MODULE 14: NDF CASE STUDIES

Contents

Parties should note that the case studies contained throughout all modules of this guidance serve as illustrative examples of specific considerations relating to the making of non-detriment findings. These case studies are not endorsed by the CITES Secretariat, or the governing and scientific bodies of the Convention, not necessarily considered to satisfy all criteria relevant to the making of NDFs, and should not be considered as such.

1. Generic case studies

1.1. Ostional, Costa Rica - harvest of eggs from olive ridley turtles (*Lepidochelys olivacea*)

This illustrative example, of a CITES Appendix I species, does not involve international trade (commercial international trade would not be permitted) and so an NDF is not required. However, the management of this egg harvest illustrates measures that might be applied to an NDF to mitigate the risks of harvest of a species that might be intrinsically vulnerable.

Olive ridley turtles are listed as Vulnerable in The IUCN Red List of Threatened Species (hereafter IUCN Red List or Red List). The adults are large and long-lived (typical of K-selected species) and are noted for their synchronised mass-nesting behaviour, known as arribadas. In these events, the eggs of earlier-nesting females are often inadvertently dug up and destroyed by later females. Taking advantage of this, laws permit the local community to harvest and sell for human consumption, eggs from nests laid in the first few days of an arribada (but not subsequently). The local community in return contributes to the policing of nesting beaches to prevent illegal take of eggs later in the arribada.

This management regime, which has been sustained for decades, has several obvious advantages. It provides the community with an important source of income and nutrition, through exploiting a life stage (eggs) that has the characteristics of an r-selected species. Eggs laid early in the arribada are unlikely to result in successful hatching and, so, eventual recruitment to the adult population may be minor. In turn, this harvest provides an incentive for the community to conserve the nesting beach and the returning adults. To work successfully, this requires local community 'buy-in', effective policing, and monitoring to ensure the offtake does not result in any negative impact on the adult population. There remain gaps in knowledge here – for example, it is challenging to distinguish the impact of egg harvest on trends in numbers of returning nesting females from other factors affecting the survival of adults away from the nesting beach (such as bycatch by fisheries, etc).

Nevertheless, this management regime demonstrates an approach to mitigating risks arising from harvest and retains the scope for adaptive management if required. If an impact of harvest on adult numbers was demonstrated, harvests could be adjusted to respond to it. It is important to recognise that, despite the absence of complete knowledge, this harvest has been definitively sustained over time, it has generated stewardship and conservation benefits, and it supports local people.

1.2. Sustainability, threat status and the IUCN Red List

Estimation of sustainable harvests should consider, amongst other things, population data and harvest pressure resulting from legal and illegal trade relative to the vulnerability of the species (intrinsic and extrinsic factors that increase the risk of extinction of the species).

The vulnerability of the species needs to take into account the distribution, population size and trends, ecology, and threats that contribute to the conservation status and risk of extinction as documented for example by the IUCN Red List.

The IUCN Red List system for categorising extinction risk has eight categories: Extinct (EX); Extinct in the Wild (EW); Critically Endangered (CR), Endangered (EN); Vulnerable (VU); Near Threatened (NT); Least Concern (LC); Data Deficient (DD) and Not Evaluated (NE). The three threatened categories are CR, EN and VU. In a

species assessment, the species is evaluated against five criteria which relate to: A) population reduction; B) geographic range; C) small population size and decline; D) very small or restricted population; and E) quantitative analysis. Each criterion has quantitative thresholds and is qualified by several sub-criteria.

Criterion A relates to species with significantly declining populations. The population decline may be in the past, ongoing, or projected into the future. The term 'population' is used in a specific sense in the Red List Criteria that is different to its common biological usage. Population is here defined as the total number of individuals of the taxon. For functional reasons, primarily owing to differences between life forms, population size is measured as numbers of mature individuals only.

To qualify for Criterion A, the threshold for population decline to meet the lowest category of threat i.e. VU, is 50% over a defined period in the past where the decline has ceased and 30% for ongoing or projected decline. The basis for recording the decline must be specified with a range of options including actual or potential levels of exploitation. The thresholds for population decline for CR and EN are higher.

Detailed population data are rarely available for use in IUCN Red List assessments. For example, a recent study of assessments for over 4,000 timber species indicated that Criterion A was used for 32% of timber tree assessments - more than double the rate for all threatened tree species (currently 13.8%). However, even internationally traded species lacked population and trade information to guide assessments under Criterion A. In some cases, such data were not publicly available. Although these species were assessed as threatened due to declining population, their assessments lacked quantitative information on inventory, production and trade data and often population decline estimates were supported by "surrogate" information on habitat loss and other threats (Barstow et al. 2022).

Barstow, M., Jimbo, T., & Davies, K. (2022). Extinction risk to the endemic trees of Papua New Guinea. Plants, People, Planet. Available here.

1.3. Assessing risks from ineffective management – 'M-risk' & intrinsic vulnerability

An approach focusing on shark fisheries as an example aims to rapidly assess a species' risk to over-exploitation from ineffective management (referred to as 'M-risk') noting that this is only one type of governance risk. Combined with assessments of intrinsic vulnerability to harvest (see above), this approach can be used by managers to identify species or populations at greatest risk from inadequate regulatory or management controls. It identifies potential gaps in management that, if necessary, can be overcome by additional management actions, a simple step within an adaptive management program.

In this case study, Sherman et al. (2022 and 2023) showed that the management of shark fisheries both in areas within national jurisdiction and in areas beyond it (the 'high seas'), is inherently complex, often with overlapping governance regimes including Regional Fisheries Management Organisations. Their analysis evaluated whether the management of individual species was sufficient for their relative sensitivity by combining a management-risk score for each species with their intrinsic vulnerability to determine a final M-Risk score. They then applied this rapid assessment approach to requiem sharks (family Carcharhinidae) to assess how adequately managed they were across their geographic range.

Such an M-risk analysis need not necessarily be complex – it can be applied to analysing gaps in governance or effective management at a national level where different sub-national governments or agencies manage a species within their own separate jurisdictions.

1.4. American ginseng – United States of America – using conditions in NDFs

American ginseng *Panax quinquefolius* is a long-lived, slow-growing herbaceous perennial plant whose roots are harvested predominantly for export to East Asia where it is used for medicinal purposes; the combination of its life history traits and high market demand put it at potential risk of over-harvest.

Harvests are managed by 19 individual States but conditions for international trade are determined by the Scientific Authority in the Federal government. Conditions applied to harvests include prohibitions or regulation

of harvesting on State and Federal controlled lands, to provide refugia from harvest, and the use of close seasons to provide opportunities for seed production by plants. Harvested roots are certified by State authorities. Finally, as a further safeguard, the Scientific Authority only permits international trade in roots which are five or more years old, which is intended to provide a greater opportunity for plants to contribute to recruitment before being harvested.

Ginseng is also produced from artificial propagation and from 'forest farming', but wild-harvested plants are more sought after and command higher prices.

The United States of America thus applies a range of conditions to harvest and to trade, to reduce the risks of ginseng being detrimentally affected by harvests.

1.5. Birds and their role in the ecosystem

Birds have some of the most diverse range of ecological functions of all vertebrates. A synthesis of the ecological functions birds provide is included below. Ecological functions are categorised as representing one of three major linkages: genetic, resource, and process. Birds encompass all three. Habitat loss affects all bird functional groups, with large frugivores (seed dispersers) particularly vulnerable to exploitation.

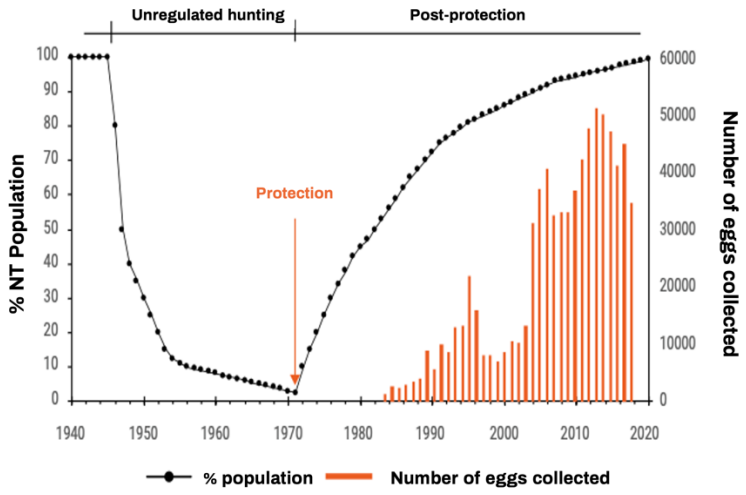
Function	Description	Example
Genetic transfer	Responsible for the transfer of genetic material (i.e., by pollination or seed dispersal)	In the Philippines, the loss of seed dispersers, such as Palawan hornbills (*Anthracoceros marchei*), can result in most seeds being deposited under the parent tree and consumed by seed predators.
Resource cycling	Responsible for mineral and nutrient transport and deposition (i.e., through their guano).	The elimination of Aleutian seabirds, such as tufted penguins *Fratercula cirrhata*, by introduced foxes can lead to reduced nutrient deposition, triggering a shift from grassland maritime tundra to other vegetation types.
Linking trophic processes	Responsible for connecting habitats through their role as primary or secondary consumers across habitats (i.e., by insect control or scavenging)	Disappearance of scavenging Indian long-billed vultures (*Gyps indicus*) can cause increases in the number of rotting carcasses and, so, of attending mammalian scavengers
Linking non-trophic processes	Responsible for facilitating essential processes in the physical environment (i.e., ecosystem engineers)	Reduced number of three-toed woodpeckers (*Picoides tridactylus*) in forest fragments can cause increases in spruce bark beetles (*Dendroctonus* and *Ips* species) and decreases in nesting holes used by other species.

1.6. Changes in adaptive management approach to management of *Crocodylus porosus* in Australia's Northern Territory (NT)

The biomass of saltwater crocodiles in the NT at the time of their first protection (1971), was estimated to be reduced by 99% relative to when intense harvesting started (1945-46), with adult population abundance 1-2% of former abundance. Through legal protection and regulated management regimes, the population has since recovered. During recovery, management has had to adapt to a range of changing circumstances (outlined below) not only relating to the status of the population, but to changing public perceptions, international obligations, and economic value.

Adaptation 1. (1945-46). From minimal to maximal unregulated harvest to meet international demand for skins. In the absence of any regulation, this was not an adaptation as such – but simply a change in the pressures on the population.

Adaptation 2. (1971). From unregulated harvest of a severely depleted population to total protection of a remnant population with no idea of whether it could recover.



Adaptation 3. (1979-80). With the increasing population, the introduction of management actions to reduce the probability of attacks on people through public education programmes, problem crocodile removal program, and the first crocodile farm (for tourism, stocked with problem animals and production anticipated as being from captive breeding in the future).

Adaptation 4. (1983-84). With further recovery, the introduction of a ranching program through which landowners (indigenous and non-indigenous) could sell the eggs from their lands to the three farms established by then.

Adaptation 5. (1985-87). Formulation of formal NT management program, approved by the Commonwealth, in order to comply with the requirements of CITES, noting that the population had been transferred from Appendix I to Appendix II (1985) pursuant to the ranching resolution (then Resolution Conf. 3.15), which required annual reporting of biological and commercial viability, and the commitment to continuing population monitoring.

Adaptation 6. (1994-5). With further recovery, and with the transfer to Appendix II being changed from the ranching resolution to the then Bern Criteria (Resolution Conf. 1.2), management and monitoring obligations were scaled back. The farming industry (still based largely on ranching) increased, strengthening the view that crocodiles were a valuable commercial asset to the NT community.

Since 1995, the ranching programme and measures to reduce human-wildlife conflict have continued. No effort to maximise the sustainable offtake of the wild population, by adding a significant wild harvest to the ranching program, has yet been made, and it is thus under-utilised in terms of maximising sustainable offtake.

Source: Prof. G. Webb, Wildlife Management International.

2. Case studies for local and traditional knowledge

2.1. CITES recognition of local and traditional knowledge

CITES has long considered the role of local and traditional knowledge as highlighted in the following:

- Resolution Conf. 13.2 (Rev. CoP14), on *Sustainable Use of Biodiversity Addis Ababa Principles and Guidelines* notes that Addis Ababa Practical principle 4 states that adaptive management should be practiced based on science and traditional and local knowledge. The Resolution further notes that the Addis Ababa Principles and Guidelines could support the guidance for the making of non-detrimental findings.
- Resolution Conf. 16.5 on *Cooperation with the Global Strategy for Plant Conservation of the Convention on Biological Diversity* notes the potential contribution of CITES to Target 13 of the GSPC (indigenous and local knowledge innovations and practices associated with plant resources, maintained or increased, as

appropriate, to support customary use, sustainable livelihoods, local food security and health care), particularly in terms of NDFs, Resolution Conf. 10.19 (Rev. CoP14) on *Traditional medicines*, and the CITES Standing Committee Working Group on CITES and Livelihoods.

- Resolution Conf. 16.6 (Rev. CoP18) on *CITES and livelihoods*, CoP recommends recognising that community and traditional knowledge should be considered, as appropriate and in accordance with the provisions of the Convention and national laws, regulations and policies when empowering the rural communities.

Resolution Conf. 16.7 (Rev. CoP17) on *Non-detriment findings*, recommends that local knowledge on trade could be one of sources of information when making a non-detriment finding.

2.2. The Canadian approach to integrating local and traditional knowledge into scientific assessments

In Canada, at the national level, the Aboriginal Traditional Knowledge (ATK) Subcommittee of the Committee on the Status of Endangered Wildlife (COSEWIC) has developed an eight-step process for incorporating aboriginal traditional knowledge into species assessments including:

- Community approvals
- Ethics review
- Completion of any required permits
- Acquisition of participant's Prior Informed Consent
- Interview(s) with Aboriginal traditional knowledge (ATK) holder(s)
- Information review with ATK holder(s)
- Integration of ATK into species status report
- Post assessment meeting communication with ATK holders

Some critics have argued however that this approach still seeks to integrate indigenous knowledge into a pre-existing, largely western scientific framework. At sub-national level, the Species at Risk Committee of the Northwest Territories has developed two sets of distinct but complementary assessment criteria for determining species at risk – one reflecting indigenous knowledge and the other scientific knowledge. Assessments are conducted by a Species at Risk Committee (SARC) comprising both Indigenous knowledge and scientific knowledge holders. Determinations of a species risk status are based on both indigenous and scientific criteria and where there is a disagreement – as inevitably there sometimes is – this is resolved through a series of meetings to examine and work through disagreement with any outstanding differences clearly documented.

Source: https://www.cosewic.ca/index.php/en-ca/assessment-process/atk-guidelines.html

2.3. Use of local and traditional knowledge in the NDF for *Aloe ferox* in South Africa

Aloe ferox is a large succulent plant that occurs largely in South Africa and in southern Lesotho. It is one of South Africa's leading wild- harvested commercially traded plants. The latest NDF, conducted in 2018, concluded that the harvest and trade was non-detrimental, posing a low to moderate risk to the population in the wild. Local and traditional knowledge fed into the NDF assessment at various stages:

- Information from harvesters and landowners provided key insights into the time taken from seed germination to the first harvest of aloe leaves.
- In both the Eastern and Western Cape, aloe harvesters reported on the population status citing concerns about declines in the Eastern Capes based on having to walk increasingly long distances (about two hours) to harvest sites.
- Tappers from the Eastern Cape reported illegal, overharvesting of aloe leaves by untrained harvesters as a major threat to the species.
- In the Western Cape, it was reported that local indigenous harvesting practices were employed to regulate the harvest. Before the tappers decide to harvest the following factors are considered:
  - There must be sufficient leaves on the plant.

- Only a fraction of the lower leaves can be cut from each plant so that the growth point is not injured, and only the leaves that would die naturally at the end of the season should be taken.
- Leaves must be fat / thick. Thin leaves indicate that if harvested, the plant is less likely to survive the dry period. In addition, thin leaves result in lower product yields, which acts as an economic deterrent to harvesting (i.e., low return per unit effort).
- In winter rainfall areas, winter is the better season for harvesting (cooler and wetter); harvesting leaves in summer is not favoured as cut leaves develop a skin very quickly, which reduces the bitter yield.

Source: DEA (2019 National Environmental Management » Biodiversity Act (10/2004) » Non-detriment findings for Aloe ferox for public consultation (cer.org.za) South Africa Department for Environmental Affairs.

2.4. Incorporating indigenous knowledge in polar bear management in Canada

Polar bears in Canada are protected through a collaborative conservation and management approach that is shared with provinces, territories and regional wildlife management boards (established through land claims agreements). A combination of western science, experience and Indigenous Knowledge forms the basis for research; the inclusion of Indigenous Knowledge helps to provide information on polar bear abundances, movements and behaviours, and provides valuable long-term perspective on changes in the populations.

As part of Canada's approach, the Polar Bear Technical Committee (PBTC) reviews scientific research and Indigenous Traditional Knowledge and provides an annual status assessment of the polar bear subpopulations in Canada, to inform conservation and adaptive management activities. PBTC includes provincial and territorial government representatives and scientists, experts from within Indigenous user groups, Wildlife Management Boards, and other ex-officio members.

When providing advice concerning international export of polar bears, the Canadian CITES Scientific Authority (SA) takes into account overall harvest and export levels relative to population abundance and trends in Canada. The CITES SA reviews the PBTC assessments, management decisions, conservation status, and harvest and trade levels for the Canadian subpopulations, and considers participatory monitoring of populations and harvest rates involving researchers, hunters and Indigenous people. Methods including mark and recapture surveys (physical and DNA), aerial surveys, traditional ecological knowledge, harvest data, and population viability analyses (statistical modelling).

Source: Information provided by Erin Down, Environment and Climate Change Canada, drawing on Conservation of Polar Bears in Canada - Canada.ca; Overview | Polar Bears in Canada (polarbearscanada.ca); Polar bear: non-detriment finding - Canada.ca

2.5. Incorporating local and traditional knowledge into NDFs for sport hunting in Southern Africa

In Mozambique, quotas for leopard hunting are set in a participatory way. Local knowledge from professional hunters, game scouts and safari operators is a key component of the monitoring of leopard populations contributing to the NDF of the CITES export quota for African leopard hunting trophies. This knowledge includes hundreds of records of sightings, kills, feeding and trophy measurements. Annual Activity Reports compiled by hunting operators are mandatory for quota setting, and are informed by surveys and local studies. The quotas are set conservatively, and it is estimated that actual offtake is generally 40-50% of the quota. In its latest (2018) assessment, based on the data collected the National Administration for Conservation Areas (ANAC) concluded that the low level of off-take generated by safari hunting was not detrimental to the survival of leopard and that safari hunting provided a net benefit to the species.

Source: ANAC (2018) Review of the Leopard (*Panthera pardus*) quota of Mozambique, established per Resolution Conf. 10.14 (Rev. CoP16) and non-detriment determinations, in accordance with CITES Decision 17.114. MZ_LEOPARD_REVIEW_FINAL_AC30 (cites.org).

The Zambia NDF report on African Leopard Sport Hunting conducted in 2018 provides more detail on the specific role of local communities in setting and review of the leopard quota. It notes that "Zambia has a participatory quota setting process" drawing information from aerial and ground surveys, patrol sightings, local and expert opinion and hunting monitoring. For hunting in Game Management Areas – on the borders of National Parks - Community Resource Boards (CRBs) submit a proposal for a quota to the Department for National Parks and Wildlife (DNPW) based on community-based population estimates, poaching incidents reported by Community Scouts, and any other relevant observable trends.

Source: DNPW (2018) Non detrimental findings report for African leopard sport hunting in Zambia. E-AC30-15-A5.pdf (cites.org).

Zimbabwe's 2018 review of its CITES quota for leopard trophy hunting (considered to be non-detrimental) also highlights its participatory approach. Inputs are collected from a variety of stakeholders including government, NGOs, hunting operators and local communities. A series of workshops starting at the local level and working up to the national level and involving all stakeholders contribute information allowing the CITES Scientific Authority to determine an appropriate national quota.

Source: ZPWMA (2018) Zimbabwe's Review of the Convention On International Trade In Endangered Species (CITES) Leopard (Panthera pardus) Quota Microsoft Word - ZW Leopard Review 2018_AC30.docx (cites.org).

2.6. Reconciling scientific and indigenous knowledge in narwhal NDF assessments in East Greenland

The narwhal (Monodon monoceros) is a medium-sized whale characterised by a long "tusk" - an elongated protruding canine tooth. Narwhals live in the Arctic waters of Greenland, Canada, Svalbard (Norway) and the Russian Federation. In Greenland, they are hunted for their meat, mattak (skin and blubber) and tusks. Mattak is considered a delicacy and can be sold within Greenland for high value.

Greenland is part of Denmark, having full autonomy regarding the management of its living resources. There is no official definition of indigenous people in Greenland, but the government is formed primarily by ethnical Inuit, who speak Greenlandic, eat traditional food and either are hunters themselves or have family which are hunters. In Greenland, indigenous knowledge is highly regarded, and is normally referred to as "user's knowledge".

The executive order that regulates the management of narwhals, states that quotas must be set taking into consideration: 1) international agreements, 2) biological advice, 3) user's knowledge and 4) hearing of the hunting council and municipalities. Greenland receives scientific advice on East Greenland narwhals from the North Atlantic Marine Mammal Commission (NAMMCO), which in turn receives advice from its Scientific Committee (NAMMCO-SC) informed by the Greenland Institute of Natural Resources (GINR) – the CITES Scientific Authority. The hunting council is formed by indigenous organizations and institutions dealing with hunting. Municipal authorities are usually composed of local (indigenous) people. In addition, most management decisions concerning wildlife, including annual narwhal quotas, are subject to public hearings.

The first NDF assessment for narwhals was carried out in 2006. Narwhals did not obtain an NDF then, as catches in West Greenland were higher than the quota. In 2009, narwhal quotas and catches in all Greenland were consistent with the advice, and GINR issued the first narwhal NDF. Since 2016, narwhals have not obtained an NDF because catches have exceeded the advice.

In 2016, a GINR aerial survey carried out in the hunting ground of East Greenland showed a population estimate of 673 narwhals (95% CI 363 – 1261) compared to 2636 (95% CI 1074 – 6565) in a previous (2008) survey. As a result of the apparent population decline, NAMMCO-SC advised the Greenland government to reduce quotas from 66 narwhals per year to 20 and then, in 2018, advised a total ban on hunting. This advice was reiterated in 2019, and in 2021, based on results over part of the narwhal's range, a declining proportion of females in the catch and the recaptures of individuals captured in nets for satellite telemetry, together with new modelling using life history parameters from narwhals in East Greenland. The models indicated that a catch of even one or two animals would lead to a population decline, with a high probability of extinction within the next 10 years, but that stocks may recover in the absence of hunting.

In reaction to the advice of a hunting ban, a delegation of narwhal hunters made their case to NAMMCO in 2021. The hunters argued that their knowledge and observations did not match the scientific results. They explained that the narwhals they hunt originate from three different stocks, two of them unknown to scientists. They said that there was a large reservoir of narwhals further north, in the protected areas of the East Greenland National Park supplying their hunting grounds, that their hunting was sustainable and that narwhal food products were needed for food security. They also questioned the aerial surveys used to estimate abundance of narwhals, suspecting that scientists have performed surveys in foggy conditions with poor visibility. They explained that they consistently observed a high number of narwhals and had seen neither a decline nor an increase in the number of animals. Based on this information, NAMMCO did not endorse the advice from the Scientific Committee on the hunting ban.

