk and to available capacity (with assumption that the greater the risk the more precautionary the harvest – measures are not mutually exclusive and are broadly listed in terms of complexity of implementation)

- Do nothing (but monitor any impacts – see below)
- Use refugia to restrict the proportion of population subject to harvest – refugia may be protected or no-take areas or *de facto* refugia due to limits on fishing capacity (e.g. deep-water populations not available to harvest by divers) – expanding the proportion of species' range covered by such refugia if greater risk or uncertainty. Complexity of measures range from community controlled no-take zones to designated national / marine parks
- Quotas - on number of specimens that are permitted to be harvested (from defined localities – distribute amongst harvesting areas) or exported – set quotas at lower more precautionary levels (even if these are initially arbitrary) where risk seems high and / or information is poor / uncertain
- Size limits (maximum and/or minimum) – a proxy measure to reduce the impacts of harvests – these may be defined by biological characteristics to limit take to less vulnerable parts of population or may be *de facto* measures due to particular sizes desired in trade (if this is compatible with reducing impacts on populations)
- Limits on fishing effort and / or methods – through limiting number of fishing licences or boats/nets or other gear or time restrictions – seek to train fishermen and enhance standards
- Use appropriate permit / licence or other control mechanisms
- Set thresholds or reference points to determine when management interventions might be required
- Shift from wild harvests to other production systems (e.g. captive production of giant clams) – this may be driven by desire to reduce pressure on declining wild stocks (linked to re-stocking) or by market demands
- Where appropriate seek to build co-management and public participation (especially traders / applicants) in decision making to increase 'ownership' and understanding of the need for regulation
- For shared stocks, collaborate with other range states to seek combined management measures avoiding cumulative impacts on populations.
- Prohibit exports or harvest / fishery (temporarily) if necessary and risks very high and supporting information uncertain

Record harvests and population responses record impacts of any harvests through fishery dependent or independent data, trends in populations and shifts in markets (proportionate to the risk and to available capacity). Understand the limitations and the confidence you can place in any results.

Fishery independent data

- Surveys of biological parameters of the resource – using repeatable and standardised methods – to determine trends in the resource or in selected indicators
- Ensure that refugia are genuinely acting as such and maintain viable populations of the species and / or contribute recruits to harvested areas.
- Use of local / harvesters / traditional knowledge
- Track changes in status elsewhere especially for shared stocks

Fishery dependent data

- Monitor landings, size of harvested specimens, logbooks, geographic locations of harvests, logbook information, catch per unit effort.
- Use metrics / conversion factors to make data more meaningful in population terms
- Monitor compliance – e.g. proof of legal acquisition, enforcing management measures

Market responses

- Trends in market demand – change in prices or demand for types of specimens / commodities in trade
- Whether illegal trade is known or thought to occur

External factors

- Record impacts of any changing external factors

Review, revise and refine based on information from monitoring review risks and effectiveness of measures and refine/revise management measures as appropriate based on periods relevant to species and / or risks

- Use feedback from monitoring to review and, if necessary, revise management measures.
- Identify gaps in knowledge and, if necessary, undertake work to enable appropriate feedback mechanisms to be established.
- Review original risk assessment

Have we achieved non-detriment?
Non-detriment achieved if population trends (or indicators of these), despite harvests, are positive or stable (within defined thresholds) or measures have been set in place to achieve this. Any risks are being effectively mitigated and addressed.