In 2021, the Greenland government granted extra funding to GINR to carry out a new aerial survey, this time with hunter involvement. The abundance estimate was planned in five phases: 1) planning workshop with scientists and hunters, 2) aerial survey with professional observers/scientists and hunters, 3) data analysis by scientists, 4) final workshop with hunters and scientists and 5) reporting to NAMMCO (NAMMCO-SC assessment scheduled for December 2023).

During the workshop, hunters and scientists agreed upon survey design, including timing and coverage. The aerial survey was carried out in August and September 2022. An additional bubble window was added to the plane, so that an experienced hunter could see the same as the 4 professional observers. Observations made by hunters during the survey were also recorded and considered in the analysis. The survey revealed a further decline in numbers to 441 (95% CI 212 – 918). At a subsequent meeting between hunters and biologists, the hunters explained that they see many narwhals, including several calves in the population and believe that narwhal numbers are stable or increasing – with many more individuals than the survey indicated - and that their catches are sustainable. Hunters appreciated the collaboration, but believed that narwhal numbers were considerably larger than suggested by the survey results.

Perhaps the most important result of this experience was that hunters and scientists could communicate and learn from each other both throughout the work and while sharing hotels and meals during the survey and the workshops. The meeting and the participation in the surveys helped to reduce hunter's mistrust, as they could contribute to the planning of the survey and verify that it was carried out during fair weather and that scientists were committed to their work and were able to detect narwhals. The scientists benefitted from the vast knowledge of hunters and gained insight into their culture and way of life, which in turn motivated their work. The major drawback to the process is that it was considerably more expensive than a survey carried out only by scientists.

In conclusion, the involvement of the hunters in the survey could to some extent bridge the gap in the understanding of the scientific background for the advice, but it may not change the scientific assessment of the status of narwhal stocks, nor the hunters view about the sustainability of their own catches.

Source: Prepared by Fernando Ugarte, Mads Peter Heide-Jørgensen & Rikke Hansen, GINR

2.7. Example of a framework for assessing reliability of local knowledge

In a study to explore the decline of native mammals in northern Australia, indigenous information was compiled from a series of interviews. In order to account for different levels of knowledge, a system for ranking the reliability of information was devised whereby the information from each interview was assessed against five criteria:

1. Correct identification of the species or knowledge of local language name

2. Interviewee being resident, active or otherwise familiar with the specified location

3. Information provided corroborated by others in the same location

4. Consistency with scientific and/or historical data

5. Overall reliability of interviewee in terms of recognition as a knowledge holder in the community

A point was allocated for criterion resulting in a maximum score of 5. Reliability of each interview was then scored as high (4–5 points), medium (2–3 points) and low (0–1) and this reliability taken into account in drawing conclusions.

Source: Ziembicki, M. R., Woinarski, J. C. Z., & Mackey, B. (2013). Evaluating the status of species using indigenous knowledge: Novel evidence for major native mammal declines in northern Australia. Biological Conservation, 157, 78–9.

2.8. Initiating NDF-making using local and traditional knowledge

In many cases, Scientific Authorities will be required to make NDFs for exports of CITES-listed species in which trade has been taking place for many years. Often, those exports may have occurred without robust NDFs being completed – sometimes even when trade occurs at high volumes. The species in question may be relatively unknown, and Scientific Authorities may not have sufficient (or any) information available to begin making an NDF.

In cases like these, local and traditional knowledge can be a significant source of information to begin the NDF-making process. For example, Scientific Authorities can call harvesters, middlemen, and exporters to their offices to explain the trade system. Doing so can provide useful information on harvest volumes, harvest seasons, harvestable sizes or parts and derivatives, locations of harvest, supply chain actors, and many others aspects of trade. This information can be useful for monitoring, management, and for regulating trade using NDFs with conditions (see **module 1 section 5** for additional information on NDFs with conditions).

Harvesters often have a strong understanding of species' biology, so may be able to provide Scientific Authorities with information on litter/clutch sizes, habitat associations, dispersal and movements, areas or timings of high-density, and other aspects of biology and ecology.

While this knowledge will not be sufficient to complete an NDF, it can often provide Scientific Authorities with enough initial information to begin the NDF-making process, to identify which gaps need to be filled, to highlight areas that require verification, and about how to monitor and manage harvests and trade in future.

3. Case studies for aquatic species

3.1. Monitoring seahorses to inform adaptive management

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

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

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

3.2. Mexico sharks NDFs case study

Since the entering into force of the Appendix II listings of sharks of commercial relevance in Mexico at CoP16 in Thailand in 2013, we have transited from a low data scenario NDF, to a higher level of data/lower level of risk.

When making NDFs two main processes are deployed as envisaged in Res. Conf. 16.7 (Rev. CoP17) on NDFs: I. Acquisition and assessment of information on species biology and II. Set a sustainable catch rate. Both processes are linked such that, better species data (threats included), will reduce the risk associated with management decisions and strengthen NDFs. These two processes ultimately work on a spectrum and depend on the available baseline data (Fig 5C):

I. The quality of the species population data depends on the collection methodology and associated analysis. Figure 5C aims to categorise the state of knowledge to assess baseline data. When you move from informal or anecdotal information to using standardised sampling of the population, the analysis becomes more robust.

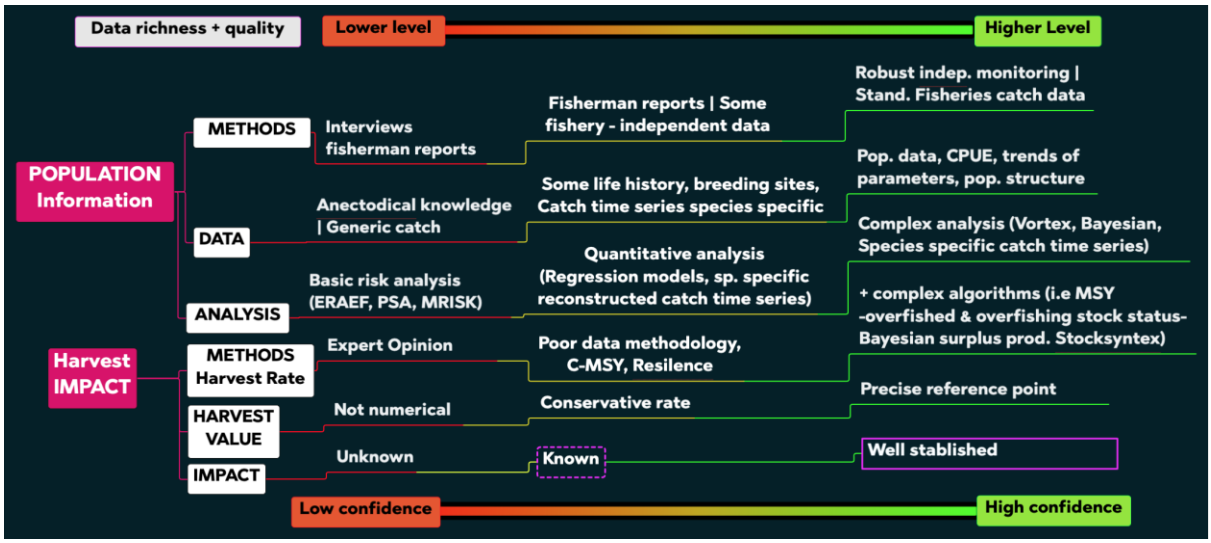


Figure 5C. Shows the gradient of species data quality* on population information and harvest impact.

II. If data is limited, the confidence on NDFs is lower and this can be refined through adaptive management, but the initial risk is higher. It should be noted that although expert opinion was included in the low confidence section in **Fig. 5C**, it only means that in a low information scenario, the most robust way to set a conservative harvest is to relay on expert opinion and ask them to evaluate the scarce data. However, as information level increases, the expert opinion will also be needed to interpret the output of complex analysis. With better data, you can define more robust catch rates and reference points that in turn reduces the risk associated with a catch rate.

Once you have defined your level on both variables, you can identify relevant tools to analyse the data and the steps required to move towards a better information level and reduce risk associated with NDFs.

Applying those general guidelines from **Fig. 5C**, Mexico grounded them to a data and analysis level gradient specific to shark species. The key steps that Mexico made to transit from lower (empty boxes) to higher data (filled boxes) scenarios (see **Fig. 5D**), were:

Population level – Data analysis: In 2019 (bit.ly/mitiburon) an expert-lead inter-sectoral analysis of academia, fishery sector and CITES authorities designed the analysis used to reconstruct the catch time series for each species back to 1970 including information from published scientific and grey information coupled with local surveys by the Mexican fisheries authority (INAPESCA).

Impact - Methodology to set off-take rate: With the data from the reconstructed catch time series, we used an analysis of MSY based on catches to set offtake level for each species listed in CITES.

Impact – Off-take rate: The Catch-MSY model yielded conservative reference points with confidence intervals. The exception to this was *I. oxyrinchus* where a formal stock assessment (highest confidence analysis level in Fig. 5C) was already available and its status is not overfished and overfishing is not occurring. These reference points were used to inform "Sustainable Exportation Volumes" (VES in its Spanish acronym).

Impact – Impact level: With VES defined, international trade is within a sustainable margin and the amount available is updated in the webpage of the Mexican CITES SA public in order to inform traders about its current level (bit.ly/mitiburon).

Both elements (data evaluation and the study case for *S. lewini*) were presented by Mexico in the poster session during the workshop, and can be consulted in the next link https://bit.ly/P05t3rMX.

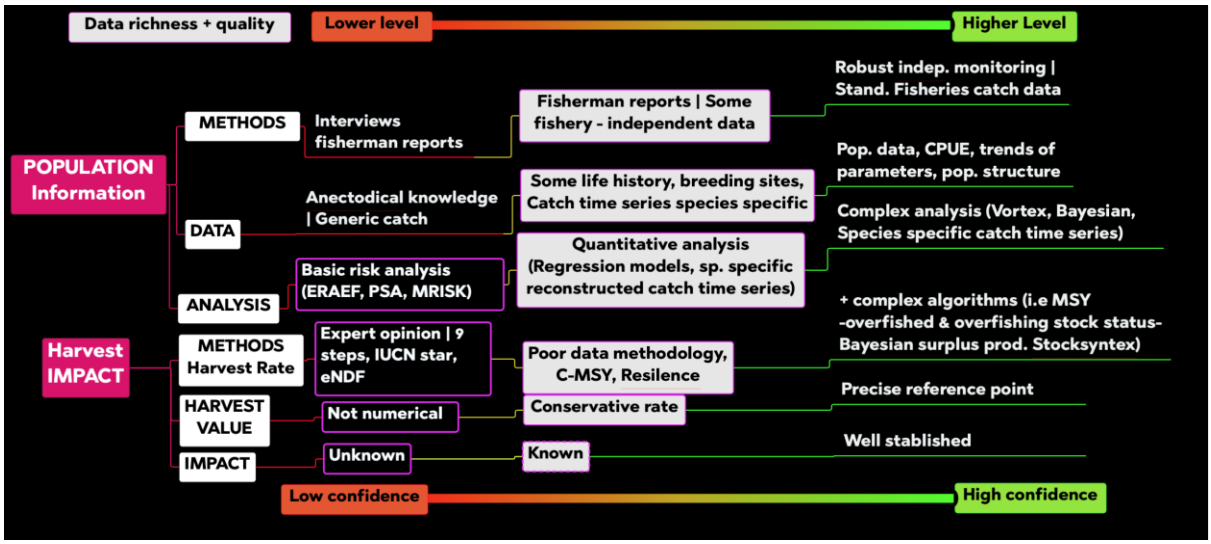


Figure 5D. NDF framework of data richness and trade risk for sharks. Boxes are signalling the level transition that Mexico has travelled from low data scenarios (boxes with pink frame) to higher-level scenarios (boxes with white backgrounds) since the CoP16.

4. Case studies for migratory species and transboundary populations

4.1. Example of a multinational collaboration in conservation management, including trade, in the case of a migratory species

The Saker Falcon, Falco cherrug, is a large falcon species that has been favoured for use in falconry for thousands of years. Notwithstanding its cultural and economic importance in many countries, population monitoring data has suggested that failure to control and reduce the cumulative effect of threats may cause most of the species' subpopulations to significantly decrease or become extinct.

Urgent coordinated action to maintain and restore the conservation status of the species has, therefore, been deemed necessary to avoid losing the species, including for future generations.

Recognising the risk of extinction of the species throughout all or significant parts of its range, a Saker Falcon Task Force (STF) was established under the auspices of the Convention on the Conservation of Migratory Species of Wild Animals' (CMS) Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia (Raptors MOU).

The STF aimed to bring together range States, partners and other interested parties to develop a coordinated Global Action Plan, including a management and monitoring system, to conserve the Saker Falcon throughout its

range. This goal included the ambition to develop and apply an Adaptive Management Framework to ensure that any taking of the species from the wild would be legal, controlled and sustainable.

4.2. Example of a multinational collaboration in conservation management, including trade, in the case of a species with transboundary populations

The Vicuna, *Vicugna vicugna*, is a is a wild high-altitude camelid distributed throughout the Andean Mountains from 3,000 to 5,000m asl, in the Puna and High Andean ecoregions. Populations of this species are found in Peru, Bolivia, Argentina, and Chile, with a small, introduced population in Ecuador. The species is valued for its fibre (hair) which is used in expensive high-end fashion products. The species was listed as Vulnerable in 1996, on the IUCN Red List but was reclassified as Least Concern in 2008. This change in threat status was the result of improved conservation measures which shifted unsustainable use of the species, to managed sustainable use based on non-lethal harvesting of the fibre supported by national legislation and multinational agreements. The development of non-lethal harvesting is based in ancient traditional Inca practice herding and corralling of wild vicunas for shearing of the fibre by local communities, which is done in the spring. The meat of the vicuna is considered valueless, so sheared vicunas are of no interest to poachers. This conservation success is the result of facilitation by various levels of legislation. Estimated population numbers for the species have improved from 10,000 In 1965 to recent estimates of a total in excess of 500,000 individuals.

Convention on the Trade in Endangered Species of Wild Fauna and Flora (CITES) came into force in 1975. All populations of the Vicuna were initially listed in Appendix I. CITES allowed for successful implementation of the regional **Vicuña Convention** (1979), an agreement whereby Argentina, Chile, Peru, Bolivia, and Ecuador have reversed the unsustainable use trend that was leading vicuñas to extinction, through enforcing decisions made in the framework of the Vicuña Convention upon all CITES Parties. Subsequently, all populations in Peru, Bolivia and Ecuador as well as some populations in Argentina and Chile are moved to Appendix II, specifically for trade in fibre obtained through live-shearing.

The Convention for the Conservation and Management of the Vicuna (1979) provides a good example of multilateral cooperation for the sustainable management of a species. Within this framework, Argentina, Chile, Peru, Bolivia and Ecuador set an important precedent in achieving sustainable management through the adoption of national action plans for vicuña management. The Vicuña Convention establishes an obligation for parties to prohibit all hunting and trade in vicuña products, except in cases closely monitored by the state and approved as sustainable practices within the Vicuña Convention. Manufacturers of cloth or garments using Vicuna fibre must, under licence from the country of origin, identify the cloth with a specific mark or logo stating "Vicuna (country of origin)".

National Legislation applies to the harvesting of vicuna fibre within the range countries, and specified populations, permitted in terms of CITES. This legislation, which determines specific areas for harvesting and the obligations and remuneration to communities involved, varies from county to country.

Sustainable use, whilst controversial, has provided a valuable tool for conservation of the species, maintaining wild populations, and restoring a valuable resource to local communities. In the case of the vicuna, this is preferable to maintaining captive populations and is possible because of international and regional agreements.

4.3. Adaptive Management Framework for the sustainable use of the Saker Falcon (*Falco cherrug*)

One key aim of the Saker Task Force is to develop an Adaptive Management Framework (AMF) that moves the current illegal, and presumably unsustainable trapping activity, into a system that is legal, controlled, and sustainable and conforms CMS and CITES requirements. To develop such a framework the STF established an Adaptive Management Framework Discussion Group to use an AMF to assist the decision-making of stakeholders, especially international partners, and national authorities, on the sustainable use of the Saker Falcon.

The objective is to design an international AMF which integrates nine modules:

a. global governance and data management, including effective sustainable use models and a sustainable, international quota scheme,
b. internationally harmonized policy and law-making that ensures sustainability,
c. reinforced law enforcement,
d. effective awareness raising,
e. effective monitoring and research schemes,
f. complementary ex situ conservation measures,
g. compensatory in situ conservation measures,
h. effective stakeholder engagement, cooperation, and networking to respond to the socio-economic and cultural drivers of Saker Falcon use, and
i. the involvement of rural communities in the conservation management of the Saker Falcon.

Currently, a significant degree of uncertainty and speculation accompanies the population estimates. For certain key range States, especially in Asia. Therefore, the STF is seeking to find a careful balance between the benefits of an internationally coordinated sustainable use framework and the inherent risks of taking Saker Falcons from the wild in large numbers. Safeguards can help ensure that management decisions are based on the best available science, in the context of the precautionary approach and, ultimately, that any legal use is sustainable and exerts minimal adverse impact on decreasing non-target populations.

The draft AMF suggests that legal harvest may conditionally be allowed in larger, stable or increasing Saker Falcon populations in parts of its global range, only if safeguards for sustainability are met and the origin of falcons is identifiable. Depleted or decreasing breeding populations should not currently be considered suitable for any harvest. However, the illegal taking of wild falcons along the flyways and in wintering areas must be mitigated.

This would require an international harmonization of alternative policies, legal and wildlife management tools. As well as a concerted international data sharing to ensure that harvest that is assessed as non-detrimental at the Range State level does not affect negatively the Saker Falcon populations of other Range States.

This case study demonstrates how adaptive management can be used as a tool to achieve shared objectives for a species across multiple range States with a range of measures being proposed to achieve sustainable use and boost populations.

4.4. Considerations of population demographics in migratory birds

The population size and demographic attributes of a species of migratory bird will differ depending on whether the birds are sampled at their breeding ground (where the population may be higher due to the presence of immature individuals), along the flyway/migration route (noting that not all individuals may migrate or may not migrate at the same time), or at their final destination (at which point a significant proportion of the population may have died during the migration).

4.5. Example of use of a marking system

A “Mark and Bank” scheme has been proposed for management of Saker falcon, Falco cherrug, harvests. This scheme proposes widespread marking of Saker chicks in Central Asia with specialised numbered tamper-proof rings which incorporate a microchip. A feather is taken from the chick, linked to the ring, and banked for future DNA comparison if necessary. The recording of such rings by trappers (encouraged to engage through on-line recording system offering entry to a lottery) as well as though participation by falconers and falcon hospitals in Gulf States, would enable measurement of the saker population size, scale of trade and ultimately adaptive management of trade.

4.6. Example of monitoring to allow harvest determination and adaptive management practiced in Namibian Community Conservancies

Wildlife populations in communal conservancies are monitored through annual game counts, waterhole counts and the Event Book monitoring system. Periodically aerial surveys are also conducted in some areas. These multiple methods are used to ensure that a variety of species can be monitored, and the results compared. Wildlife populations vary from year to year in response to changes in the environment such as drought, rainfall, diseases, predation, utilisation, and poaching. Annual road-based game counts and line transect counts are undertaken in conservancies, along with regular fixed foot patrols, which are collected in the Event Book by the community game guards. In preparation for annual game counts, the Natural Resources Working Group (NRWG) and the Ministry of Environment and Tourism Namibia (MEFT) train community game guards and staff on game count methodology. Game count training is used as an opportunity to review broader wildlife monitoring techniques such as fixed patrols and the Event Book monitoring system. The predator sightings index is produced by dividing the number of physical sightings recorded during the year by the number of event books (one book per game guard) (MEFT/NACSO 2023. The state of community conservation in Namibia (Annual Report 2022). MEFT/NACSO, Windhoek).

4.7. Risk Assessment based on Life History Gradients and Geographic/Exploitation Gradients – See module 1.

Understanding life history traits, in concert with geographic distribution of populations and anthropogenic pressures, including wildlife trade, allow conservation scientists and managers to make robust predictions about the likelihood a population or species can withstand harvest for the international trade in wildlife. This framework of placing species along life history, geographic, and exploitation gradients is useful for both simplified and complex NDFs.

Species 1: Saltwater Crocodile *Crocodylus porosus*.

- IUCN Red List: Least Concern (2019). CITES Appendix II in Australia, Indonesia, Papua New Guinea, and parts of Malaysia (other populations in Appendix I)
- Life History trait Gradients: Delayed maturity (K) Large brood size with low investment (r) and moderately frequent reproduction (intermediate)
- Geographic and exploitation Gradients: Large contiguous range and occupancy in harvest areas. Harvest is large (71,000 skins in 2017) but managed through ranching and other means so overexploitation unlikely. Thus, gradient will tend towards “Easier to Sustain”.

Species 2: Cape Mountain Zebra *Equus zebra zebra*.

- IUCN Red List – moved from Vulnerable (2008) to Least Concern (2015) and downlisted from CITES Appendix I to II at CITES CoP17.
- The Cape Mountain Zebra is a sub-species of Mountain Zebra found in South Africa with a separate sub-species (E z hartmannae) found in neighbouring Namibia.
- Life History Gradients: Slow maturing with small (single) brood sizes so K selected.
- Geographic and exploitation gradients: The population has increased from 100 to 5000 (approx.) individuals found in 75 sub-populations but these are subjected to active population management with low and managed harvest pressure. This would tend to move the gradient towards “easier to sustain”.

4.8. Examples of harvest that specifically relates to breeding and nesting

1) The harvesting of eiderdown. Although eiderdown pillows or quilts are now a rarity, eiderdown harvesting continues and is sustainable, as it can be done after the ducklings leave the nest with no harm to the birds.
2) Harvesting of nests for “Birds Nest Soup” is an historical tradition. Edible bird's nests are bird nests of swiftlets, mainly belonging to the genus *Collocalia*, created from solidified saliva, which are harvested for human consumption. Typically, the swiftlets nest in caves but recently houses, with no windows, have been built to facilitate nesting and harvest thus increasing sustainability. See CoP10 Doc 10.50

3) Olive ridley turtles (*Lepidochelys olivacea*) are listed as Vulnerable on the IUCN Red List and are in CITES Appendix I. The adults are noted for their synchronised mass-nesting behaviour, known as arribadas. In these events, the eggs of earlier-nesting females are often inadvertently dug up and destroyed by later females. Taking advantage of this, laws permit the local community to harvest and sell for human consumption, eggs from nests laid in the first few days of an arribada (but not subsequently). The local community in return contributes to the policing of nesting beaches to prevent illegal take of eggs later in the arribada (see module 1).

4.9. Example of unsustainable off-take in the breeding area of a species

The Brazilian Guitarfish, Rhinobartos harkelii, is listed in CITES Appendix II and is considered Critically Endangered on the IUCN Red List. The species has undergone a population collapse because of overfishing, particularly yearlong fishing in shallow coastal waters which are important for breeding and pupping. This fishing has disproportionately affected larger pregnant females. The females live 14 to 28 years and undergo a 1 to 11 month pregnancy, producing 4 to 12 pups, so tending to "K" selection.

4.10. Example of harvesting on migration routes (flyway)

The common quail, *Coturnix coturnix*, undergoes an annual migration from western Asia, across the Black Sea, through Türkiye, across the Mediterranean Sea to North Africa. The flocks of quail are followed by migratory Sparrowhawks, *Accipiter nisus*, and this is seen as a significant cultural opportunity to local communities in both Türkiye and North Africa who traditionally trap sparrowhawks, train them rapidly, hunt the quail for food and then release the sparrowhawks when the quail flocks move on. By contrast to this sustainable harvesting, the quail are captured in huge numbers in large nets set up over hundred kilometres along the southern and southeastern Mediterranean coast and the species is now in decline.

4.11. Species populations in "core" versus "peripheral" areas

Red-necked Falcon (*Falco chicquera*) in South Africa: This species is Near Threatened on the IUCN Red List, which occurs in Southern Africa including Namibia, Botswana, North-West Zimbabwe, and Mozambique (as well as further north). Within South Africa, it has a stronghold within the Kgalagadi National Park, and occurs sporadically in the north and west of the country where there are historic reports of breeding. Thus, it may be considered rare within South Africa but a harvest of individuals within South Africa, excluding the Kgalagadi Transfrontier Park, would hold no conservation significance for the species.

Saker falcon (*Falco cherrug*), in Central Asia: Populations within Mongolia and China are strong with a non-breeding surplus, limited by nest site availability. The strength of these populations results from provision of artificial nest-sites, management of illegal trade and mitigation of electrocutions on dangerous electrical transmission lines. In contrast to this, populations within areas of Central Asia to the west of China and Mongolia, are doing poorly as these conservation constraints have not been managed. It is necessary to recognize these as separate populations which require different management strategies and harvest restrictions.

The Atlantic Sturgeon (*Acipenser oxyrinchus*) is a species found in coastal waters and rivers in North America and the Baltic region. It has been assessed as Vulnerable on the IUCN Red List and is on Appendix II of CITES. Specimens of this fish are encountered, very rarely, in rivers in Ireland where these individuals can be considered as vagrants.

4.12. Example of varying demographics in response to mortality and harvesting

In the specific case of raptor species, natural mortality may be as high as 70% for first year raptors. First year birds, and, in some species such as the Saker falcon, particularly larger female birds, may be in higher demand for use in falconry, leading to preferential harvesting. Simultaneously, larger female raptors may also be more vulnerable to electrocution than males when perching on dangerously constructed electrical transmission infrastructure.

4.13. Example of implementation of the Precautionary principle through an adaptive management approach to making NDFs

The 2015 South African NDF assessment for the Leopard, Panthera pardus, would exemplify the application of the precautionary principle through an adaptive management approach. This species occurs in approximately 20% of the country and 68% of this is outside of protected areas. The protected areas provide secure core areas for the species and recreational hunting occurs outside of these areas, on private land. Transboundary populations are shared with Mozambique, Zimbabwe, Botswana, and Namibia. The NDF found that there was uncertainty relating to the abundance and population trends of the species in South Africa, uncertainty relating to the illegal killing of leopards in South Africa as well as in adjacent States and poor management of existing harvests. Based on these uncertainties, steps were recommended to develop better monitoring and management of any permitted harvest, and these included:

a) The development of guidelines for the allocation of leopard trophy quotas.
b) A conditional leopard trophy quota allocation in compliance with the new guidelines.
c) The development of national norms and standards for the management and monitoring of leopard trophy hunting and putative damage causing animals.
d) Full implementation of the norms and standards by the end of 2019.

Thus, the NDF recognised and addressed the knowledge deficits and proposed the means to address these, while imposing better controls on the harvest. Subsequent NDFs will take into account the significant improvements in the regulatory and management regime pertaining to leopards in South Africa.

4.14. Example of Assessment for a Harvest Request - Wild Peregrine Falcons, *Falco peregrinus minor*, in the Western Cape, South Africa.

The following example is a hypothetical case study that is provided to illustrate the use of scientific data and accepted international norms. It also illustrates the application of a precautionary approach and is included to assist Scientific Authorities in incorporating and evaluating scientific evidence. The example is that of a population of *Falco peregrinus minor* which is neither migratory nor transboundary, however some subspecies of the peregrine falcon are migratory, and this subspecies can be considered to include populations which are transboundary. In this case, there is no implication requiring development of an NDF, but is simply provided to illustrate aspects that may be considered in that process.

The hypothetical case considers a request for the harvesting of 10 immature (nestlings or first-year birds) for the purpose of use as falconry birds in the western Cape Province of South Africa. Following use, the intention will be to release the birds back to the wild within the Western Cape. There has been previous permission to harvest a smaller number of these birds in the Western Cape. There is no trade in wild-taken specimens of this species within South Africa nor evidence of illegal trade.

The Peregrine falcon is listed as Least Concern on the IUCN Red List with most populations stable or increasing. Under South African National Legislation, the peregrine falcon is considered “of least concern” and is protected. There is evidence of a strong population of this species in The Western Cape[1] and evidence of increasing populations in urban settings[2]. The species remain in CITES Appendix I but, in this case, the intention to harvest the specimens in not for purposes of trade.

There are an estimated 200 to 400 breeding pairs of peregrines in the South Western Cape[1] and the breeding success for this species has been estimated to vary from 1.1 to 1.37 chicks per year[3]. Based on this, a very cautious calculation using the lowest of these estimates for peregrine chicks bred in the South Western Cape per annum would give a number of at least 220 young birds. This number must be significantly higher if extended to the whole of the Western Cape.

Population modelling studies have been performed elsewhere to establish the basis for calculating falconry harvests:

1. A very limited harvest of peregrine falcons is permitted, under EU "Birds Directive" derogation, in the Republic of Ireland. Scientific modelling to show the effects of this harvest has been undertaken[4]. This demonstrates that a harvest of 5% of chicks would have no effect on the population and 10% would be sustainable.
2. A study was undertaken by the United States Fish and Wildlife Service to estimate the effect of allowing a harvest of peregrines for the purposes of falconry. The conclusion of this study was that a 5% harvest of young (first year) birds would be undetectable in any population study[5].
3. The CMS/UNEP Saker Task Force determined that a 5% harvest of young saker falcons, in Central Asia and the near east, for falconry would be acceptable[6].

Indeed, a 5% harvest of young falcons appears to be internationally acceptable as a level at which such a harvest would have no impact on population levels.

Considering the request for a permit for the harvest of 10 peregrines: This number is below 5% of the production of wild peregrines within the province and will have no measurable effect on the population of peregrines. We must also note that most of these birds will, ultimately, be released back to the wild. Similarly, a harvest of this size will have no effect on the role of the species within the ecosystem.

This example can be applied to the Simplified Assessment in module 2. In a more formal Simplified Assessment, further information or justifications should be provided for each score given. The example in **Module 5** Box P has been abbreviated for illustrative purposes.

Sources:

[1] Pepler D, Lombard A, Oettle E, Populations of Peregrine Falcon in the South Western Cape. South Africa. (2008)

[2] Altwegg R, Jenkins A, Abadi F, Nest boxes and immigration drive the growth of an urban Peregrine Falcon Falco peregrinus population. Ibis (2013)

[3] Jenkins A, Ostrich - Journal of African Ornithology 71(3-4):385-392 (2000)

[4] Sielicki J, Population modelling of Peregrines in Ireland – Conference Proceedings International Conference on the Stewardship of Biodiversity and Sustainable Use. (2016)

[5] Final Revised Assessment, Management Plan and Implementation Guidance: Take of Nestling Peregrine Falcons in the Contiguous United States and Alaska for Use in Falconry – US Fish and Wildlife Service, Division on Bird Management (2006)

[6] Kovács, A., Williams, N.P. and C.A. Galbraith (2014) Saker Falcon Falco cherrug Global Action Plan (SakerGAP), including a management and monitoring system, to conserve the species. CMS Raptors MoU Coordinating Unit, Abu Dhabi. CMS Technical Series No. XX.

5. Case study for terrestrial invertebrates

5.1. NDF for *Brachypelma smithi*

Background Information

Scientific and common names

Class: Arachnida
Order: Araneae
Family: Theraphosidae
Scientific name: *Brachypelma smithi* (F. O. Pickard-Cambridge, 1897)

Common names: Mexican red knee tarantula, Mexican redknee tarantula (English); tarantule à genoux rouges du Mexique (French); tarantula de anillos rojos, tarantula mexicana de rodillas rojas, tarantula mexicana pierna roja (Spanish).

Distribution

Brachypelma smithi is endemic to the Mexican state of Guerrero and ranges along the coastal side of the Sierra Madre del Sur mountain range east of the Balsas River Basin to the Acapulco city region (CEC, 2017a; Mendoza & Francke, 2017).

Biological characteristics

General biological and life history characteristics

Inhabits subtropical dry thorn and deciduous secondary forest of lowlands near the Pacific coast and slightly higher inland elevations. They prefer undisturbed areas shaded by trees or bushes, and favour areas near seasonal water-courses (C. S. Fukushima et al., 2018; Mendoza & Francke, 2017).

Brachypelma smithi are a fossorial species that modifies previously excavated burrows or self-excavate their own, often only minor alterations to natural small cavities under debris such as large rocks and tree roots in dense thickets or vegetation of dry thorn forests and deciduous forests (Mendoza and Francke 2017). The burrows have no traces of silk at the entrance giving no clear indication there is a spider inside, and the interior is often multi-tunnelled (Mendoza & Francke 2017). The mating season occurs during the last part of rainy and first part of dry seasons (September to January) when mature males wander in the open to search for females. The males are likely most active at night, cooler daylight hours, and throughout overcast days. Adult females typically moult once per year, just prior to the onset of the annual male emergence. Females will produce cocoons (large silken egg sacs) during the drier winter months with young emerging about two months later, with most young dispersing in the late spring (or early summer), just before the onset of the early summer rains (Mendoza & Francke 2017).

Habitat types

Subtropical/tropical dry forest, 0–1,500 in altitude.

Role of the species in its ecosystem

These are nocturnal predators that wait near the entrance of their refuge from dusk into the night to feed on ground-dwelling arthropods (insects, arachnids, some myriapods) or small vertebrates.

Population

From C. Fukushima et al. (2019): “Despite no systematic research on populations of *B. smithi*, it is known that there are loss of habitat area and quality (Global Forest Watch 2018) due to human activities such as urbanization and agriculture. Adding to this, the species is suffering from overharvesting due to relatively intense trafficking as well as for use in traditional medicine (George Odell and Alejandro Alagon pers. comm.), especially in the Guerrero coastal area. Some populations in the highlands are depleted by locals and coastal populations are threatened by being run over by cars while crossing highways, since their range follows the main Pacific coastal highway. In the Acapulco vicinities, B. smithi has been collected to extinction. Populations are easily accessed by smugglers and there have already been cases of hundreds of specimens caught with a single smuggler. Adding to this, extensive flooding of the Papagayo River nearly caused the complete destruction of two B. smithi populations (Mendoza and Francke 2017).”

Global population size

Unknown. In 2019 the area of occurrence was estimated to be 11,572 square kilometers and area of occupancy was estimated at 4,692 square kilometers (C. Fukushima et al., 2019).

Current Global population trends

Decreasing.

Global conservation status (IUCN Red List)

Near Threatened.

National conservation status for the case study country

Brachypelma smithi is protected and listed as a Threatened Species in Mexico (DOF, 2010).

Main threats within the case study country

Brachypelma smithi faces a multitude of threats to its survival. The expanding urbanization and associated transportation networks in the southern coastal region of its habitat range are causing rapid habitat destruction and fragmentation. This development, especially notable in the port city of Acapulco, extends into the foothills and neighboring coastal towns, primarily driven by tourism-related growth. Consequently, numerous subpopulations have been directly threatened or entirely eradicated by these urbanization activities. The species is further threatened by illegal overharvesting, particularly in the Pacific coastal area of Guerrero State. High levels of trafficking are driven by the demand for the tarantulas for the pet trade and for use in traditional medicine. Some local populations in highland areas have been depleted by local collectors (C. Fukushima et al., 2019).

The construction of roads, particularly the north-south coastal Pacific highway poses another threat. Males are vulnerable to vehicular mortalities during the species' mating season, when they roam in search of a mate (C. Fukushima et al., 2019).

The species is also threatened with an increased frequency of detrimental natural events, such as severe weather and flooding in the coastal region of Guerrero State (C. Fukushima et al., 2019). A notable example is the extensive devastation caused by the hurricane season of 2012–2013, which nearly eradicated certain subpopulations of *B. smithi* (Mendoza & Francke, 2017).

Species Management

Management Measures

In Mexico, the General Wildlife Law (*Ley general de Vida Silvestre*—LGVS) establishes national policy for wildlife protection and programs for sustainable exploitation of wildlife. The LGVS also defines the following risk categories for Mexican at-risk species and populations (DOF, 2021):

- Endangered (P): species whose survival is threatened by drastic declines in population, distribution and/or habitat loss or disruption.
- Threatened (A): species which may be in danger of extinction in the short or medium term if the threats to their survival are not reduced.
- Subject to special protection (Pr): potentially threatened species for which special efforts are required to secure and promote their conservation.

Species that are assessed as being at-risk and their category of risk are listed in the Official Mexican Standard NOM-059-SEMARNAT-2010 (NOM-059). NOM-059 is the "reference instrument" of the LGVS. The NOM-059 defines the criteria that must be met for a species to be considered "at risk", provides the criteria for reviewing the conservation status of native Mexican species of animals and plants, and categorizes those species that require special protection (DOF, 2010).

The LGVS regulates the establishment of Management Units for the Conservation of Wildlife Management and Exploitation Units (*Unidades de Manejo y Aprovechamiento*—UMAs). UMAs are properties and facilities used by the owners for the sustainable use of native species that operate under a management plan that was approved by the General Directorate for Wildlife (*Direccion General de Vida Silvestre*—DGVS) (DOF, 2010).

An UMA management plan must contain the following components (DOF, 2021):

- The specific short-, medium- and long-term goals and indicators of success.
- Relevant biological information about the species being managed.

- A physical and biological description of the area and its infrastructure.
- The sampling methods and monitoring mechanisms to be used.
- A calendar of activities.
- The measures to be used for management of habitat, populations and specimens.
- Contingency measures.
- Where appropriate, the system to be used to identify the specimens, parts and derivatives that are used in a sustainable manner.

There are two types of UMA: extensive and intensive. An extensive UMA (*Unidad de Manejo y Aprovechamiento Extensivo*) manages the conservation and sustainable exploitation of wildlife in their natural habitats. The goal is to ensure that the activities conducted within the UMA do not significantly affect the ecological dynamics or endanger the long-term survival of the species concerned. An intensive UMA (*Unidad de Manejo y Aprovechamiento Intensivo*) focuses on breeding or propagating wildlife species in a controlled environment. The goals are to increase the population of the species concerned and facilitate their commercial production. This may be accomplished to support conservation breeding programs, research, or for commercial purposes such as farming or the pet trade. The management practices of intensive UMAs typically involve reproductive management, commercial activities that may include the sale of wildlife, and conservation goals. Although intensive UMAs have commercial objectives, they must also contribute to the conservation of the species concerned. *Brachypelma* are bred in intensive UMAs for sale and possible export from Mexico. The collection of wild specimens for parental stock is permitted only via the UMA framework.

Monitoring system

Methods used to monitor harvest

Unknown.

Confidence in the use of monitoring

Unknown.

Legal framework and law enforcement

The Secretariat of Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*—SEMARNAT) is responsible for protecting, restoring, and conserving the ecosystems, natural resources and assets of Mexico; it is also responsible for promoting sustainable development. SEMARNAT is ultimately responsible for conserving native species and for implementing CITES.

SEMARNAT meets its mandate through the activities of a number of sub-entities within the Secretariat, including the following:

- The General Directorate for Wildlife (*Direccion General de Vida Silvestre*—DGVS).
- The National Commission for the Knowledge and Use of Biodiversity (*Comisión Nacional para el Conocimiento y Uso de la Biodiversidad*—CONABIO).
- The Federal Attorney for Environmental Protection (*La Procuraduría Federal de Protección al Ambiente*—PROFEPA).

The DGVS is responsible for the management of wildlife in the country and the implementation of the General Law of Wildlife (*Ley General de Vida Silvestre*—LGVS) (DOF, 2021). The DGVS acts as the CITES Management Authority in Mexico and is responsible for issuing permits, keeping records and liaising with the CITES Secretariat. The DGVS also manages the National System Management Units for the Conservation of Wildlife (*Sistema Nacional de Unidades de Manejo para la Conservación de la Vida Silvestre*—SUMA) (CONABIO, 2023), which includes the approval of plans for UMAs.

CONABIO is responsible for promoting, coordinating, supporting and implementing activities to improve the knowledge of biological diversity, its conservation and sustainable use. Conabio serves as the CITES Scientific Authority in Mexico and is responsible for completing NDFs.

PROFEPA is a decentralized administrative body of SEMARNAT that has technical and operational autonomy. PROFEPA responds to and controls environmental deterioration. One of PROFEPA's primary tasks is to enforce compliance with environmental regulations. PROFEPA is responsible for enforcing CITES in Mexico under the authority of the LGVS.

As noted, the LGVS regulates the sustainable use, conservation, and management of native wild animals and plants. Article 55 of the LGVS implements CITES in Mexico (DOF, 2021). The LGVS also includes some provisions that are stricter than are required by the Convention.

The Regulations for the LGVS (*Reglamento De La Ley General De Vida Silvestre*) enable and implement the LGVS and provide the essential requirements for the integration of the SUMA, and the inclusion, establishment, management and operation of the UMAs (DOF, 2014).

Utilization and Trade

Type of use

Brachypelma smithi is commercially traded almost exclusively as captive-bred live specimens for the pet trade (Tables 1 & 2).

Harvest

Harvesting regime

The harvest of wild specimens of *B. smithi* is prohibited by Mexican law except for collection of parental specimens for breeding via permit under the UMA framework, or for collection for valid and approved scientific purposes (DOF, 2021).

Legal and illegal trade levels

Legal trade

Specimens of *B. smithi* are sometimes erroneously sold as *B. annitha* or *B. hamorii* in the international commercial tarantula pet trade. *Brachypelma smithi* and *B. hamorii* are morphologically very similar and difficult to tell apart (Cooper et al., 2019).

In 2016, captive-bred juveniles sold for approximately USD$30–$35 in Canada and the United States of America, USD$10 in Mexico and USD$5 in the EU. Adult males sold for approximately USD$95 in Canada and USD$60 in the United States of America. Adult females sold for approximately USD$250 in Canada and the United States of America, and USD$60 in the EU (CEC, 2017b).

Data downloaded from the UNEP-WCMC CITES Trade Database showed that in the years 2017–2020, Mexico exported 13,194 specimens of *B. smithi.* All were live, captive-bred specimens traded for commercial purposes. More than 77% (n=10,212) were exported to the United States of America. The remaining were exported to Canada, China, Germany, Poland and the United Kingdom of Great Britain and Northern Ireland (Table 1). As of August 2023, Mexico had not reported any exports of *B. smithi* for 2021.

A total of 2,463 specimens of *B. smithi* were reportedly exported from non-range States in 2017–2021. All were reported as live except for five specimens exported from Zimbabwe in 2019 that were unspecified. All specimens were captive-bred and traded for commercial purposes. The Japan, the United States of America and the European Union were the primary markets for specimens exported from non-range States (Table 1).

Illegal trade

Wild specimens are known to be illegally collected and exported from Mexico, often using "brown-boxing" techniques (E. Cooper, pers. obs.). "Brown-boxing" is the shipping of unlabeled packages of animals from an exporting country to an importer (TBS, 2018). This commonly involves specimens illegally collected and/or illegally exported (E. Cooper, pers. obs.). The volume of specimens illegally traded is unknown.

Table 1. Mexican Exports of *Brachypelma smithi*, 2017–2020

Year	Exporter	Importer	Exporter reported quantity
2017	Mexico	Canada	100
		Germany	120
		United States of America	71
		Subtotal	**291**
2018	Mexico	Canada	750
		Poland	102
		United States of America	827
		Subtotal	**1,679**
2019	Mexico	China	10
		United Kingdom of Great Britain and Northern Ireland	400
		United States of America	1,694
		Subtotal	**2,104**
2020	Mexico	Canada	850
		United Kingdom	450
		Poland	200
		United States of America	7,620
		Subtotal	**9,120**
Grand total			**13,194**

Source: World Conservation Monitoring Centre (WCMC) CITES Trade Database. All specimens were live, captive-bred and traded for commercial purposes. Mexico had not reported any exports of *B. smithi* for 2021 at the time of writing.

Table 2. Exports of *Brachypelma smithi* from non-Range States, 2017–2021

Year	Exporter	Importer	Exporter reported quantity
2017	Switzerland	Hong Kong SAR of China	25
	Germany	Switzerland	2
		Japan	49
		Norway	16
		United States of America	900
	Ukraine	Canada	50
		Japan	120
		Netherlands	100
	Subtotal		**1,262**
2018	Germany	Japan	50
		Norway	2
	Ukraine	Canada	105
		Japan	100
		Malaysia	20
	Subtotal		**277**
2019	Germany	United States of America	30
	Ukraine	Canada	95
		Japan	100
		Netherlands	457
		United States of America	225
	Zimbabwe	Unknown	5
	Subtotal		**912**
2020	Germany	United States of America	9
	Subtotal		**9**
2021	Germany	United States of America	1

Year	Exporter	Importer	Exporter reported quantity
	Russian Federation	Azerbaijan	2
	Subtotal		**3**
Grand total			**2,463**

Source: World Conservation Monitoring Centre (WCMC) CITES Trade Database. Re-exports were excluded. All were reported as live except for the five specimens exported from Zimbabwe in 2019 that were unspecified. All specimens were captive-bred and traded for commercial purposes.

Non-Detriment finding procedure

Step 1: Information gathering

Cooper et al. (2019) illustrates the morphological characters useful for identifying specimens of *Brachypelma smithi* and how to distinguish specimens from the very similar species *Brachypelma hamorii.* The publication also discusses collecting and preserving DNA samples to confirm the identification of tarantula specimens.

Step 2: Rapid evaluation

As discussed previously, all of the specimens of *B. smithi* in legal trade in the years 2017–2021 were captive-bred specimens.

Generic guidance for confirming that specimens are truly captive-bred is provided in Resolution Conf. 10.16 (Rev CoP19) and Resolution Conf. 17.7 (Rev CoP19) (CITES, 1997, 2016). Guidance for applying CITES source codes is offered in Lyons, D., et al. (2017) and guidance for inspecting captive breeding facilities is discussed in Lyons, Jenkins, et al. (2017).

A rapid evaluation for wild-caught specimens of *B. smithi*, following the steps provided in part 4.3 of Module 7: Terrestrial Invertebrates, provided the results summarized in Table 3.

Table 3. Simplified assessment of wild specimens of *Brachypelma smithi*

Row	Life history characteristics	Degree of risk				Total
		Low Score 1	Medium Score 2	High or unknown Score 3	Very high Score 4	
1	Geographic distribution				4	4
2	National/sub-national population size/distribution				4	4
3	Habitat specificity		2			2
4	Food specificity	1				1

5	Reproductive output		2			2
6	Adult longevity				4	4
Total		1	4	0	12	**17**

Step 3: Conclusion

Based on the information presented, the reported trade in captive-bred *B. smithi* would not be detrimental to survival of the species in the wild.

However, the source of the parents should be considered when completing an NDF for trade in the species. If the If the parents were also captive bred, then the impact of the trade on wild populations would be minimal. If one or both parents were removed from the wild, then the Scientific Authority should also consider the impact of this removal on wild populations and may find it informative to review Step 2.3 of the guidance. For exports of *B. smithi*, the specimens to be exported must have been produced from an accredited UMA. For specimens of *B. smithi* that were captive-bred in other countries (non-range States) it may be important to consider whether the parental stock had been legally imported.

The response to any proposed trade in wild-caught specimens of *B. smithi* would be quite different. A rapid assessment of the biological and life-history characteristics of the species resulted in a total score of 17. A score of nine or higher suggests that a full detailed NDF evaluation should be completed (see Module 7). In addition, any assessment that scores a three or four for any characteristic automatically qualifies for a full detailed NDF evaluation.

6. Case studies for birds

6.1. Identification of the Cape Parrot and the Grey-headed Parrot

Morphological similarities between the Cape Parrot (*Poicephalus robustus*) and the Grey-headed Parrot (*Poicephalus fuscicollis suahelicus*) make distinguishing the two species challenging. The similarities are such that the Cape Parrot was previously considered a subspecies of *P. fuscicollis*. Whilst both species are Appendix II listed, the Cape Parrot is endemic to South Africa and assessed as Vulnerable on the IUCN Red List, whereas *P. fusicollis* spp. are distributed across a much wider range and are classified as Least Concern on the IUCN Red List. This has clear implications for the preparation of an NDF.

To support correct identification, the South African National Biodiversity Institute (SANBI) has compiled the 'Cape Parrot Identification Guide' on behalf of the Scientific Authority of South Africa. This includes,

1. A brief description of the two species,

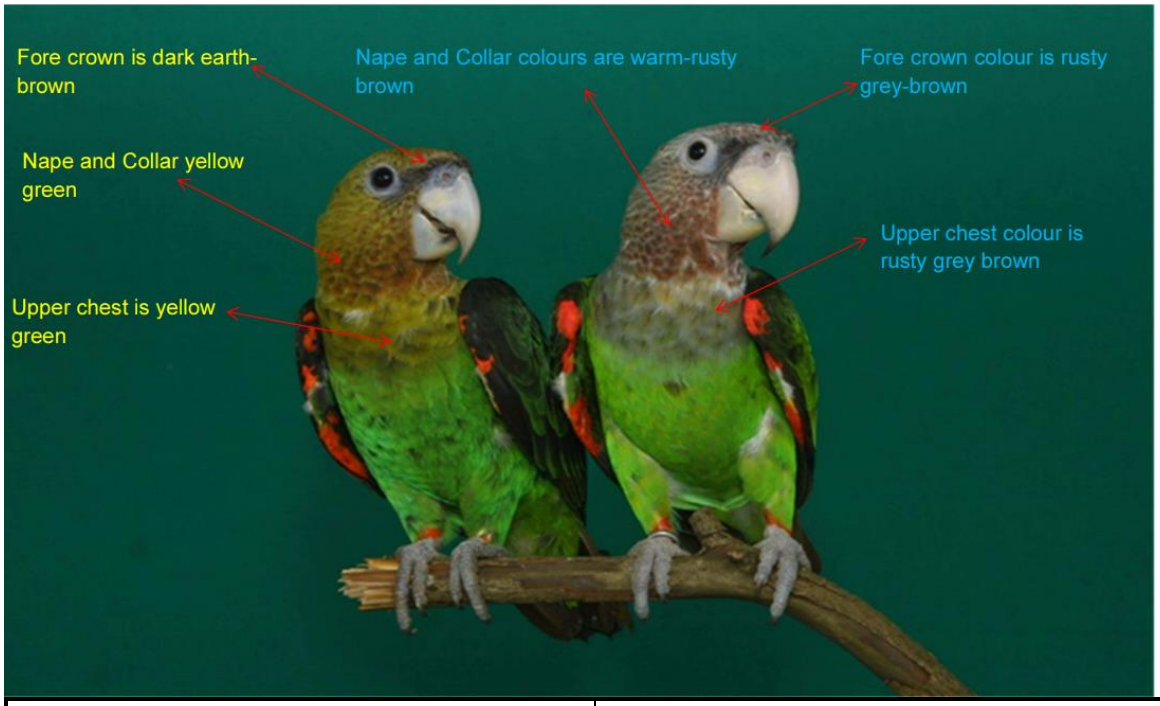
2. Tables listing the main ecological, morphological and biological differences between the two species,

3. Photographs of both sexes annotated to show the colour differences between the two species, and.

4. A colour palette to assist in recognising the various colours described.

Male Cape parrot (*P. robustus* - left) and male grey-headed parrot (*P. fusicollis suahelicus* - right)

6.2. Example Simplified Assessment for the Mealy Amazon (*Amazona farinosa*) in Suriname



Species name	Mealy Amazon - *Amazona farinosa*
Range state name	Suriname
Report compiled by	Chair of the Scientific Authority Suriname
Date compiled	5 December 2023

Section One: Summary

Please provide a short overview (1-2 paragraphs) of the trade in this species in the country of interest.

In terms of international trade, Suriname is a significant exporter of live *Amazona farinosa*. Suriname's wildlife trade sector is contributing to its economy, especially bird species, including *A. farinosa*, account for a significant portion of its exports. This species is widespread with a continuous distribution at the national level and is harvested from the wild for the export with the following purposes: commercial trade, breeding in captivity, zoo and scientific. From 2013 to 2020, live specimens were exported with a mean of 181 individuals each year. Since 2022, Suriname has implemented a zero-export quota for this species after the publication regarding this matter by the CITES Secretariat in 2022.

Section Two: Simple Evaluation score

For the taxon for which the NDF is being completed, define sensible threshold values for each criterion based on the best information available. Please score each attribute listed within the table below and sum these to provide a total.

Table 2C. Scoring criteria for the five variables of interest in the *Simplified Assessment.*

	Number of points			**Score**
Criteria	**1**	**2**	**3**	
Annual Harvest level	Low	Medium	High/Unknown	**1**
Area of distribution	Large	Medium	Small/Unknown	**1**
Life-history	Fast	Medium	Slow/Unknown	**2**
Conservation or threat status	**If the status of the species is** threatened or Unknown, give a **max score of 1 point.**			**0**
Illegal trade	If levels of illegal trade are inferred by reference to seizure data, they should be included under "Annual harvest level". If illegal trade is known to be occurring, but *levels* are unknown give a **max score of 1 point.**			**1**
Final Score and Justification	(If score lower than five (5) = **trade is non-detrimental** (record the score and justification in the worksheet provided). If the Simplified NDF score is equal to or greater than five (5) then a **Comprehensive Assessment should be undertaken**.			**5**

Section Three: Justification – Annual harvest level

Please provide an explanation with appropriate references to justify the score given.

From 2013 – 2020, a total of 1450 live specimens were exported with a mean of 181 individuals each year. Analysis of the CITES export trade data shows that most of the specimens which were exported, came from the wild except in 2017, were twenty specimens were exported from breeding in captivity, and in 2020 fourteen specimens were exported from breeding in captivity. The SA is aware of one permit for breeding in captivity for his species in Suriname but there is no data available to support the export of this source. The table below shows an overview of the export numbers on yearly basis.

Year	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**Total**
Export from Suriname	347	172	131	184	203	237	99	77	**1450**

Suriname has a system of voluntary export quotas for wildlife fauna species, which was in place 1987 after revision of the Game Law 1954 and has been revised in 1995 and is up until date used. Before the latest decision of the Standing Committee (SC74 doc. 30.1), the quota for the *A. farinosa* was 450. Suriname implemented a zero-export quota for *A. farinosa* after the publication regarding this matter by the CITES Secretariat in 2022 since this species has been placed under the RST.

Suriname does not have a harvest plan for this species. Although this species is a CITES Appendix II listed species, it is not a fully protected species in Suriname as it is nationally listed as a cage species. The Game Act of 1954, the Game State Decree and the Game Calendar regulate trade of this species. Hunting, capture, transport and trade of this species is prohibited during the closed season from December until June (mating and breeding season). Most of the legal national harvest occurs in the coastal areas and areas where there is no strong local control.

Based on this information, the harvest level can be considered as “low”.

Section Four: Justification – Area of distribution

Please provide an explanation with appropriate references to justify the score given.

The exact area of occupancy in Suriname is not available for this species. This species inhabits extensive tracts of lowland tropical evergreen forest, also occurring in palm stands, deciduous and gallery woodland and secondary growth near forest. In Suriname, this species is mostly found in forests along rivers and savannah forests throughout the country. In July and August flocks come on forested sand-ridges in the coastal region. The national distribution of this species in Suriname is widespread and contiguous. Recent population study on known harvest sites shows that this species is still in abundance in the wild (Ramcharan 2022). The population trend is stable, however like many other parrot species, they are facing challenges due to illegal harvesting and trade. These factors can significantly affect their populations and their ability to adapt to changing environments in the long term. Taking in consideration that Suriname is 93% forested, which estimates a land area of ~152.000 km^2, the area of occupancy for this species is “large” (>20.000km^2).

Section Five: Justification – Life history

Please provide an explanation with appropriate references to justify the score given.

Estimated to be medium, thought to be between 4-5 at reproductive maturity (Sholty 2006) and average generation length is 9.56 years (BirdLife International 2023)

This species has a monogamous mating system. Mating occurs once a year and normally begins in the spring. Once sexually mature, this species parrots will choose one partner for life.
The table below shows an overview of the reproductive features of the *A. farinosa*.

Breeding interval Mealy parrots breed for a span of a few months once a year.	**Breeding season** Breeding occurs from November to March.	**Average eggs per season** 3 eggs
Average time to hatching 4 weeks	**Average time to independence** 2 months	**Range age at sexual or reproductive maturity (female)** 4 to 5 years
Range age at sexual or reproductive maturity (male) 4 to 5 year		

Section Six: Conservation or threat status

Please provide an explanation with appropriate references to justify the score given.

IUCN status: Least Concern (IUCN 2023)

Section Seven: Illegal trade

Please provide an explanation with appropriate references to justify the score given.

Due to the lack of data, it is difficult to quantify the extent of illegal trade of this species. Anecdotal reports of illicit and transborder trade that could pose a threat to this species.

Section Eight: Conclusion, course of action, and determination on exports

Please provide an overall conclusion on the perceived threat of trade to the species and details on whether further course of action will be taken to complete an NDF for the species.

Based on this simplified assessment score we need more information on the species so a comprehensive assessment is required.

Section Eight: Literature Cited

Please provide references to all the reports and literature cited in this evaluation.

BirdLife International (2023) Species factsheet: Amazona farinosa. Downloaded from http://datazone.birdlife.org/species/factsheet/southern-mealy-amazon-amazona-farinosa on 05/12/2023.

Sholty, K. 2006. "Amazona farinosa" (On-line), Animal Diversity Web. Accessed December 05, 2023 at https://animaldiversity.org/accounts/Amazona_farinosa/

IUCN 2023. The IUCN Red List of Threatened Species. Version 2022-2. https://www.iucnredlist.org

Ministry of Land policy and Forest Management

CITES trade data base 2023 https://trade.cites.org/

Ramcharan S. and Lingaard M. (2022, August 5). Population size status of parrot species, a focus on population size of parrot species in known harvest areas, Suriname.

6.3. Preventing illegal take, killing and trade of Helmeted Hornbill

Helmeted Hornbill (*Rhinoplax vigil*), a species restricted to South-East Asia, is hunted throughout its range for its unique solid casque, which is used to make ornamental carvings. International trade in parts, products or specimens of this species for primarily commercial purposes has been illegal under CITES since 1975, while national legislation prohibits hunting and trade in most range states. However, high demand continues to drive unsustainable illegal take, killing and trade. A surge in trade resulted in the species being re-classified in 2015 as Critically Endangered on the IUCN Red List. In response, BirdLife and others developed a range-wide conservation strategy and action Plan for conservation of the species. The plan has been widely adopted across the range and many actions are already underway. These include monitoring of hornbill populations and poaching activity; identification of the most important sites of hornbills; public engagement and awareness raising; disruption of trade routes with seizures at transit points; improved law enforcement at poaching sites; and working with indigenous peoples and local communities to appointment them as guardians for their local hornbill populations. This approach has been successful in securing several high priority sites across Indonesia, Malaysia, Myanmar and Thailand, with these countries' sites are acting as 'safe havens' where the hornbills breed and are shielded from illegal take.

6.4. Local self-regulation can be more effective at ensuring sustainable resource use than an outright ban

An outright ban, though at times necessary, is not always the most effective or desirable mechanism for dealing with unsustainable levels of hunting. For example, at Lake Chilwa Important Bird Area (IBA) in Malawi, where wildfowl hunting is an important part of local livelihoods hunting clubs have successfully implemented measures to control hunting. They have also created a framework of fines that are enforced locally and contribute to community projects. This system of self-regulation is working well and, crucially, is respected by the local community.

Lake Chilwa Important Bird Area (IBA), a shallow lake of about 700 km² bordered by swamps and seasonally flooded grassland, is very rich in fish and supports the livelihoods of about 60,000 people. It meets IBA criteria mainly because of its large congregations of waterfowl. Hunting these birds has long been part of local livelihoods, but large-scale commercial exploitation started in 1996, when the lake dried up and the fishery collapsed. This ability to shift between resources is an important dimension of the resilience of people dependent on natural resources and living in an uncertain environment. However, a survey in 1998/99 estimated that over a million waterfowl had been taken following the drying of the lake, a level that appeared unsustainable.

The response of BirdLife Partner the Wildlife and Environmental Society of Malawi (WESM) was not, as might have been expected, to seek a ban on bird hunting, but to find a way to give communities the responsibility and

capacity to manage their resource sustainably. A revision of Malawi's Wildlife Act allows Community Conserved Areas to be established. Under the management of WESM's Zomba branch, 20 hunting clubs have been created around the lake, with representatives elected to an umbrella body. WESM worked with the clubs and local government to reach an agreement on measures such as a closed season, no-hunting zones, and licensing and bag-limits. These have been written into a by-law, with a framework of fines and measures for dealing with infractions. Importantly, the whole process operates at the local level, traditional chiefs deal with offenders, and fines contribute to community projects like repairing boreholes and improving school buildings.

So far, the system is working well, and the regulations seem to be respected. The hunting clubs are now looking at ways of diversifying their livelihoods. They are earning extra income by guiding tourists and, with WESM's help, have developed a tourism business plan. The hunters also carry out bird censuses four times a year, in January, April, July and October.

6.5. UK Scientific Authority Generic Questions relevant to assessments of Captive breeding against the guidance found in Conf. Res 10.16 (Rev CoP19)

The UK Scientific Authority developed the following questions to assist in the assessment of non-detriment for import permits for captive-bred individuals *and/or* specimens into the UK. Text in *italics* describes what aspect the question seeks clarification.

1. **Full details of the breeding facility (including the name and address, the date of establishment, and a full description of the facility)** *(Designed to establish whether it is a controlled environment)*
2. **The number and origin of the founder breeding stock, with the date and details of acquisition.** (*Designed to establish both the legal acquisition of the founder stock, and ensure it was acquired in a manner not detrimental*)
3. **The size of current breeding stock in total number of individuals including the male/female ratio.** (*important to ensure that the numbers produced are within the biological capability of the species according to the number of breeding females held*)
4. **The year of first successful breeding.**
5. **Whether the breeder has bred this species to F2 generation** (*Designed to assess and attribute source code*)
6. **Whether the breeding stock has been augmented with wild taken individuals, and if so details of how many and when** (*Designed to understand the regularity of harvest of wild-caught individuals to supplement the breeding stock*).
7. **Full details of annual production for the last 5 years**

(*Important to ensure that the numbers produced are within the biological capability of the species according to the number of breeding females held*)

7. Case studies for reptile species

7.1. NDF for *Boa constrictor constrictor*

Species name	Boa Constrictor (*Boa constrictor constrictor*)
Range state name	Suriname
Report compiled by	D. Natusch
Date compiled	2012
Section One: Summary	
Please provide a short overview (1-2 paragraphs) of the trade in this species in the country of interest. Boa constrictor is harvested from the wild in Suriname and is exported for the pet trade. They are harvested from throughout the country and approximately 200 – 300 specimens are exported annually. An export quota of 1010 individuals per annum is currently in place.	

Section Two: Simple Evaluation score

Please score each attribute listed within the table below and sum these to provide a total.

	Number of points			Score
Criteria	**1**	**2**	**3**	
Annual Harvest level	Low (<500)	Medium (500 - 5,000)	High (>5,000)	**1**
Area of distribution	Large (>20,000km^2)	Medium (2,500 – 20,000km^2)	Small (<2,500km^2)	**1**
Life-history	Fast	Medium	Slow	**2**
Illegal trade and IUCN status	If levels of illegal trade are known, they should be included under "Annual harvest level". If unknown, and suspected to be detrimental, give a **maximum score of 1 point. Similarly, if the status of the species is** listed as VU, EN or CR in the IUCN Red List Of Threatened Species, give a **maximum score of 1 point**			**0**

Section Three: Justification – Harvest level

Please provide an explanation with appropriate references to justify the score given.

A harvest quota of 1,010 individuals is allocated for harvest in all of Suriname annually. There is no evidence of illegal trade and only 1/3 of this quota is realised each year (exports between 200 – 300 individuals per year). This justifies the harvest level score of **1** (low).

Section Four: Justification – Area of distribution

Please provide an explanation with appropriate references to justify the score given.

Boa constrictor occur throughout Suriname. It is a generalist species that thrives in modified and anthropogenic habitats (including cities) (Henderson et al. 1995). For this reason, we deem the area of occupancy within Suriname to be the total land area of the country: 163,821 km^2. This extent is considerably larger than 20,000 km^2 and thus justifies an area of occupancy score of **1**.

Section Five: Justification – Life history

Please provide an explanation with appropriate references to justify the score given.

Boa constrictor is a livebearer with a high reproductive output, producing an average of 27 young in a litter and up to 65 young in large females (Bertona and Chiaraviglio, 2003; Pizzatto and Marques, 2007). They are fast growing, but probably only produce litters bi-annually (Bertona and Chiaraviglio, 2003; Pizzatto and Marques, 2007). For this reason, we follow a precautionary approach and give a life history score of **2** (medium).

Section Six: Illegal trade and IUCN Status

Please provide an explanation with appropriate references to justify the score given.

There is no evidence of illegal trade in *Boa constrictor* from Suriname, and the species is listed as Least Concern by the IUCN. For this reason, we assign a score of **0**.

Section Seven: Conclusion, course of action, and determination on exports
Please provide an overall conclusion on the perceived threat of trade to the species and details on whether further course of action will be taken to complete an NDF for the species. The sum of scores for the attributes listed above is **4**. All scores four and below do not require that a secondary evaluation be completed. Based on the information presented above, we can be confident that harvesting for trade does not affect the viability of *Boa constrictor* populations in Suriname. This Simple NDF is a sufficient NDF for *Boa constrictor* in Suriname. Exports are deemed to be non-detrimental. Trade is allowed to continue.
Section Eight: Literature Cited
Bertona, M., and Chiaraviglio, M. (2003) Reproductive biology, mating aggregations, and sexual dimorphism of the Argentine Boa Constrictor (*Boa constrictor occidentalis*). Journal of Herpetology. 37, 510-516. Henderson, R., Waller, T., Micucci, P., Puorto, G., and Bourgeois, R. (1995). Ecological correlates and patterns in the distribution of neotropical Boines (Seprentes: Boidae): A preliminary assessment. *Herpetological Natural History*, **3**, 15-27. Pizzatto, L., Marques, O.A.V. (2007): Reproductive ecology of Boine snakes with emphasis on Brazilian species and a comparison to Pythons. South Am. J. Herp. 2: 107-122.

7.2. NDF for *Bradypodion thamnobates* (CITES II)

Species name	*Bradypodion thamnobates* (CITES II)
Range state name	South Africa
Report compiled by	Krystal Tolley
Date compiled	5/5/2023

Section One: Summary
Please provide a short overview (1-2 paragraphs) of the trade in this species in the country of interest. The Natal Midlands Dwarf Chameleon (*Bradypodion thamnobates*) is large and charismatic species of chameleon and is therefore sought after as a pet. It occurs within a small distribution (4,170 km^2) only in KwaZulu-Natal Province, South Africa. The species is Endangered primarily due to habitat loss within the Extent of Occurrence (EOO: 4.610 km^2) and the population is severely fragmented. Most individuals occur in small patches of remaining natural forest, or within patches of exotic vegetation outside of natural forest. The legal CITES trade of this species numbers on average perhaps fewer than 100 live individuals per annum for pet trade, but there are notable signs that there is illegal trade that is higher. These include a number of privately run platforms that advertise this species for sale when it appears that there is little to no possibility of legal origin. Thus, the potential illegal trade is completely unquantified and could be detrimental given that the population is severely fragmented and local extinctions could occur.
Section Two: Simple Evaluation score

Please score each attribute listed within the table below and sum these to provide a total.

	Number of points			Score
Criteria	**1**	**2**	**3**	
Annual Harvest level	Low (<500)	Medium (500 - 5,000)	High (>5,000)	**1**
Area of distribution	Large (>20,000km^2)	Medium (2,500 – 20,000km^2)	Small (<2,500km^2)	**3**
Life-history	Fast	Medium	Slow	**1**
Illegal trade and IUCN status	If levels of illegal trade are known, they should be included under "Annual harvest level". If unknown, and suspected to be detrimental, give a **maximum score of 1 point. Similarly, if the status of the species is** listed as VU, EN or CR in the IUCN Red List Of Threatened Species, give a **maximum score of 1 point**			**1**

Section Three: Justification – Harvest level

Please provide an explanation with appropriate references to justify the score given.

The annual harvest is unquantified and unknown. The CITES Trade Database statistics are unlikely to provide a reasonable

estimation of harvest as the reported pet trade is of 'captive bred' despite essentially one legal export of 12 live individuals from the range state, and despite some of the 'captive bred' exports being prior to the single legal export of this species in 2014.

It is unlikely however, that the harvest can be estimated to exceed thousands of individuals. The score is therefore 1.

Section Four: Justification – Area of distribution

Please provide an explanation with appropriate references to justify the score given.

The size of the distribution is estimated at 4,170 km^2 (Tolley 2022). The AOO (as per the IUCN guidelines) has not been estimated for this species but given the severe habitat fragmentation, is likely to be less than 2,500 km^2. The score is therefore set to 3.

Section Five: Justification – Life history

Please provide an explanation with appropriate references to justify the score given.

Bradypodion thamnobates would be considered to have a rapid life history. Females reach sexual maturity after about 1 year and probably produce their first clutch of live babies 3 to 6 months thereafter. While most Bradypodion have aseasonal breeding as they are in temperate climates, this species is likely to only reproduce once per year in the summer months given the much colder climate in its range. The species has been commonly observed in a state of torpor throughout the winter. Although probably producing only one clutch per year, the clutch sizes are commonly between 10-15 babies and are produced annually. Thus, a Life History score of 1 is given.

Section Six: Illegal trade and IUCN Status

Please provide an explanation with appropriate references to justify the score given.

There is evidence of illegal trade through private groups such as WhatsApp, Facebook and similar platforms. Chameleons for sale are not typically advertised through easily accessible web portals. Thus, this suggests that the trade is primarily underground (cautious and 'word of mouth') and therefore likely to be illegal in origin. Observers on the private groups report that trade is fairly common with some traders even claiming there are necessary permits. Queries to the provincial authorities indicate however, the trade is occurring without their knowledge (i.e., therefore no permits). Most traders also claim their exported individuals are 'captive bred' but provincial authorities apparently do not have knowledge of legitimate captive breeding facilities in most cases. Captive breeders from the province of origin also have attempted to export *B. thamnobates* through applying for CITES from other provinces.

The legal trade under CITES has been essentially limited to live exports of adults for pet trade and is not in high volumes (UNEP-WCMC 2023). Since 2009, approximately 850 live individuals have been traded through CITES. Surprisingly, most of this trade (62%) **originates** in Germany and Netherlands, outside the only range state (South Africa), and the source is indicated as *captive bred*. Paradoxically, there have been no exports from South Africa to the Netherlands and there has been only one export of 12 live individuals from South Africa ('captive bred') to Germany in 2014. Despite that, hundreds of individuals have been traded as captive bred under CITES with no legal source between 2009-2014 and only one set of 12 individuals between 2014 and present. Note that CITES trade prior to 2014 exists (from 'captive bred' - Germany), despite there being no legal exports prior to 2014 from the only range state. The original supply to the "captive bred" sources in Europe therefore consists, at least in part, of illegal trade. In addition, the popularity of this species and the level of what appears to be illegal trade on private groups suggest that there could be other, undeclared trade.

The level of removals from the wild is not quantified and would be difficult to do so given the various potential hidden sources and underground activities. That the species is severely fragmented with isolated small populations, unregulated trade could be detrimental and cause local extinctions. The species is assessed as Endangered by IUCN (Tolley 2022) with population that is severely fragmented and an ongoing decline it the quality and extent of habitat.

Due to the possibility of underground trade causing declines and the IUCN status as EN, a score of 1 is given.

Section Seven: Conclusion, course of action, and determination on exports

Please provide an overall conclusion on the perceived threat of trade to the species and details on whether further course of action will be taken to complete an NDF for the species.

This species is considered EN due to habitat loss and population fragmentation, and circumstantial evidence points to unquantified removals from the wild appear that appear to be occurring outside of the CITES convention. Much of the trade (legal and illegal) appears to be The legal trade under CITES is relatively low and is perhaps not at the level that would cause population declines particularly as the species has a fast life history and could recover. In contrast, however, given the population fragmentation, heavy removals from one sub-population could cause a local extinction and the species is unlikely to re-colonise quickly, as it has poor dispersal ability over unsuitable habitat. Overall, the levels of legal trade are probably not detrimental, but the levels of illegal trade may be. The evaluation score in total is 6.

Section Eight: Literature Cited

Please provide references to all the reports and literature cited in this evaluation.

UNEP-WCMC. 2023. CITES Trade Database. https://trade.cites.org/. (Accessed: 7 May 2023).

Tolley, K.A. 2022. *Bradypodion thamnobates*. The IUCN Red List of Threatened Species 2022: e.T3017A197397461. https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T3017A197397461.en. Accessed on 05 May 2023.

7.3. NDF for *Chameleo senegalensis* (CITES II)

Species name	*Chameleo senegalensis* (CITES II)
Range state name	Ghana
Report compiled by	Gerald Benyr
Date compiled	16/4/2023

Section One: Summary

Please provide a short overview (1-2 paragraphs) of the trade in this species in the country of interest.

In 2016 the SC recommended to suspend trade in *Chamaeleo senegalensis* from Ghana until that country demonstrates compliance with Article IV, paragraphs 2 (a) and 3, for this species, and provides full information to the Secretariat regarding compliance with the recommendations of the Animals Committee (SC66 Doc. 31.1).

Section Two: Simple Evaluation score

Please score each attribute listed within the table below and sum these to provide a total.

	Number of points			**Score**
Criteria	**1**	**2**	**3**	
Annual Harvest level	Low (<500)	Medium (500 - 5,000)	High (>5,000)	**2**
Area of distribution	Large (>20,000km^2)	Medium (2,500 – 20,000km^2)	Small (<2,500km^2)	**1**
Life-history	Fast	Medium	Slow	**1**
Illegal trade and IUCN status	If levels of illegal trade are known, they should be included under "Annual harvest level". If unknown, and suspected to be detrimental, give a **maximum score of 1 point. Similarly, if the status of the species is** listed as VU, EN or CR in the IUCN Red List Of Threatened Species, give a **maximum score of 1 point**			**0**

Section Three: Justification – Harvest level

Please provide an explanation with appropriate references to justify the score given.

According to the CTD, the latest year for which trade data are available is 2019 with a total number of 1580 exported specimens. In addition, the five-year average of the years 2015 to 2019 is far below 2000 specimens.

Section Four: Justification – Area of distribution

Please provide an explanation with appropriate references to justify the score given.

According to Trape et al. (2012), this species inhabits dry forest and dry Sudanese and Sudanese-Sahelian savannah. These biotopes cover most of the 238.000 km² of the country (see https://en.wikipedia.org/wiki/Ghana#Geography for the country area and vegetation maps in https://eros.usgs.gov/westafrica/node/147). In addition, the IUCN Red List confirms the countrywide occurrence besides the small humid lowland forest in the southwest (https://www.iucnredlist.org/species/176312/15898112#habitat-ecology).

Section Five: Justification – Life history

Please provide an explanation with appropriate references to justify the score given. Data for wild C. senegalensis are not available but probably similar to *C. gracilis* which has a clutch size of up to 45 eggs (Tilbury, 2010). At least in captivity, the *C. senegalensis* is reported to mature at 6 months, produce 2-3 clutches of 15-75 eggs each year, and survive between two and five years (http://blogs.thatpetplace.com/thatreptileblog/2014/07/01/chameleons-pets-breeding-senegal-chameleons/). As all members of the genus, *C. senegalensis* is a model R-strategist.
Section Six: Illegal trade and IUCN Status
Please provide an explanation with appropriate references to justify the score given. *Chamaeleo senegalensis* is classified as Least Concern by the IUCN Red List (https://www.iucnredlist.org/species/176312/15898112#assessment-information). According to the IUCN Red List, "this species is of value to the pet trade industry (UNEP-WCMC 2010) and is also used as medicine and sold in alternative markets (M.-O. Rödel pers. comm.). To date, there are no known or observed effects of harvesting on natural populations. Although completely harmless, chameleons are much feared by local people in parts of West Africa (Trape et al. 2012), and there may therefore be some degree of persecution." No specific data about illegal trade are available but according to the IUCN assessment, the sum of legal and illegal trade seems to be not detrimental.
Section Seven: Conclusion, course of action, and determination on exports
Please provide an overall conclusion on the perceived threat of trade to the species and details on whether further course of action will be taken to complete an NDF for the species. This species is considered EN due to habitat loss and population fragmentation, and circumstantial evidence points to unquantified removals from the wild appear that appear to be occurring outside of the CITES convention. Much of the trade (legal and illegal) appears to be The legal trade under CITES is relatively low and is perhaps not at the level that would cause population declines particularly as the species has a fast life history and could recover. In contrast, however, given the population fragmentation, heavy removals from one sub-population could cause a local extinction and the species is unlikely to re-colonise quickly, as it has poor dispersal ability over unsuitable habitat. Overall, the levels of legal trade are probably not detrimental, but the levels of illegal trade may be. The evaluation score in total is 6.
Section Eight: Literature Cited
Please provide references to all the reports and literature cited in this evaluation. Tilbury, C. R. (2010). Chameleons of Africa—an Atlas. Including the Chameleons of Europe, the Middle East and Asia. Edition Chimaira, Frankfurt am Main. Trape, J.-F., Trape, S. and Chirio, L. 2012. Lézards, crocodiles et tortues d'Afrique occidentale et du Sahara. IRD Editions, Marseille.

7.4. NDF for *Corallus caninus*

Species name	Emerald Tree Boa – *Corallus caninus*
Range state name	Guyana
Report compiled by	D. Natusch
Date compiled	2017
Section One: Summary	

Please provide a short overview (1-2 paragraphs) of the trade in this species in the country of interest.

The emerald tree boa *Corallus caninus* is harvested from the wild in Guyana and is exported for the pet trade. The species is considered common in the country (Henderson, 2015) and is harvested from throughout Guyana with a mean of 553 individuals exported each year (years 2006-2015; range = 406 – 825). Guyana has imposed a strict harvest quota of 880 specimens per year, except for 2014 when the quota was raised to 1,371 specimens.

Section Two: Simple Evaluation score

Please score each attribute listed within the table below and sum these to provide a total.

	Number of points			**Score**
Criteria	**1**	**2**	**3**	
Annual Harvest level	Low (<500)	Medium (500 - 5,000)	High (>5,000)	**2**
Area of distribution	Large (>20,000km^2)	Medium (2,500 – 20,000km^2)	Small (<2,500km^2)	**1**
Life-history	Fast	Medium	Slow	**1**
Illegal trade and IUCN status	If levels of illegal trade are known, they should be included under "Annual harvest level". If unknown, and suspected to be detrimental, give a **maximum score of 1 point. Similarly, if the status of the species is** listed as VU, EN or CR in the IUCN Red List Of Threatened Species, give a **maximum score of 1 point**			**0**

Section Three: Justification – Harvest level

Please provide an explanation with appropriate references to justify the score given.

A harvest quota of 880 individuals is allowed each year. However, actual harvests and exports are approximately half of this figure. This level of offtake is considered to be low to medium, and scored as medium as a precautionary measure.

Section Four: Justification – Area of distribution

Please provide an explanation with appropriate references to justify the score given.

Guyana's land area is roughly 215,000 km^2. *Corallus caninus* is known to occupy primary and secondary rainforest (Henderson, 2015). Although altitudinal records are scarce for Guyana, this species has been located up to 1,200 m above sea level in other parts of its range (Henderson 2015). Of Guyana's land area, approximately 100,000 km^2 is intact virgin lowland rainforest – the primary habitat of *C. caninus* (GLSC 2013; Henderson 2015).

Moreover, marsh/swamp forest and montane forest cover 19,000 and 43,000 km^2, respectively (GLSC, 2013). Although *C. caninus* has been recorded, from these habitat types (Henderson, 2015), they are not primary habitat and hence densities at these sites should be assumed lower than other habitat types.

Based on this information, the area of occupancy for *C. caninus* in Guyana is large.

Section Five: Justification – Life history
Please provide an explanation with appropriate references to justify the score given. *Corallus caninus* is a livebearer with a relatively high reproductive output of 6 – 15 young per litter (Henderson, 2015). It is unknown how often this species reproduces, or how rapidly it reaches sexual maturity, but closely related *C. grenadensis* have fast growth rates, reach maturity quickly, and reproduce frequently. For these reasons, we suggest that this species has a fast life-history.
Section Six: Illegal trade and IUCN Status
Please provide an explanation with appropriate references to justify the score given. There is no evidence of illegal trade in this species from Guyana. There is no incentive to trade illegally and demand is low (quotas have never been realised). More important threatening processes such as habitat loss do not impact this species, because Guyana has lost no forest cover since 2005 (FAO, 2010). This species is listed as Least Concern on the IUCN Red List.
Section Seven: Conclusion, course of action, and determination on exports

The sum of scores for trade in *C. caninus* from Guyana is 4. Therefore, the CITES Scientific Authority of Guyana would not be required to complete a secondary evaluation for this species.

Traders of this species are audited annually and provide information on hunting locations and harvest trends, which have remained stable over the past decade. Other than monitoring the harvest itself and ensuring exporter compliance with national wildlife trade legislation, Guyana's CITES Scientific Authority does not undertake field monitoring for this species. Their justification for not doing so is as follows:

Densities of *C. caninus* in Guyana are unknown. However, a cursory Google search of densities for other snake species in other parts of world reveals densities between 100 and 137,400 individuals per km^2 (see Table 1 below for results of a limited Google search).

Table 1. Species of snakes for which density estimates are available (based on a cursory search or Google Scholar – i.e., not an exhaustive list). **Species either closely related to *C. caninus* or which exhibit comparable ecological traits.

Species	Density (individuals per km^2)	Source
Agkistrodon shedaoensis	22,000	Huang (1984)
Bitis schneideri	140 - 2230	Maritz and Alexander (2012)
Boiga irregularis	3,500-11,900	Rodda et al. (1992).
Carphophis vermis	11,900	Fitch (1999)
**Corallus grenadensis*	1900 – 2,200	Henderson (2015)
Diadophis punctatus	92,300 – 137,400	Fitch (1999)
Epicrates monensis	10,000	Tolson (1988)
**Morelia viridis*	400-500	Wilson and Heinsohn (2007)
**Morelia viridis*	200-540	Natusch and Natusch (2011)
Natrix tessellata	5,000	Ajtic et al. (2013)
Nerodia erythrogaster	100 – 1,430	Lacki et al. (1994)
Nerodia sipedon	2,400 – 3,340	Brown and Weatherhead (1999)
Notechis scutatus	2,000	Bonnet et al. (2004)
Opheodrys aestivus	10,000 – 80,000	Plummer (1997)
Oxybelis aeneus	280 - 350	Henderson (1974)
Thamnophis sirtalis	960	Lind et al. (2005)
Vipera berus	150 – 1,230	Lindell and Forsman (1996)

Importantly, densities of green pythons (*Morelia viridis*) – a species displaying remarkable morphological and ecological convergence with *C. caninus* – range between 200 and 540 individuals per km^2 (Wilson and Heinsohn, 2007; Natusch and Natusch, 2011). Moreover, the closely related rainforest species *Corallus*

grenadensis reaches densities between 1,900 and 2,200 per km^2 (Henderson, 2015). Even in relatively unproductive temperate zones, densities of snakes are typically > 100 individuals per km^2. Density estimates for tropical snakes are likely to be much greater, owing to the increased productivity of tropical habitats.

Therefore, even if we take a conservative approach and assume densities of *C. caninus* in the most suitable habitat in Guyana (lowland forest only, not swamp/marsh or montane forest) are 10-fold lower than the lowest density estimates reported for any snake population around the world, then the population of this species in Guyana will still be more than one million individuals.

Thus, Guyana's quota of 880 individuals each year would represent only 0.09% of the national population. Guyana's increased quota of 1,371 individuals would represent only 0.14% of the national population. Offtake levels would only reach 1% of the estimate minimum population should they increase to 10,000 specimens per year. Because the true density of *C. caninus* in Guyana is likely to be considerably higher than the estimate used for representative purposes herein, and because we excluded other habitats in which *C. caninus* is known to occur for the sake of this analysis, the real percentage of the population harvested annually is likely to be much smaller.

Because Guyana's quota represents such a trivial level of offtake, the CITES Scientific Authority does not expend precious resources attempting to monitor wild populations of this species. Based on the rationale described above, both Guyana's CITES Management and Scientific Authorities are satisfied that current quotas are set at levels well below the point at which exports might be considered detrimental to the survival of the species in the wild.

Section Eight: Literature Cited

Please provide references to all the reports and literature cited in this evaluation.

Ajtić, R., Tomović, Lj., Sterijovski, B., Crnobrnja-Isalović, J., Đorđević, S., Đurakić, M., Golubović, A.,Simović, A., Arsovski, D., Anđelković, M., Krstić, M., Šukalo, G., Gvozdenović, S., Aïdam, A., Micheli, C.L., Ballouard, J-M. & Bonnet, X. (2013) Unexpected life history traits in a very dense population of Dice snakes. A Journal of Comparative Zoology. 252:350–358.

Bonnet, X., Pearson, D., Ladyman, M., Lourdais, O. and Bradshaw, D. (2002), 'Heaven' for serpents? A mark–recapture study of tiger snakes (*Notechis scutatus*) on Carnac Island, Western Australia. Austral Ecology, 27: 442–450

Brown, G. P., and P. J. Weatherhead. (1999). Demography and sexual size dimorphism in northern water snakes, *Nerodia sipedon*. Canadian Journal of Zoology 77:1358–1366.

Fitch, H.S. 1999. A Kansas Snake Community: Composition and Changes Over 50 Years. Krieger Publishing Company, Malabar, Florida, USA.

GLSC - Guyana Lands and Surveys Commission (2013) Guyana National Land Use Plan. Government of Guyana Ministry of Natural Resources and Environment.

Henderson R.W. (2015). Natural history of Neotropical treeboas. Edition Chimaira, Frankfurt.

Huang, M. 1984. An estimate of the population of *Agkistrodon shedaoensis* on Shedao Island. Acta Herpetologica since 3:17-22.

Lacki, Michael J., et al. (1994). Application of Line Transects for Estimating Population Density of the Endangered Copperbelly Water Snake in Southern Indiana. *Journal of Herpetology*, 28:241–245.

Lind, A Hartwell H. Welsh, Jr., and David A. Tallmon. (2005). Garter snake population dynamics from a 16-year study: considerations for ecological monitoring. Ecological Applications, 15: 294–303

Lindell, L. E., and A. Forsman. (1996). Density effects and snake predation: prey limitation and reduced growth rate of adders at high density of conspecifics. Canadian Journal of Zoology 74:1000–1007.

Maritz B. and Alexander, G. (2012). Population density and survival estimates of the African viperid, *Bitis schneideri*. Herpetologica. 68:195-202.

Natusch, D. J. D., and D. F. S. Natusch. 2011. Distribution, abundance and demography of the Green Python (*Morelia viridis*) in Cape York Peninsula, Australia. Australian Journal of Zoology 53:145–155.

Plummer, M. V. (1997). Population ecology of Green Snakes (*Opheodrys aestivus*) revisited. Herpetological Monographs 11:102–123.

Wilson, D., and Heinsohn, R. (2007). Geographic range, population structure and conservation status of the green python (*Morelia viridis*), a popular snake in the captive pet trade. Australian Journal of Zoology 55:147–154.

7.5. NDF for *Ctenosaura similis*

Species name	*Ctenosaura similis*
Range state name	Nicaragua
Report compiled by	Mona van Schingen-Khan

Date compiled	11.04.23

Section One: Summary

Please provide a short overview (1-2 paragraphs) of the trade in this species in the country of interest.

The species mainly harvested for national use. The species was only listed in CITES in 2019 under a family listing. Exports of the species from Nicaragua since then only comprised specimens declared as of captive-bred origin and were about around 1000-3000 specimens annually in 2020 and 2021 (importer reported vs. exporter reported). The level of breeding stock collected from the wild to supply breeding facilities is unclear.

Section Two: Simple Evaluation score

Please score each attribute listed within the table below and sum these to provide a total.

	Number of points			**Score**
Criteria	**1**	**2**	**3**	
Annual Harvest level	Low (<500)	Medium (500 - 5,000)	High (>5,000)	**1**
Area of distribution	Large (>20,000km^2)	Medium (2,500 – 20,000km^2)	Small (<2,500km^2)	**1**
Life-history	Fast	Medium	Slow	**1-2**
Illegal trade and IUCN status	If levels of illegal trade are known, they should be included under "Annual harvest level". If unknown, and suspected to be detrimental, give a **maximum score of 1 point. Similarly, if the status of the species is** listed as VU, EN or CR in the IUCN Red List Of Threatened Species, give a **maximum score of 1 point**			**1**

Section Three: Justification – Harvest level

Please provide an explanation with appropriate references to justify the score given.

Spiny-tailed iguanas are locally hunted mainly for human consumption (protein source) and persecuted as crop pests. However, local harvest levels cannot be quantified. Exports from Nicaragua are only in specimens declared as captive-bred and number around 1000-3000 specimens (importer reported vs. exporter reported, CITES Trade Database). If this source code is correct, the potential offtake of specimens serving as parental stock would be negligible considering the high number of offspring of the species. Therefore, the overall harvest level may be considered "low" in Nicaragua.

Section Four: Justification – Area of distribution

Please provide an explanation with appropriate references to justify the score given.

The species has a wide distribution range occurring throughout the country. Typical habitat are tropical dry forests, savannas, sandy beaches as well as boulders and ruins. Animals can adapt to human modified landscape and inhabit areas heavily frequented by tourists. Locally, the species may be perceived as crop pest. *C. similis* is introduced in some areas of the USA and may negatively affect the national fauna. Due to the high adaptability to modified habitats and vast distribution range, the AOO is estimated "large".

Section Five: Justification – Life history

Please provide an explanation with appropriate references to justify the score given.

Sexual maturity can be reached at the age of 14 months in species of the genus (Kelly, 2012). A dissection of a one-year-old *C. similis* showed gonad activity (Van Devender, 1982). *C. similis* lays clutches of 12-88 eggs. Communal nesting has been reported. (Langner et al. 2022) The life history can overall be considered "fast".

Section Six: Illegal trade and IUCN Status

Please provide an explanation with appropriate references to justify the score given.

The species is assessed **Least Concern** with a stable population trend (Pasachnik 2015).

There are no reports on illegal trade in the species that can be assumed detrimental to the species.

Therefore, a point of "0" will be given.

Section Seven: Conclusion, course of action, and determination on exports

Please provide an overall conclusion on the perceived threat of trade to the species and details on whether further course of action will be taken to complete an NDF for the species.

The species is widely distributed and considered Least Concern with a stable population trend. The species is mainly harvested for local use. *C. similis* is a generalist species, has a fast life history and may certainly sustain some offtake. Current international trade (focusing on captive-bred animals) on respective populations in Nicaragua is not considered to negatively impact wild populations.

Section Eight: Literature Cited

Please provide references to all the reports and literature cited in this evaluation.

Kelly, P. (2012): Spiny Tailed Iguana Care – Sheet Reptiles. Magazine August 7, 2012

Langner, C., Pfau, B., Bernardes, M., Gerlach, U., Hulbert, F., van Schingen-Khan, M., Schepp, U., Arranz, C., Riedling, M. & A. Kwet (2022): Evaluation of the Captive Breeding Potential of Selected Amphibian and Reptile Taxa Included in Appendices I and II at CITES CoP18. - Bundesamt für Naturschutz, BfN-Skripten 627.

Pasachnik, S. 2015. *Ctenosaura similis*. *The IUCN Red List of Threatened Species* 2015: e.T174480A73611567.

Van Devender, R.W. (1982): Growth and ecology of spiny—tailed and green Iguanas in Costa Rica, with comments on the evolution of herbivory and large bodysize. – I: Burghadt, G.M. & A.S. Rand (Hrsg.): Iguanas of the World – Park Ridge, New Jersey (Noyes Publ.): 162–163.

7.6. NDF for *Malaclemys terrapin*

Species name	Diamondback Terrapin (*Malaclemys terrapin*)
Range state name	USA
Report compiled by	TEL & PPvD
Date compiled	4/28/23
Section One: Summary	

Please provide a short overview (1-2 paragraphs) of the trade in this species in the country of interest.

Diamondback Terrapin (DBT) was put on Appendix II at Cop16 in 2013.

A large breeder has several outdoor ponds with a mix of Diamondback Terrapin (DBT) subspecies. He can produce about 2500-3000 captive bred hatchling in a season. However, in one specific year his output of hatchlings suddenly jumped to 14,600 DBT. This raised a red flag. It turned out that that he had purchased 3500 DBT legally acquired wild mostly adult females (mostly gravid) from another State that allowed harvest. This NDF will examine the 3500 wild caught DBT.

Section Two: Simple Evaluation score

Please score each attribute listed within the table below and sum these to provide a total.

	Number of points			**Score**
Criteria	**1**	**2**	**3**	
Annual Harvest level	Low (<500)	Medium (500 - 5,000)	High (>5,000)	**2**
Area of distribution	Large (>20,000km^2)	Medium (2,500 – 20,000km^2)	Small (<2,500km^2)	**3**
Life-history	Fast	Medium	Slow	**3**
Illegal trade and IUCN status	If levels of illegal trade are known, they should be included under "Annual harvest level". If unknown, and suspected to be detrimental, give a **maximum score of 1 point. Similarly, if the status of the species is** listed as VU, EN or CR in the IUCN Red List Of Threatened Species, give a **maximum score of 1 point**			**1**

Section Three: Justification – Harvest level

Please provide an explanation with appropriate references to justify the score given.

Breeder purchased 3500 DBT legally acquired wild mostly adult females (mostly gravid) from another State that allowed harvest. Between Nov & Feb harvested by hand. This would give us an annual harvest rate value of 2.

Section Four: Justification – Area of distribution

Please provide an explanation with appropriate references to justify the score given.

Habitat destruction poses a serious and ongoing threat to *Malaclemys terrapin* populations. The range of *Malaclemys terrapin* is coincident with dense areas of human population. Coastal development, particularly salt marsh draining, increased use of coastal waterways for commercial and recreational purposes, and loss of sand dunes, an important habitat for nesting, contribute to the loss and degradation of this species' habitat. This species is a habitat specialist to tidal marshlands (brackish waters).

State coast line is 227 km out of a total range 1360 km (for this subspecies). The DBT live in saltmarshes in a ½ km wide band along the coast. Therefore, the entire area of suitable habitat in our target State is 114 km^2. Although not know what percentage the turtles occupy, we know it is less than 114 km^2. Therefore, we assign an area of occupancy of 3.

Section Five: Justification – Life history

Please provide an explanation with appropriate references to justify the score given.

Known population dynamics research has demonstrated that this is a slow reproducing and recovering species: Age at maturity at about 4-13 years, annual reproductive output 4-23 eggs/female (mean for NJ 9.7 eggs/clutch with 2-3 clutches/year), longevity potentially over 50 years, generation time estimated 15 years. Low recruitment due to high nest predation, juvenile and adult male mortality in crab pots and high adult female mortality from vehicle collisions and crab pots in southern populations are cause for alarm because population models suggest a stable population requires both modest recruitment and, most importantly, high adult survival

We therefore assign this species clearly to the 'Slow' category: 3 points.

Section Six: Illegal trade and IUCN Status

Please provide an explanation with appropriate references to justify the score given.

DBT have been seized from illegal international shipments in modest quantities (at the order of a dozen per shipment at most). Known to have been illegally harvested by fishermen. One point.

Section Seven: Conclusion, course of action, and determination on exports

Please provide an overall conclusion on the perceived threat of trade to the species and details on whether further course of action will be taken to complete an NDF for the species.

Our evaluation yields a final score of 9, therefore a thorough NDF is required.

Evaluating Non-Detriment

Primary Evaluation score lower than five (5) = trade is non-detrimental (**record the score and justification in the *Primary Evaluation* worksheet provided (in Annex B). This can be used for Step 4 of the Non-Detriment Finding**).

If the *Primary Evaluation* score is equal to or greater than five (5) then the non-detriment requirement cannot be satisfied, warranting additional information based on other indices to evaluate detriment. **A *Secondary Evaluation* should be undertaken**.

Turns out that DBT can be harvested in the winter by hand because females hibernate in communal underwater hibernacula of up to 200 animals.

Section Eight: Literature Cited

Please provide references to all the reports and literature cited in this evaluation.

CoP16 Prop31Inclusion of *Malaclemys terrapin* in Appendix II. https://cites.org/sites/default/files/eng/cop/16/prop/E-CoP16-Prop-31.pdf

IUCN Red List assessment https://www.iucnredlist.org/species/12695/507698

Turtles of the United States and Canada (Ernst & Lovich 2009)

TTWG Checklist and Atlas v9 2021

Russ Burke pers. Com. – area of occupancy info

Guidance document for NDFs for Tortoises and FW Turtles

7.7. NDF for *Kinixys homeana*

Species name	*Kinixys homeana*
Range state name	Ghana
Report compiled by	Kwame kinixys
Date compiled	01 May 2023

Section One: Summary

Please provide a short overview (1-2 paragraphs) of the trade in this species in the country of interest.

Home's hingeback tortoise (*Kinixys homeana*) is widely distributed across West and Central Africa. In Ghana, it can be found throughout the forested south and up into the Togo Highlands. Since 2010, Ghana has exported a total of 22,772 live individuals – not all of which originated in the Ghanaian territory. This species is also harvested and consumed as wildmeat or kept as pets in Ghana, as throughout most of its range, at unknown levels.

Section Two: Simple Evaluation score

Please score each attribute listed within the table below and sum these to provide a total.

	Number of points			**Score**
Criteria	**1**	**2**	**3**	
Annual Harvest level	Low (<500)	Medium (500 - 5,000)	High (>5,000)	**1**
Area of distribution	Large (>20,000km^2)	Medium (2,500 – 20,000km^2)	Small (<2,500km^2)	**1**
Life-history	Fast	Medium	Slow	**2**
Illegal trade and IUCN status	If levels of illegal trade are known, they should be included under "Annual harvest level". If unknown, and suspected to be detrimental, give a **maximum score of 1 point. Similarly, if the status of the species is** listed as VU, EN or CR in the IUCN Red List Of Threatened Species, give a **maximum score of 1 point**			**1**

Section Three: Justification – Harvest level

Please provide an explanation with appropriate references to justify the score given.

Since 2000, a total of 22,772 live specimens of this species have been traded from Ghana, which is one of the major exporting countries, ranging from 0 to 3,395 individuals per year and averaging 1,751 annually (CITES Trade Database). We classified this as Low because of the fairly large annual heterogeneity and because numbers in recent years have been less than 600 individuals annually. Most specimens are of Wild origin, though several producers in Ghana report ranching this species or even captive breeding – the extent to which this is true is not verified. These figures do not include the extensive offtake for domestic consumption as wildmeat or the domestic pet trade. According to the IUCN Red List Assessment, this species is harvested and traded from less than 10% of its AOO, at least for international trade.

Section Four: Justification – Area of distribution

Please provide an explanation with appropriate references to justify the score given. This species is dependent on humid forest and forest matrix habitats and it is estimated that the AOO is 50% or less of the EOO (Red List Assessment). In Ghana, the area formerly covered by tropical forest covers approx. 75,000 km^2 – even if the AOO was only 26% of that, it still surpasses the criteria for large AOO in Ghana alone.
Section Five: Justification – Life history
Please provide an explanation with appropriate references to justify the score given. The IUCN TFTSG considers this species' generation time to be 15 years, though in captivity individuals have bred at closer to 8 years. Clutch sizes range from 2-4 eggs, and females can lay 1-2 times per year in captivity. Though the age to first reproduction is slow, the number of eggs produced and the frequency of reproduction suggest a "Medium" life history.
Section Six: Illegal trade and IUCN Status
Please provide an explanation with appropriate references to justify the score given. This species is not protected in Ghana and there is very little understanding of offtake for wildmeat. However, previous research in Cameroon suggests that up to 5% of the wild population is harvested annually for wildmeat, and we suspect that the proportion is higher in Ghana. As a result, we gave 1 point.
Section Seven: Conclusion, course of action, and determination on exports
Please provide an overall conclusion on the perceived threat of trade to the species and details on whether further course of action will be taken to complete an NDF for the species. The total score of 5 in the preliminary evaluation suggests that the species may be susceptible to threat from trade and that a secondary evaluation should be undertaken to determine whether trade is, in fact, detrimental. Given the volume of offtake for domestic bushmeat, detriment related to international trade will be dependent on volume of trade.
Section Eight: Literature Cited
Please provide references to all the reports and literature cited in this evaluation.

7.8. NDF for *Osteolaemus osborni*

Species name	*Osteolaemus osborni*
Range state name	Republic of Congo
Report compiled by	Jean Claude le Croc
Date compiled	01 May 2023
Section One: Summary	

Please provide a short overview (1-2 paragraphs) of the trade in this species in the country of interest.

The Congo dwarf crocodile occurs over vast areas of habitat throughout the Congo Basin. In the Congo, as is the case for all other range states, this species is mainly harvested for national consumption and Congolese consider it an important protein and economic wildmeat resource. There are no population monitoring programs, which would be challenging to implement because of habitat use, distribution and accessibility of habitats, and safety concerns (e.g., elephants in forest at night). The current trade is largely illegal, but that has more to do with the regulations on trade of Partially Protected species in Congo and the barriers to meeting those requirements for largely rural human communities. There is virtually no legal international trade in this species, and the illegal international trade is very minor (< 2%) compared to domestic trade.

Section Two: Simple Evaluation score

Please score each attribute listed within the table below and sum these to provide a total.

	Number of points			**Score**
Criteria	**1**	**2**	**3**	
Annual Harvest level	Low (<500)	Medium (500 - 5,000)	High (>5,000)	**3**
Area of distribution	Large (>20,000km^2)	Medium (2,500 – 20,000km^2)	Small (<2,500km^2)	**1**
Life-history	Fast	Medium	Slow	**2**
Illegal trade and IUCN status	If levels of illegal trade are known, they should be included under "Annual harvest level". If unknown, and suspected to be detrimental, give a **maximum score of 1 point. Similarly, if the status of the species is** listed as VU, EN or CR in the IUCN Red List Of Threatened Species, give a **maximum score of 1 point**			**0**

Section Three: Justification – Harvest level

Please provide an explanation with appropriate references to justify the score given.

Since 2000, a total of 1,311 specimens (not including scientific specimens) of this species have been traded – only 2 of which were from Republic of Congo. However, historic and recent research suggests that 10,000 – 100,000 individuals are harvested annually as bushmeat from the Lac Tele Community Reserve area alone in the north of the country. These same bodies of research also suggests that neither this level of offtake nor the prices commanded by this species at bushmeat markets has changed over this time period – suggesting the trade may be sustainable in spite of its apparent significant volume.

Section Four: Justification – Area of distribution

Please provide an explanation with appropriate references to justify the score given.

This species is widespread across the country, occurring in all suitable habitats from which it has not been locally extirpated as a result of the trade in bushmeat. We conservatively estimate that its AOO is 75% of the northern half of the country, where basically all habitats are suitable, equalling approximately 104,000 km^2, and that it also occurs in at least 25% of the remaining part of the country. Even if considerably more conservative estimates are take, the AOO far surpasses the minimum 20,000 km^2 threshold for large AOO.

Section Five: Justification – Life history

Please provide an explanation with appropriate references to justify the score given. The IUCN CSG considers this species' generation time to be 15 years, though in captivity individuals have bred at closer to 8 years. Average clutch sizes are 15 eggs. There is no data on reproductive frequency of wild females, but informal observations from the field of nest mound use frequency and from captivity suggest we can conservatively estimate biannual nesting. Though the age to first reproduction is slow, the number of eggs produced and the frequency of reproduction suggest a "Medium" life history.
Section Six: Illegal trade and IUCN Status
Please provide an explanation with appropriate references to justify the score given. This species is listed as Partially Protected under Congolese legislation, and thus can be legally harvested and traded under certain conditions. Unfortunately, virtually no traded specimens are done so under these conditions and so currently all trade is in one respect or another "illegal." However, there is a reasonable amount of information on the status and magnitude of that illegal trade, which we consider under the "harvest level" category, and this trade is not considered detrimental and so we do not add additional point(s) here.
Section Seven: Conclusion, course of action, and determination on exports
Please provide an overall conclusion on the perceived threat of trade to the species and details on whether further course of action will be taken to complete an NDF for the species. The total score of 6 in the preliminary evaluation suggests that the species may be susceptible to threat from trade and that a secondary evaluation should be undertaken to determine whether trade is, in fact, detrimental. Given the volume of offtake for domestic bushmeat, detriment related to international trade will be dependent on volume of trade.
Section Eight: Literature Cited
Please provide references to all the reports and literature cited in this evaluation.

7.9. NDF for *Phrynosoma hernandesi*

Species name	*Phrynosoma hernandesi*
Range state name	USA
Report compiled by	Mona van Schingen-Khan
Date compiled	04.04.23
Section One: Summary	
Please provide a short overview (1-2 paragraphs) of the trade in this species in the country of interest. International trade in the species seems to very low. As the species was only recently listed in App. II, comprehensive trade data is lacking. However, according to the LEMIS database only 11 wild specimens have been exported from the US between 2006 and 2020.	
Section Two: Simple Evaluation score	

Please score each attribute listed within the table below and sum these to provide a total.

	Number of points			Score
Criteria	**1**	**2**	**3**	
Annual Harvest level	Low (<500)	Medium (500 - 5,000)	High (>5,000)	**1**
Area of distribution	Large (>20,000km^2)	Medium (2,500 – 20,000km^2)	Small (<2,500km^2)	**1**
Life-history	Fast	Medium	Slow	**1-2**
Illegal trade and IUCN status	If levels of illegal trade are known, they should be included under "Annual harvest level". If unknown, and suspected to be detrimental, give a **maximum score of 1 point. Similarly, if the status of the species is** listed as VU, EN or CR in the IUCN Red List Of Threatened Species, give a **maximum score of 1 point**			**0**

Section Three: Justification – Harvest level

Please provide an explanation with appropriate references to justify the score given.

11 wild caught specimens have been exported from the US between 2006 and 2020 (LEMIS trade database). It seems that *P. hernandesi* is not harvested for other purposes than the pet trade. The species is only listed in CITES since February 2023, therefore no other trade data is available. The harvest volume is considered "low".

Section Four: Justification – Area of distribution

Please provide an explanation with appropriate references to justify the score given.

The species occurs in Canada, USA and Mexico with an estimated distribution range of 1,691,719.62 km². In the US, the species has a rather large distribution range. Habitats are diverse and vary from semi-arid plains, forest, grassland, shrubs to high mountains. The exact AOO in the US is unknown, but according to the large range and diverse habitats the AOO it can be considered "large" as well.

Section Five: Justification – Life history

Please provide an explanation with appropriate references to justify the score given.

P. hernandesi is viviparous. According to James et al. (2004), females reproduce annually, giving birth to 6-13 neonates. Males reach sexual maturity with about one year, females breed in their second year.

The life history can be assessed "fast" to "medium".

Section Six: Illegal trade and IUCN Status

Please provide an explanation with appropriate references to justify the score given.

The species is assessed **Least Concern** with a stable population trend.

There is no evidence for illegal trade in the species.

Therefore, a point of "0" will be given.

Section Seven: Conclusion, course of action, and determination on exports
Please provide an overall conclusion on the perceived threat of trade to the species and details on whether further course of action will be taken to complete an NDF for the species. Due to the vast distribution range, good conservation status and low harvest, international trade in the species is currently not perceived as a threat to the species.
Section Eight: Literature Cited
Please provide references to all the reports and literature cited in this evaluation. Hammerson, G.A. 2007. *Phrynosoma hernandesi*. *The IUCN Red List of Threatened Species* 2007: e.T64076A12741970. https://dx.doi.org/10.2305/IUCN.UK.2007.RLTS.T64076A12741970.en . Accessed on 12 April 2023. James, J.D., Alberta Conservation Association, Alberta & Alberta (2004). Status of the short-horned lizard (Phrynosoma hernandesi) in Alberta; Update 2004/. Alberta Sustainable Resource Development, Fish & Wildlife. U.S. Fish & Wildlife Service (USFWS). 2018. LEMIS database.

7.10. NDF for *Physignathus cocincinus*

Species name	*Physignathus cocincinus*
Range state name	Viet Nam
Report compiled by	Mona van Schingen-Khan
Date compiled	03.04.23
Section One: Summary	
Please provide a short overview (1-2 paragraphs) of the trade in this species in the country of interest. *P. cocincinus* is harvested for both, local consumption (food) as well as for the national and international pet trade in Viet Nam. At present there are no large-scale captive breeding facilities in Viet Nam. Therefore, specimens in trade are usually sourced from the wild. Trade into the EU and the US has been recorded in the past with about 70.000 specimens exported annually. Trade volumes into other countries are not known. The listing in CITES App. II came into force in Feb. 2023. Thus, global trade data is not available yet.	
Section Two: Simple Evaluation score	

Please score each attribute listed within the table below and sum these to provide a total.

	Number of points			Score
Criteria	**1**	**2**	**3**	
Annual Harvest level	Low (<500)	Medium (500 - 5,000)	High (>5,000)	**2-3**
Area of distribution	Large (>20,000km^2)	Medium (2,500 – 20,000km^2)	Small (<2,500km^2)	**2**
Life-history	Fast	Medium	Slow	**1**
Illegal trade and IUCN status	If levels of illegal trade are known, they should be included under "Annual harvest level". If unknown, and suspected to be detrimental, give a **maximum score of 1 point. Similarly, if the status of the species is** listed as VU, EN or CR in the IUCN Red List Of Threatened Species, give a **maximum score of 1 point**			**1**

Section Three: Justification – Harvest level

Please provide an explanation with appropriate references to justify the score given.

In the past, an average of about 70.000 specimens was exported from Viet Nam into the EU and the US annually. Data for US imports was only available until 2018. According to the CITES Trade Database, a mean of 6.700 live *P. cocincinus* were imported directly by the EU-27 and the United Kingdom of Great Britain and Northern Ireland annually in the period 2010-2019 as reported by importers. Nguyen et al. (2018a) argued that most individuals exported from Viet Nam probably originate from the wild, since there is no knowledge about any breeding facilities in Viet Nam being capable of producing such large quantities of water dragons for the pet trade.

Besides the international and domestic pet trade, harvest of water dragons for consumptive use (mainly food consumption) has been documented and identified as a significant threat to the species in Viet Nam in the past, but has not yet been quantified.

In case export levels will remain stable and the species is additionally harvest for domestic use, annual harvest level could be considered at least "medium" to "high". The circumstances may of course change after the listing, therefore the primary evaluation should be repeated according to "new" trade volumes.

Section Four: Justification – Area of distribution

Please provide an explanation with appropriate references to justify the score given.

In Viet Nam, the species is widely distributed and occurs in Lao Cai, Ha Giang, Cao Bang, Yen Bai, Bac Kan, Thai Nguyen, Lang Son, Vinh Phuc, Quang Ninh, Ninh Binh, Bac Giang, Hai Duong, Son La, Hoa Binh, Thanh Hoa – northern provinces, Nghe An, Ha Tinh, Quang Binh, Quang Tri, Thua Thien Hue, Da Nang, Quang Nam, Kon Tum, Gia Lai, Lam Dong – central provinces, Phu Yen, Binh Phuoc, Dong Nai and Kieng Giang – southern provinces (Dang et al. 2006; Gewiss et al. 2020; Nguyen et al. 2009). The semiaquatic species is associated with rocky streams in undisturbed evergreen lowland forests at elevations from 50 to 820 m a.s.l (Das 2010; Gewiss et al. 2020; Nguyen et al. 2018a; Ziegler 2002). Therefore, the actual area of occupancy (AOO) is assumed to be much smaller than the total extent of occurrence (EOO) (Nguyen et al. 2018b). First assessments of the population status of *P. cocincinus* in Viet Nam revealed that water dragons occur in low population densities, and population sizes were estimated to be overall very small, especially in disturbed populations (see Gewiss et a. 2020; Nguyen et al. 2018a). In China, an AOO of less than 500 km² is assumed (Stuart et al. 2019).

There is no estimate on the AOO of the species in Viet Nam. Viet Nam covers 331.690 km². Considering that the species is widely distributed, but only occurs at isolated sites along specific forested streams, the AOO may considered "medium". However, a more precise estimation is necessary.

Section Five: Justification – Life history

Please provide an explanation with appropriate references to justify the score given.

Water dragons are oviparous and can reach maturity in 6 to 12 months with a snout-vent-length (SVL) of about 150-170 mm (Werning 2010). In the wild, females regularly lay and bury about 5 – 16 eggs in sandy soil at the end of the dry season and the beginning of the rainy season (Das 2010; Ziegler 2002). In captivity, water dragons mate without specific induction and females can lay multiple clutches per year (Manthey & Schuster 1992; Werning 2010). Considering the fast reaching of maturity, the potential high frequency of reproduction and medium litter sizes, overall the life history can be considered "fast", 1 point will be given.

Section Six: Illegal trade and IUCN Status

Please provide an explanation with appropriate references to justify the score given.

The species is assessed **Vulnerable** with a decreasing population trend. Therefore, a point of "1" will be given.

There are reports on illegal trade in the species from Thailand before listing of the species. After the listing came into force in February 2023, there are no reports on illegal trade activities internationally.

Even though the species is nationally protected, harvest for domestic use may likely resume.

Section Seven: Conclusion, course of action, and determination on exports

Please provide an overall conclusion on the perceived threat of trade to the species and details on whether further course of action will be taken to complete an NDF for the species.

The species is assessed Vulnerable in Viet Nam and was recorded from isolated sites throughout the country. Due to the specific habitat requirements (associated to small forest streams) and low densities at unprotected sites, the species may be specifically vulnerable to high offtake rates. As the species has a generally fast life history, it may however recover from and sustain some offtake. The non-detriment requirement under current harvest levels cannot be satisfied. While the different scores were not always clear, a minimum of five points will be reached anyway.

However, a secondary evaluation should be undertaken and the implementation of management interventions (such as regional quotas/ size limits) should be considered in order to ensure trade is sustainable.

Section Eight: Literature Cited

Please provide references to all the reports and literature cited in this evaluation.

CITES Trade Database 2021. CITES Secretariat, Geneva, Switzerland. Compiled by UNEP-WCMC, Cambridge, UK. Available at: trade.cites.org. Accessed 24 August 2021.

Dang, P.H., Nguyen, T.Q., Nguyen, S.T., Nguyen, K.V. 2006. A photographic guide to mammals, reptiles and amphibians of Phu Quoc Island, Kien Giang Province, Vietnam, Ho Chi Minh City General Publishing House, Ho Chi Minh City, Vietnam.

Das, I. 2010. A Field Guide to the Reptiles of South-East Asia, New Holland Publishers, London, UK.

Gewiss, L.R., Ngo, H.N., van Schingen-Khan, M., Bernardes, M., Rauhaus, A., Pham, C.T., Nguyen, T.Q., Ziegler, T. 2020. Population assessment and impact of trade on the Asian Water Dragon (*Physignathus cocincinus* Cuvier, 1829) in Vietnam. Global Ecology and Conservation 23 e01193.

Manthey, U., Manthey, S. 1998. Amphibien und Reptilien von Laos – Ein Reisebericht Teil 1: Phou Khao Khouay NBCA (Februar 1998). Sauria.

Nguyen, S.V., Ho, C.T., Nguyen, T.Q. 2009. Herpetofauna of Vietnam, Chimaira, Frankfurt, HE, Germany.

Nguyen, T.Q., Ngo, H.N., Pham, C.T., Nguyen, V.H., Ngo, D.C., van Schingen, M., Ziegler, T. 2018. First population assessment of the Asian Water Dragon (*Physignathus cocincinus* Cuvier, 1829) in Thua Thien Hue Province, Vietnam. Nature Conserv. 26, 1–14.

Stuart, B., Sumontha, M., Cota, M., Panitvong, N., Nguyen, T.Q., Chan-Ard, T., Neang, T., Rao, D.-q. & Yang, J. 2019. *Physignathus cocincinus*. *The IUCN Red List of Threatened Species* 2019: e.T104677699A104677832. https://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T104677699A104677832.en . Accessed on 03 April 2023.

U.S. Fish & Wildlife Service (USFWS). 2018. LEMIS database.

Werning, H. 2010. Die Grüne Wasseragame, third ed. Natur und Tier – Verlag, Münster, NRW, Germany. 62 pp.

Ziegler, T. 2002. Die Amphibien und Reptilien eines Tieflandfeuchtwald-Schutzgebietes in Vietnam, Natur & Tier Verlag, Münster, NRW, Germany.

7.11.NDF for *Shinisaurus crocodilurus*

Species name	*Shinisaurus crocodilurus*
Range state name	Viet Nam
Report compiled by	Mona van Schingen-Khan
Date compiled	03.04.23

Section One: Summary

Please provide a short overview (1-2 paragraphs) of the trade in this species in the country of interest.

The subspecies *S. crocodilurus vietnamensis* has been only reported from isolated forest streams in northern Viet Nam so far (Ngo et al. 2020; van Schingen et al. 2016b). While the species is strictly protected in the country and no legal exports have been reported so far, Vietnamese Crocodile lizards are still sporadically being offered in third countries (Ngo et al. 2020; pers. obs.).

Section Two: Simple Evaluation score

Please score each attribute listed within the table below and sum these to provide a total.

	Number of points			Score
Criteria	**1**	**2**	**3**	
Annual Harvest level	Low (<500)	Medium (500 - 5,000)	High (>5,000)	**1**
Area of distribution	Large (>20,000km^2)	Medium (2,500 – 20,000km^2)	Small (<2,500km^2)	**3**
Life-history	Fast	Medium	Slow	**2**
Illegal trade and IUCN status	If levels of illegal trade are known, they should be included under "Annual harvest level". If unknown, and suspected to be detrimental, give a **maximum score of 1 point. Similarly, if the status of the species is** is listed as VU, EN or CR in the IUCN Red List Of Threatened Species, give a **maximum score of 1 point**			**1**

Section Three: Justification – Harvest level

Please provide an explanation with appropriate references to justify the score given.

There are currently no legal exports of the species from Viet Nam. However, still specimens from Viet Nam are sporadically being offered in EU markets (pers. obs. in 2023/ com.; Ngo et al. 2020). Therefore, it can be expected that there is still some illegal trade. In addition, the species is being harvested to small extent for local use, such as food. As the known population in Viet Nam has been estimated to not exceed 200 individuals (e.g. 2016a; Reinhardt et al. 2018), a harvest level of more than 2000 specimens per year is unlikely. Therefore, harvest is considered "low".

Section Four: Justification – Area of distribution

Please provide an explanation with appropriate references to justify the score given.

The species has a distribution range not exceeding 1.500 km² in Viet Nam (Nguyen et al. 2022). The area of occupancy is much smaller, as the species is associated to small, densely vegetated streams within that range (e.g., van Schingen et al. 2015a,b, 2016a). Only few streams are known to still harbour the species.

Section Five: Justification – Life history

Please provide an explanation with appropriate references to justify the score given.

The species usually reaches maturity with about 2-4 years (Zollweg 2013). In captivity, some individuals even reached maturity with less than 2 years, if fed very well (pers. obs.). Usually Crocodile lizards give birth once a year to 2-14 litter (Zollweg 2013). The species is ovoviviparous. Therefore, the time to maturity, litter size and frequency of reproduction can be considered "medium".

Section Six: Illegal trade and IUCN Status

Please provide an explanation with appropriate references to justify the score given.

The species is assessed **Endangered** with a decreasing population trend.

While, there are no legal exports, still specimens from Viet Nam are sporadically being offered in EU markets (pers. obs./ com.; Ngo et al. 2020). Therefore, it is possible that there is still some illegal harvest and trade in the species.

Section Seven: Conclusion, course of action, and determination on exports

Please provide an overall conclusion on the perceived threat of trade to the species and details on whether further course of action will be taken to complete an NDF for the species.

The species is assessed Endangered and is in Viet Nam only known from few isolated sites in the North of the country. Habitats are steadily shrinking due to mining activities, conversion of habitat into agricultural land and development for touristic purposes. Due to the specific habitat requirements (associated to small forest streams) and small population sizes the species is specifically vulnerable to harvesting. As the species is already at the brink of extinction, any international trade in wild specimens of the species could be considered detrimental. The non-detriment requirement cannot be satisfied for the species in Viet Nam. Measures to protect remaining habitats and to prevent poaching are urgently needed.

Section Eight: Literature Cited

Please provide references to all the reports and literature cited in this evaluation.

Ngo, H., Nguyen, T., Le, M., van Schingen-Khan, M., Nguyen, T.Q., Rauhaus, A., Vences, M., & Ziegler, T. (2020). Genetic screening of captive crocodile lizards (*Shinisaurus crocodilurus*) in Europe. *Der Zoologische Garten.* 88: 17-30.

Nguyen, T.Q., Hamilton, P. & Ziegler, T. 2022. *Shinisaurus crocodilurus* (amended version of 2014 assessment). *The IUCN Red List of Threatened Species* 2022: e.T57287221A217811129. https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T57287221A217811129.en . Accessed on 03 April 2023.

Reinhardt, T., van Schingen, M., Windisch, H. S., Nguyen, T. Q., Ziegler, T. & Fink, P. (2018): Monitoring the loss: Detection of the semi-aquatic crocodile lizard (*Shinisaurus crocodilurus*) in inaccessible habitats via environmental DNA. – Aquatic Conservation 29 (3): 353-360.

van Schingen-Khan, M., Barthel, L.M.F., Pham, D.T.K., Pham, C. T.P., Nguyen, T.Q., Ziegler, T., Bonkowski, M. (2022). Will climatic changes affect the Vietnamese crocodile lizard? Seasonal variation in microclimate and activity pattern of *Shinisaurus crocodilurus* vietnamensis. Amphibia-Reptilia, 43(2): 155–167.

van Schingen, M., Ha, Q.Q., Pham, C.T., H.Q., Le, T.Q., Nguyen, Q.T., Bonkowski, M. and Ziegler, T. (2016a). Discovery of a new crocodile lizard population in Vietnam: Population trends, future prognoses and identification of key habitats for conservation. *Revue Suisse de Zoologie*. 123(2): 241-251.

van Schingen, M., Le, M.D., Ngo, H.T., Pham, C.T., Ha, Q.Q., Nguyen, T.Q., Ziegler, T. (2016b). Is there more than one Crocodile Lizard? An Integrative Taxonomic Approach Reveals Vietnamese and Chinese *Shinisaurus crocodilurus* Represent Separate Conservation and Taxonomic Units. Der Zoologische Garten, 85(5): 240–260.

van Schingen, M., Pham, C.T., Thi, H.A., Nguyen, T.Q., Bernardes, M., Bonkowski, M., Ziegler, T. (2015a). First ecological assessment on the endangered Crocodile Lizard, *Shinisaurus crocodilurus*, Ahl, 1930 in Vietnam: Microhabitat characterization and habitat selection. Herpetological Conservation and Biology, 10(3): 948–958.

van Schingen, M., Schepp, U., Pham, C.T., Nguyen, T.Q. and Ziegler, T. (2015b). Last chance to see? Threats to and use of the Crocodile Lizard. *Traffic Bulletin*. 27: 19-26.

Zollweg, M., Kühne, H. 2013. Krokodilschwanzechsen - *Shinisaurus crocodilurus*. Natur und Tier – Verlag, Münster, Germany.

7.12.NDF for *Smaug mossambicus* (CITES II)

Species name	*Smaug mossambicus* (CITES II)
Range state name	Mozambique
Report compiled by	Gerald Benyr
Date compiled	23/4/2023

Section One: Summary

Please provide a short overview (1-2 paragraphs) of the trade in this species in the country of interest.

In 2012 the SC recommended to suspend trade in Smaug mossambicus from Mozambique until that country until that country demonstrates compliance with Article IV, paragraphs 2 (a) and 3, for this species, and provides full information to the Secretariat regarding compliance with the recommendations of the Animals Committee (SC62 Doc. 27.1 (Rev. 1)).

Section Two: Simple Evaluation score

Please score each attribute listed within the table below and sum these to provide a total.

	Number of points			Score
Criteria	**1**	**2**	**3**	
Annual Harvest level	Low (<500)	Medium (500 - 5,000)	High (>5,000)	**2**
Area of distribution	Large (>20,000km^2)	Medium (2,500 – 20,000km^2)	Small (<2,500km^2)	**2**
Life-history	Fast	Medium	Slow	**2**
Illegal trade and IUCN status	If levels of illegal trade are known, they should be included under "Annual harvest level". If unknown, and suspected to be detrimental, give a **maximum score of 1 point. Similarly, if the status of the species is** is listed as VU, EN or CR in the IUCN Red List Of Threatened Species, give a **maximum score of 1 point**			**0**

Section Three: Justification – Harvest level

Please provide an explanation with appropriate references to justify the score given.

According to the CTD, trade ended in 2012 with a volume of 1170 specimens. The average trade volume of the last five years was 994 specimens. The IUCN Red List reports an average of 600–700 individuals per year at the height of this trade.

Section Four: Justification – Area of distribution

Please provide an explanation with appropriate references to justify the score given.

The IUCN Red List reports: "the species has an extent of occurrence of nearly 40,000 km² _and its modelled distribution within this area covers 10,975 km² _and that it is "widespread and found across a number of different environments, suggesting it is not limited to a particular vegetation type or altitudinal range". Approximately a fifth of the range is in Mozambique.

Section Five: Justification – Life history

Please provide an explanation with appropriate references to justify the score given.

With approximately three years for reaching maturity, a clutch size of typically 3 to 5 offspring and an most likely in average biannual reproduction cycle (Krabbe-Paulduro & Paulduro 1989, Reptile Care Database http://www.reptile-care.de/species/Scincoidea/Cordylidae/Smaug-mossambicus.html), the species has medium life – _history parameters compared to the values given in figure 2 of the snake NDF guide.

Section Six: Illegal trade and IUCN Status

Please provide an explanation with appropriate references to justify the score given.

The IUCN Red List assessment of 2019 (Farooq, Conradie & Verburgt) categorizes the species as Least Concern with a stable population trend. It also reports that "the trade data also show there have been nearly 40 wild caught individuals (2008–2010) exported from South Africa, where this species does not occur" _but assume that instead native species might be have been trade. No other illegal trade or national use is reported and compared to the assumed legal trade, 40 specimens are a negligible number. Hence, no detrimental effect of illegal trade is assumed.

Section Seven: Conclusion, course of action, and determination on exports

Please provide an overall conclusion on the perceived threat of trade to the species and details on whether further course of action will be taken to complete an NDF for the species.

With a score of six the species-country combination requires a more detailed assessment.

Section Eight: Literature Cited

Please provide references to all the reports and literature cited in this evaluation.

Farooq, H., Conradie, W. & Verburgt, L. 2019. *Smaug mossambicus*. The IUCN Red List of Threatened Species 2019: e.T110167750A110167783. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T110167750A110167783.en. Accessed on 23 April 2023.

Krabbe-Paulduro, U. & E. Paulduro (1989). *Cordylus warreni* (Boulenger). Sauria (Supplement: Amph./Rept.-Kartei), 11 (4): 153–160. TGB, Berlin

7.13.NDF for *Apalone spinifera*

Species name	Spiny Softshell, *Apalone spinifera*
Range state name	USA
Report compiled by	PPvD &TEL
Date compiled	28 April 2023

Section One: Summary

Please provide a short overview (1-2 paragraphs) of the trade in this species in the country of interest.

The Spiny Softshell Turtle (*Apalone spinifera*)is a highly aquatic freshwater turtles that inhabits the Laurentian system of Canada, much of the United States of America, and the Rio Grande and tributaries in northern Mexico. The species has been introduced into the Colorado River system of the western USA.

Apalone spinifera was assessed as Least Concern in the IUCN Red List, last assessed in 2010.

Apalone spinifera was included by the USA in Appendix III in late 2016, and transferred to Appendix II at CoP19.

The subspecies *A. spinifera atra* is endemic to a small area of northern Mexico; it has been listed in Appendix I since 1975, and is not considered in this evaluation.

Reported annual export numbers are 375 in 2017, 1 in 2018, 236 in 2019, none in 2020, and 120 in 2021 [would be interesting to compare to LEMIS over same period; there are NO records of 'Apalone spp.' in the CITES Trade Database]

Section Two: Simple Evaluation score

Please score each attribute listed within the table below and sum these to provide a total.

	Number of points			Score
Criteria	**1**	**2**	**3**	
Annual Harvest level	Low (<500)	Medium (500 - 5,000)	High (>5,000)	**1-3**
Area of distribution	Large (>20,000km^2)	Medium (2,500 – 20,000km^2)	Small (<2,500km^2)	**2**
Life-history	Fast	Medium	Slow	**2**
Illegal trade and IUCN status	If levels of illegal trade are known, they should be included under "Annual harvest level". If unknown, and suspected to be detrimental, give a **maximum score of 1 point. Similarly, if the status of the species is** is listed as VU, EN or CR in the IUCN Red List Of Threatened Species, give a **maximum score of 1 point**			**1**

Section Three: Justification – Harvest level

Please provide an explanation with appropriate references to justify the score given.

International trade volumes have not exceeded 400 live specimens per year, with minimal recorded trade in parts or derivatives. The total offtake and trade volume including subsistence/personal use and domestic trade is unavailable and likely to be orders of magnitude greater than reported international trade.

Human-associated mortality occurs as traffic casualties (females crossing roads to nesting sites), boat strikes, drowning in commercial fishing gear, and often lethal outcome of accidental catch by sports fishermen.

Annual offtake level for international trade is clearly in the 'Low' = 1 point category, while total offtake including legal domestic offtake is likely in a higher category, but data are unavailable to determine whether this is in the medium or high category.

Section Four: Justification – Area of distribution

Please provide an explanation with appropriate references to justify the score given.

Total extent of original indigenous occurrence = 2.7 million km^2. (TTWG 2021: 322)

Estimated % of suitable habitat within that extent of occurrence = at most 1% freshwater rivers, lakes, reservoirs and permanent ponds.

Commercial exploitation is permitted in 19 of 33 States in the USA where it occurs (PARC State of the Union report (2011).

Very rough estimate: Commercial exploitation is permitted across half its Extent of Occurrence (1.35 M km^2), where it occupies 1% of total land area = 13,500 km^2 Area of Occupancy.

Section Five: Justification – Life history

Please provide an explanation with appropriate references to justify the score given.

Spiny Softshell females typically produce two clutches of eggs per year, each clutch comprising 12-18 eggs (extremes: 4-39 eggs). Longevity likely can exceed 30 years. Age to maturity appears unrecorded, and is likely to vary by climatic zone; estimated somewhere between 3 and 10 years.

By turtle standards this is a relatively fast life history (though hardly an r-selected species) and we'll award two points.

As an aside, its ability to successfully establish itself in the Colorado River basin indicates great adaptability and population growth potential.

Section Six: Illegal trade and IUCN Status

Please provide an explanation with appropriate references to justify the score given.

Illegal trade may occur but has not been reported at significant quantities; e.g., only 4 seizures involving a total of 209 specimens were recorded during the period 2000-2015 (CITES, 2016, CoP17 Doc. 73); compared to informal understanding of commercial and personal take numbers this appears insignificant. Zero points awarded.

Section Seven: Conclusion, course of action, and determination on exports

Please provide an overall conclusion on the perceived threat of trade to the species and details on whether further course of action will be taken to complete an NDF for the species.

While the Spiny Softshell is an adaptable freshwater turtle species that is understood to be subject to substantial domestic offtake and human-induced accidental mortality, it does not appear that international trade is a significant impact. Nevertheless, a score of five to seven points (depending on volume of domestic offtake) points the way to a more detailed NDF to be compiled to evaluate the situation and offtake risks in more detail.

Of particular relevance for further data collection and evaluation are

1) What part of the distribution range were the specimens collected? This is particularly relevant if specimens derived from the introduced Colorado River population.

2) What data are available for domestic commercial capture and trade, and for offtake for personal use?

3) What data, if any, are available for rates or volumes of traffic mortality, fisheries bycatch, and invasive/subsidised predator impacts?

Section Eight: Literature Cited

Please provide references to all the reports and literature cited in this evaluation.

IUCN Red List account: https://www.iucnredlist.org/species/163451/97398618

CITES, 2016, CoP17 Doc. 73 TORTOISES AND FRESHWATER TURTLES (TESTUDINES SPP.), Annex Table 2, page 63.

CITES Trade Database, https://trade.cites.org/en/cites_trade/download/view_results?filters%5Btime_range_start%5D=2004&filters%5Btime_range_end%5D=2022&filters%5Bexporters_ids%5D%5B%5D=all_exp&filters%5Bimporters_ids%5D%5B%5D=all_imp&filters%5Bsources_ids%5D%5B%5D=all_sou&filters%5Bpurposes_ids%5D%5B%5D=all_pur&filters%5Bterms_ids%5D%5B%5D=all_ter&filters%5Btaxon_concepts_ids%5D%5B%5D=8721&filters%5Breset%5D=&filters%5Bselection_taxon%5D=taxonomic_cascade&web_disabled=&filters[report_type]=gross_exports

Species+, https://speciesplus.net/species#/taxon_concepts?taxonomy=cites_eu&taxon_concept_query=apalone%20spinifera&geo_entities_ids=&geo_entity_scope=cites&page=1 (CITES listing dates).

7.14.NDF for *Varanus niloticus*

Species name	*Varanus niloticus*
Range state name	Chad
Report compiled by	Patrick Aust example
Date compiled	13/4/2023

Section One: Summary

Please provide a short overview (1-2 paragraphs) of the trade in this species in the country of interest.

The Nile monitor (*Varanus niloticus*) is the second most heavily traded varanid species (CITES Trade Database). It is widespread across Africa but commercial trade is mostly confined to Mali, Cameroon, Chad, Nigeria, and Sudan. In Chad it is harvested for food and skins. The meat is mostly consumed regionally and skins are exported to Europe and Asia. From 2010 to 2021, 564,950 wild sourced individuals were traded (all countries, exporter reported, trade terms = skins and live, CITES Trade Database).

Section Two: Simple Evaluation score

Please score each attribute listed within the table below and sum these to provide a total.

	Number of points			Score
Criteria	**1**	**2**	**3**	
Annual Harvest level	Low (<500)	Medium (500 - 5,000)	High (>5,000)	**3**
Area of distribution	Large (>20,000km^2)	Medium (2,500 – 20,000km^2)	Small (<2,500km^2)	**1**
Life-history	Fast	Medium	Slow	**1**
Illegal trade and IUCN status	If levels of illegal trade are known, they should be included under "Annual harvest level". If unknown, and suspected to be detrimental, give a **maximum score of 1 point. Similarly, if the status of the species is** is listed as VU, EN or CR in the IUCN Red List Of Threatened Species, give a **maximum score of 1 point**			**0**

Section Three: Justification – Harvest level

Please provide an explanation with appropriate references to justify the score given.

Historically, the trade wild-sourced monitor lizards used to be much greater than it is today. Trade peaked in the early 1990s at approximately 863,871 individuals per year (exporter reported, trade terms = skins and live, CITES Trade Database) and has steadily declined since then to where it is now at approximately 47,079 individuals per year (2010 -2021 mean). This downward trend mirrors that seen in similar traded species (e.g., *Salvator* spp.) and is believed to be the result of diminishing demand from the fashion industry (see CITES Livelihood case studies, CoP19). Chad exported an average of 12,363 Nile monitor skins per year from 2010 to 2021 (exporter reported, CITES Trade Database). Live Nile monitors are not harvested for the pet trade in Chad. Overall trade volumes in wild-harvested live animals are comparatively low (2010 -2021 mean = 6865 individuals/year, exporter reported, CITES Trade Database) and mostly confined to juvenile specimens from Togo and Benin (see Robinson et al. 2015). In Chad, adult and sub-adult Nile monitors of both sexes are harvested on a seasonal basis. The meat is sun-dried and sold in regional bushmeat markets and the skins are exported raw to tanneries in Europe and Asia (de Buffrenil 2004).

Section Four: Justification – Area of distribution

Please provide an explanation with appropriate references to justify the score given.

The distribution of this species encompasses most of sub-Saharan Africa wherever there are substantial bodies of water (Spawls 2002). The species is capable of aestivation in seasonal habitats (Angelici and Luiselli 1999). Nile monitors are habitat and dietary generalist and readily exploit a wide range of artificial environments (Dalhuijsen, Alexander, and Branch 2014; Spawls 2002). In Chad, they occur mostly in the southern parts of the country where permanent rivers and seasonal wetlands are a dominant feature of the landscape (de Buffrenil 2004; Dowell et al. 2015; Bayless 1997). Considering the habitat requirements and known range limits, the AOO in Chad may be considered to be in excess of 20,000 km^2.

Section Five: Justification – Life history

Please provide an explanation with appropriate references to justify the score given.

The Nile monitor has a rapid life history. Approximately 50% of mature females reproduce each year laying up to 60 eggs per clutch (de Buffrénil and Rimblot-Baly 1999). Growth rates can be rapid and sexual maturity may be reached in approximately two years (de Buffrénil and Hémery 2002).

Section Six: Illegal trade and IUCN Status

Please provide an explanation with appropriate references to justify the score given.

There is evidence of illegal trade within the informal sector. Monitor lizards are an important source of bushmeat in some parts of Africa (Angelici and Luiselli 1999) and cross-border supply chains in West and Central Africa are common (Luiselli et al. 2020). Sun-dried meat sourced in Chad is reportedly sold domestically in Chad as well as in Cameroon and Nigeria (de Buffrenil 2004). There are no records of these transactions in the CITES Trade Database. The extent to which populations in Chad are harvested primarily for their meat is unknown. Nevertheless, there are no records of illegal skin trade internationally and it is likely that the meat trade in Chad functions as a by-product of the skin trade (based on relative values), and overall risks are probably low. The species is assessed as IUCN Least Concern with a stable population trend. As a result of the above, no points are given.

Section Seven: Conclusion, course of action, and determination on exports

Please provide an overall conclusion on the perceived threat of trade to the species and details on whether further course of action will be taken to complete an NDF for the species.

The species is considered IUCN to be Least Concern with a stable population trend. It is an ecological generalist and is widely distributed across sub-Saharan Africa, including Southern Chad. Intensive exploitation has been ongoing in Chad for decades (and possibly centuries) but overall the species remains common and resilient to current harvest levels (Dowell et al. 2015, CITES Trade Database). Buffrenil (2004) argues that the species may have developed a degree of demographic accommodation to resist heavy exploitation. Levels of illegal trade are evident but probably non-detrimental.

Based on the information presented above, the sum of scores for the attributes listed above is **4**. We can be confident that harvesting for trade does not currently affect the viability of the *V. niloticus* population in Chad.

This primary evaluation is a sufficient NDF for *V. niloticus* in Chad. Current exports are deemed to be non-detrimental. Trade is allowed to continue and no further course of action will be taken to monitor or manage harvests.

Section Eight: Literature Cited

Please provide references to all the reports and literature cited in this evaluation.

Angelici, Francesco M, and Luca Luiselli. 1999. "Aspects of the Ecology of Varanus Niloticus (Reptilia, Varanidae) in Southeastern Nigeria, and Their Contribution to the Knowledge of the Evolutionary History of V. Niloticus Species Complex."
Revue d'Ecologie, Terre et Vie 54 (1): 29–42.
Bayless, MK. 1997. "The Distribution of African Monitor Lizards (Sauria: Varanidae)." *African Journal of Ecology* 35 (4): 374–77.
Buffrenil, V de. 2004. "Exploitation of African Monitor Lizards: The Case of the Nile Monitor (Varanus Niloticus) in Chad." *BULLETIN-SOCIETE ZOOLOGIQUE DE FRANCE.* 129: 75–90.
Buffrénil, Vivian de, and Georges Hémery. 2002. "Variation in Longevity, Growth, and Morphology in Exploited Nile Monitors (Varanus Niloticus) from Sahelian Africa." *Journal of Herpetology* 36 (3): 419–26.
Buffrénil, Vivian de, and Frédérique Rimblot-Baly. 1999. "Female Reproductive Output in Exploited Nile Monitor Lizard (Varanus Niloticus L.) Populations in Sahelian Africa." *Canadian Journal of Zoology* 77 (10): 1530–39.
Dalhuijsen, Kim, Graham J Alexander, and William R Branch. 2014. "A Comparative Analysis of the Diets of Varanus Albigularis and Varanus Niloticus in South Africa." *African Zoology* 49 (1): 83–93.
Dowell, Stephanie A, Vivian de Buffrénil, Sergios-Orestis Kolokotronis, and Evon R Hekkala. 2015. "Fine-Scale Genetic Analysis of the Exploited Nile Monitor (Varanus Niloticus) in Sahelian Africa." *BMC Genetics* 16 (1): 1–12.
Luiselli, Luca, Emmanuel M Hema, Gabriel Hoinsoudé Segniagbeto, VALY Ouattara, Edem A Eniang, Gnoumou Parfait, Godfrey C Akani, Djidama Sirima, Barineme B Fakae, and Daniele Dendi. 2020. "Bushmeat Consumption in Large Urban Centres in West Africa." *Oryx* 54 (5): 731–34.
Robinson, Janine E, Richard A Griffiths, Freya AV St John, and David L Roberts. 2015. "Dynamics of the Global Trade in Live Reptiles: Shifting Trends in Production and Consequences for Sustainability." *Biological Conservation* 184: 42–50.
Spawls, Stephen. 2002. *Field Guide to the Reptiles of East Africa*. Academic.

8. Case studies for tree species

8.1. Forest Management Plans, Quotas and NDFs in Belize

In Belize, tools to carry out NDFs for CITES-listed tree species include a Sustainable Forest Management Plan, Annual Plan of Operation and General Yield Model to determine sustainability. They are peer reviewed with recommendation for export of not, made to the CITES Scientific Authority (SA). Recently a Management Plan Framework has been developed to guide Sustainable Forest Management Plans for Forest Reserves that comprise about 18% of the National Protected Area System. The focus has been on sustainable harvesting of economically valuable tree species but the ultimate goal is the protection of biodiversity and ecosystem services. Sustainable Forest Management Plans are prepared and submitted to the Forest Department every 5 years within the context of 40-year Long Term Licences and Annual Plan of Operations (APO). The APOs guide annual reduced impact logging and are based on the General Yield Model.

Each Sustainable Forest Management Plan should include inventory information to assess the structure and composition of the forest with the sampling intensity at least 0.2% of the Forest Reserve. There should be an inventory of all trees (over 25cm DBH) with further details for commercial timbers.

Plans for management of timber and other wood products production should refer to the Code of Practice for Reduced Impact Logging and the General Yield Model. Information is required to justify the approach to harvesting of commercial species, (size and quantities) with calculation of cutting cycle and annual allowable cut, division of the forest into annual harvesting units and a schedule of timber and other wood products production. Harvesting operations are based on minimum environmental standards specified in the legislation, licence and Code of Practice e.g., crown cover, maximum number of trees felled per hectare, restrictions against harvesting

on slopes and watershed areas, minimum DBH for tree felling, a list of species to be protected, cutting techniques to optimize natural regeneration.

Monitoring of forest cover is required through, for example, pre- and post-harvest inventory. In addition, the use of remote-sensing tools including satellite imagery, fly-overs and drones should be explored. Use of standardised methodologies accepted by academia and the Forest Dept. is required. References must be provided. Monitoring of water supply and certain wildlife is also required.

Belize sets annual export quotas for *Swietenia macrophylla*, *Cedrela odorata* and *Dalbergia* spp. In accordance with the guidelines provided by CITES and in adherence to national Forestry laws, the national export quota is set according to the following basic steps:

A. A long-term forest license is approved for a given private land or forest reserve.

B. A Management Plan is developed by the license holder and reviewed by the Forest Department and forest experts including the Scientific Authority. The Management Plan is approved.

C. An Annual Plan of Operation for a given cutting block is prepared as per the established guidelines and framework and presented to the Forest Department for review and approval.

D. In a given cutting block in a sustainable logging concession, a full count and measurement of all standing trees is performed. The group of trees is taken as a single, independent population and a sustainable harvest yield is determined using scientific methods.

E. The previous step is repeated for all individual logging concessions in which a licensee proposes to harvest CITES-listed species, and a national sustainable harvest yield is determined by summation.

F. The CITES SA then validates the proposed sustainable harvest yields and verifies the estimated volume of lumber to be produced – which forms the export quota.

G. Once validated, the CITES Management Authority confirms an export quota to each individual logging concession, which can then begin to cut and export the lumber.

H. Only licensees with approved export quotas can export CITES-listed species, but only from areas to which the export quota applies. However, the licensee can sell such timber to third parties, who may then export the material under the export quota for the designated area from which the timber was cut.

I. The Forest Department undergoes a legal acquisition finding process, as per the Convention and its Resolutions to ensure that the timber is acquired from legal sources. The sale or transfer of timber from one buyer to the other must adhere to this process to verify quota integrity.

J. The Forest Department has established the volume of timber in log, flitch or sawn lumber form which may be exported based on conversion factors (are these publicly available) since the estimated standing export volume cannot be the same as the volume of sawn lumber.

Source: Belize Forest Department (2020) CITES Implementation report 2018-2020. 18-20Belize.pdf (cites.org)

8.2. NDF formulation for *Swietenia macrophylla* in Mexico

In Mexico, the management of CITES timber and other wood product species at the national level operates within the framework of the General Law of Sustainable Forestry Development. The process for formulating NDFs for *Swietenia macrophylla* is linked to the framework for sustainable forest management. The process has been developed since 2008, with the CITES SA working with forestry authorities from the outset. The State of Quintana Roo is the main area for export of mahogany wood. The State authorities request Technical Opinions (TOs) from the CITES SA on the Forest Management Programs (PMF) or Unified Technical Documents (DTU) prior to harvesting authorizations. In general, a TO can be considered a pre-NDF and is based on analysing information

available in management plans and programs, technical studies and annual reports, on the property or place of origin, the methods of obtaining, analysis and results of the population sampling/monitoring in the field, the management measures of the species and its habitat, and the methods and estimation of the rate of exploitation. Management plans for timber and other wood product species last for a specified period of time and NDF requirements can be modified when the management plan is revised.

Negative or partial NDFs are issued when the forest referrals come from properties whose PMF does not have a TO and/or when there is a lack of information to formulate the NDF. The steps necessary to develop technical considerations for a mahogany NDF or TO are set out in the Manual of Procedures with support sources included that contain reference values, literature or guides that can be used to determine if the data, methods and management of the species are adequate and therefore the estimates are reliable.

An analysis of the information required for NDF formulation for mahogany, indicating the relationship with national and international legislation has been undertaken. This includes elements such as: basic information of the species and the property, method of sampling, field data and calculation memory, volume of use and management of the species, including recommendations for information delivery. This was shared with CITES PC24 as PC Inf. 3. which provides a checklist of information requirements.

Source: CONABIO (2021) Manual de procedimientos para emitir consideraciones técnicas por especie para la formulación de Dictámenes de Extracción No Perjudicial (NDF): Caoba (*Swietenia macrophylla*). Available at: https://www.biodiversidad.gob.mx/media/1/planeta/cites/files/CONABIO_NDF_caoba.pdf

Source: CONABIO (2018) Guía informativa para el manejo y aprovechamiento sustentable de caoba en el marco de las disposiciones de la CITES. CONABIO. Ciudad de México. Draft Version of the "Informative Guide for the Management and Sustainable Harvest of Mahogany under CITES Provisions". PC24 Inf. 3. Available at: https://cites.org/sites/default/files/eng/com/ac/30/Inf/S-PC24-Inf-03.pdf

8.3. Forest inventory in Central African countries

In Central Africa, most commercial logging companies have followed an inventory protocol (Réjou-Méchain et al., 2011). In 2009, 88% of these companies were involved in developing or implementing a management plan mandated by new forest laws and regulations designed to promote SFM in Central African Republic (CAR), the Congo, Democratic Republic of Congo, Cameroon and Gabon. The first step in developing such plans was to conduct a systematic inventory to (i) locate timber resources, (ii) calculate management parameters such as rotation length, minimum felling diameters, harvestable volume, etc. and, (iii) identify areas that are ecologically vulnerable or unique in terms of biological diversity and/or patrimonial value. The forest inventory data covered about 22 million ha, representative of 46% of Central Africa's production forests. The systematic sampling design consisted of continuous 25 m wide transects, separated on each side by 2–3 km, and subdivided into rectangular 0.5 ha plots of 25 m by 200 m. A total of 803 transects were inventoried during four field campaigns. In the overall dataset the transect length ranged from 221 m to 32.3 km, with a mean length of 6.3 km. Trees throughout the 0.5-ha plot with a diameter at breast height (DBH) ≥30 cm were recorded, while those between 10 and 30 cm DBH were recorded only on a 0.125 ha area (i.e. the first 50 m of the plot). The centre of each plot was located using a global positioning system (GPS). A total of 28,229 plots were established across the four concessions. Tree identification was based on both commercial and local names where available. To minimize possible discrepancies between scientific names and local or commercial names, local botanical experts were provided with training and a correspondence list between local and scientific names prior to the inventory.

The Inventory of a concession typically required a workforce of 30–50 people permanently in the field for 18–24 months. Data quality was checked by a systematic re-sampling procedure conducted by experienced field botanists. This re-sampling procedure took place within one month of the commercial inventory and without any information about the identity or abundance of the inventoried species.

Source: Réjou-Méchain, M., Fayolle, A., Nasi, R., Gourlet-Fleury, S., Doucet, J. L., Gally, M., Hubert, D., Pasquier, A., & Billand, A. (2011) Detecting large-scale diversity patterns in tropical trees: Can we trust

commercial forest inventories? *Forest Ecology and Management*, *261*(2), 187–194. https://doi.org/10.1016/j.foreco.2010.10.003.

8.4. Inventory for *Pterocarpus erinaceus* in Burkina Faso, Niger and Togo to inform NDFs

Forest inventories have been undertaken for *P. erinaceus* populations in Burkina Faso, Niger and Togo (Segla et al. 2016). Sampling was based on two methods, the band transect method and the random method. The transect method was chosen as appropriate in areas with low density of the species in Sudanian and Sahelian zone vegetation in Burkina Faso and Niger, whereas the random method was adopted for the Guinean and Sudanian zones in Togo with a relatively high density of species.

For the transect method, two perpendicular transects with widths of 200 m each were used, north–south and east–west transects taking account the heterogeneity of the plant formations. Sufficient inventories of *P. erinaceus* individuals to estimate the density could subsequently be made. In each observation band an azimuth method was carried out using a GPS. Gradually moving along the transects, all *P. erinaceus* individuals were observed and diameters at breast height (DBHs) ≥ 10 cm were measured.

The random method was based on 1000 m^2 (40 m × 25 m) sampling units at regular intervals of 200 m, randomly defined in populations dominated by *P. erinaceus*. A total of 60 plots were studied in Togo (20 in Abdoulaye wildlife reserve, 25 in Oti-Keran National Park and 15 in Togodo wildlife reserve).
In all cases the DBH ≥ 10 cm measurements were performed using a tree caliper for large diameters or a tape measure for medium and small stems. Measurements of total and merchantable heights were made using a graduated pole (for trees lower than 5 m) or a Relascope of Bitterlich (for trees higher than 5 m).

Forest characteristics were assessed by calculating the average diameter, the total average height and the average merchantable height of the species. An analysis of variance was performed to compare the dendrometric parameters (diameter and height) according to the climate zones. A general linear model was applied using R software and Minitab 16.
The average density (average number of standing individuals estimated per ha), the basal area (the sum of the cross sections of all *P. erinaceus* individuals per m^2 /ha) and Lorey's mean height (average height of individuals weighted by their basal area) of individuals in each climate zone were calculated.

To determine the size class distribution, Minitab 16 software was also used to estimate the parameters of the Weibull distribution from diameter and height data. To ensure adequate adjustment of the observed Weibull distribution, SAS software (SAS Inc., 1999) was used for an adjustment test based on a log-linear analysis.

The minimum felling diameter (MD) and the rotation cycle for *P. erinaceus* is based on the formula of Durrieu de Madron and Forni (1997) which calculates the recovery rate (the ratio between the stock of harvestable trees at the beginning of the forestry operation and the predicted remaining stock after one felling cycle) and adapted to the distribution per diameter class of the species basal area by Sokpon and Biaou (2002) and Sokpon et al.(2006). This rotation calculation method is based on the principle that the duration of rotation is related to the passage of trees with a diameter lower than the MD to the group of exploitable tree diameter (plant diameter higher than the MD). The rotation cycle, therefore, takes into account the growth rate and the diametric structure of the species.

To determine the rotation cycle, the restoration percentage of the original exploitable basal area for the species needs to be calculated, the restoration percentage is based on the exploitation losses, the diameter growth and the natural mortality of individuals. The MD is determined iteratively by testing the various diameter classes, including the classes 25 cm, 35 cm, 45 cm and 55 cm. When the restoration percentage is low (below 50%) the MD increases and a new restoration percentage is calculated until an MD favouring restoration of the species (N50%) is obtained. The restoration percentage is calculated based on the transition time, or rotation, which is the time required to move all individuals in one diameter class to a diameter higher than the MD.The restoration percentage does not indicate the actual restoration, but gives a renewed idea of the restoration of populations of a species. The formulae used to determine the transition time and the restoration percentage are from Durrieu de Madron and Forni (1997).

In Togo an NDF has been developed for *P. erinaceus* for the period 2022-2023. Comprehensive data collection took place as a basis for the NDF. The *Principles for Non-Detriment Findings (NDF) for Trees* methodology developed in Cancun in 2008 were followed considering five points: biology and distribution area of the species; information on the population; management measures and harvesting regime; control and follow-up; conservation

and precautionary principle. Workshops were held to review the information and draft NDF. Based on species density per hectare, population structure, MD and recovery rate, the study set the operating quota at 80% of the potential to be exploited within a defined area. In order to ensure a rapid recovery of degraded stands of *P. erinaceus*, 20% of the standing resource in the form of seed trees is preserved. The exploitation of the species in protected areas and in ecologically sensitive areas is forbidden. At the same time there is a national moratorium on the cutting, marketing, import or re-export of *P. erinaceus* timber for a period of 10 years (2016-2026) in order to limit overexploitation and allow natural stands to be able to regenerate.

Source: Segla, N.K., Rabiou, H., Adjonou, K., Moussa, B.M., Saley, K., Radji, R.A., Kokutse, A.D., Bationo, A.B., Mahamane, A. and Kokou, K. (2016) Population structure and minimum felling diameter of *Pterocarpus erinaceus* Poir in arid and semi-arid climate zones of West Africa. South African Journal of Botany 103 (17-24). Available at: https://doi.org/10.1016/j.sajb.2015.09.005

Source: Sokpon, N. and Biaou, H. (2002) The use of diameter distributions in sustained-use management of remanent forests in Benin: case of Bassila forest reserve in North Benin. Forest Ecology and Management 161, 13–25. Available at: https://doi.org/10.1016/S0378-1127(01)00488-1

Source: Durrieu de Madron, L., Forni, E., (1997) Aménagement forestier dan' l'Est du Cameroun structure du peuplement et périodicit' d'exploitation. Bois et Forêts des Tropiques 254, 39–64. Available at: https://doi.org/10.19182/bft1997.254.a19897

8.5. Forest management and NDF development for *Pericopsis elata* in Cameroon

In Cameroon, *Pericopsis elata* is mainly found in the southeast of the country, notably in the departments of Boumba and Ngoko, Haut-Nyong and Kadey. In 2004 MINEF estimated the area of distribution as 4,071,857 ha, representing around 19% of the national forest estate. More recently the CITES SA has estimated a larger area of distribution.

There are four different categories of forest management within the country: forest concessions (Forest Management Units) managed by the private sector; communal forests – managed by municipalities; community forests, and standing timber sales.

The period of management for a FMU is 15 years, and is renewable once. With a maximum area of 200,000 ha, the FMU is divided into Annual Cutting Areas. A management plan is required by the Ministry of Forests & Wildlife (MINFOF), the CITES Management Authority. Annual operating plans are required for each area to be harvested. The required elements of the management plan are specified in Arrêté 0222/A /MINEF/25 May 2021.

Pericopsis elata is categorised as a special species and is subject to management requirements which link to the NDF. The CITES MA allocates the volumes of *Pericopsis elata* to be exploited, monitoring and controlling the entire exploitation chain. The National Forestry Development Support Agency (ANAFOR) is the CITES SA responsible for issuing the NDF based on scientific studies.

Annual harvest quotas are set for *Pericopsis elata* in each management area. The harvest quota is adjusted each year based on the profile of the annual exploitation "block" and the exploitation/harvest history in the previous annual blocks of the same FMU.

The total annual harvest potential for *Pericopsis elata* is 75,715.08 m^3 based on exploitation inventories of all valid sites. The national harvest quota allocated is 37,653.23 m^3 representing 49.73% of the harvest potential. It is considered precautionary and appropriate for sustainability of the species. The harvest quota equates to 14,989.72 m^3 of processed timber - for export by 18 companies.

Source: Fouda Ndjodo, Zapfack, L., Nkengfack, A., Onana, J. M., Leka Essomba, Bindzi, I., A Mba M., Nnanga Mebanga R.L., Bekolo Bekolo, Mbarga, N., Kana P. (2023) Avis de Commerce Non Préjudiciable sur *Pericopsis elata* (Fabace–e - Faboideae) au Cameroun Période 2023. ANAFOR, Cameroun.

8.6. Information collection and NDF formulation for *Dalbergia* & *Diospyros* in Madagascar

A workshop to evaluate scientific knowledge and identify priority research required for the issuing of an NDF was organized by TRAFFIC on 22-23 September 2014 in Antananarivo, in cooperation with the CITES Scientific and Management Authorities of Madagascar. The workshop was attended by government representatives from forestry, finance and police departments together with World Bank, EU, WWF, TRAFFIC, MBG, WCS, CI, MNP, the National Group of Forest Operators of Madagascar (GNEFM) and individuals from teaching and research institutions. The main objective was to allow stakeholders involved in the conservation and management of Madagascar's resources to evaluate available information and to identify priority research required for *Dalbergia* and *Diospyros* species to guide the NDF process. The workshop used the IUCN NDF Guidelines, compiled by Rosser and Haywood (2002).

The workshop concluded that there was insufficient biological and ecological data available on precious timbers of Madagascar for the issuing of an NDF for the export of tree species. Gaps in essential information included species abundance, regeneration and population trends, particularly since data were only available from a few sites, thus making it difficult to extrapolate reliably. Few forest inventories existed for the species and these were hard to access. Accurate information on standing stocks, quantities felled and logging locations was not available. In addition, experts were not able to estimate the regeneration capacity of key species hindering the development of sustainable action plans.

A comprehensive review of available information on *Dalbergia* and *Diospyros* of Madagascar was carried out by TRAFFIC to inform the NDF workshop and subsequently to prepare an overall assessment of the situation. Detailed recommendations were presented on research needs together with recommendations on management of forestry operations and controls on the trade in the species. Various of the recommendations have subsequently been carried out enabling Madagascar to make progress in identification of the main commercially valuable species in the genera; and in the development of NDFs for these species including implementation of appropriate monitoring mechanisms.

Source: Ratsimbazafy, C., Newton, D. and Ringuet, S. (2016) Timber Island: The Rosewood and Ebony Trade of Madagascar. TRAFFIC. Cambridge, UK. Available at: https://www.traffic.org/publications/reports/timber-island-the-rosewood-and-ebony-trade-of-madagascar/

Source: Rosser, A. and Haywood, M. (2002) Guidance for CITES Scientific Authorities Checklist to assist in making non-detriment findings for Appendix II exports. Occasional Paper of the IUCN Species Survival Commission No. 27. IUCN, Gland, Switzerland and Cambridge, UK. Available at: https://www.iucn.org/resources/publication/guidance-cites-scientific-authorities-checklist-assist-making-non-detriment

8.7. Information collection & NDF recommendations for *Cedrela* spp. in Colombia

In Colombia there are five species of *Cedrela: C. fissilis, C. montana, C. nebulosa* and *C. odorata* distributed in different ecosystems at altitudes from 0 to almost 3000 m above sea level and a recently described species Cedrela gonzalopalominoi (Villanueva-Tamayo et al. 2023) from dry forest remnants in the Western Andean foothills. Many of the forest habitats are undergoing transformation. Exportation between 2013 - 2020 registered on CITES Trade Database does not exceed 170m^3 compared to timber transport permits granted to domestic use around 134,100 m^3. To support future development of NDFs for these species, information collection and review has been carried out following the 9-step guidance for timbers by the CITES Scientific Authorities. Scientific Authorities in Colombia Humboldt Institute collect information on distribution of Cedrela spp. used data from Global Biodiversity Information Facility – GBIF together with data from Colombia Biodiversity Information System – SIB, the National Herbarium, University herbaria and the Tropicos database. Complementary field data on Cedrela odorata was included from the Instituto Amazónico de Investigaciones Científicas-SINCHI Scientific Authorities on Amazon region. Information on the threat status of Cedrela spp. nationally and globally was based on the IUCN Red List, the red book of threatened timber plants in Colombia (Cárdenas & Salinas 2007) ratified by national law (Resolution 1912 of 2017) of the Ministry of Environment and Sustainable Development (MADS) by which the list of threatened wild species found in the national territory is established. Information on spatial distribution and population density of Cedrela spp. was collected by Humboldt Institute from documents available

online and from SINCHI focus on C. odorata. For a preliminary population size structure, information was collected on the diameter and height of individuals of the species by department. Information on diametric growth of *Cedrela* spp. was based on Cárdenas et al. (2015) and information on growth and mortality was obtained from a 25 ha permanent plot in Amacayacu Amazonas established by SINCHI, the National University of Colombia, and National Parks System.

The population density of *Cedrela* spp. (number of individuals/ha) varies depending on the species and the area of distribution. In the review, population density could only be established for C. odorata and varies between 0.051 and 4.8 individuals with DBH > 10 cm per ha, similar to population density in Bolivian forests. Information to determine the density population of the species including individuals < 10 cm DBH is uncommon and further research is needed to integrate the information into NDF development for C. odorata populations. Furthermore, information on population trends is needed in the departments of Nariño, Santander, Antioquia y Chocó where harvesting is greater. Generally, there is limited information to establish the size structure of the populations of Cedrela spp. In the case of C. montana, for example, an approximation of the population structure could only be made for the department of Cundinamarca. The average diameter for isolated trees is 30.6 cm, for primary forest it is 45.23 cm and for fragmented forest it is approximately 38 cm. The species shows good regeneration but for the seedlings to reach the adequate DBH for use it will require a long period of time. The minimum felling diameter is established in accordance with the forest management plans and based on local parameters and for the Sustainable Regional Authorities. MCD are established by the Ministry of Environment and Sustainable Development (MADS).

In the case of *Cedrela odorata* the Minimum felling diameters have been established, in Amazonia a MD of 80 cm was proposed (Castaño et al., 2007), while in the department of Chocó a MCD of 45 cm was established by the Regional Environmental Authority Cárdenas et al. 2015). However, Colombian regulations specify that in the Chocó harvesting of threatened species including C. odorata included, must guarantee the permanence of at least 30% of each diameter class and the harvestable diameter will be at least 50 cm. Recently, information was requested from 16 Regional Autonomous Corporations where Cedrela spp. are harvested relating to administrative arrangements, forest management plans and harvesting plans for Cedrela spp. between 2018 and 2020. Several responded, with for example, the Corporación Autónoma Regional de Santander (CAS), providing the characterization, methodology, definition of forest management administrative units, guidelines for updating the Forest Management Plan of its jurisdiction and a database with information on harvesting permits granted between 2018 and 2019 (also in the database provided by the MADS). Harvesting information between 2013-2020 including species, product type and quantity was obtained from a database maintained by MADS of harvesting permits issued at national level. A database of transport permits granted for these species recorded by volume also maintained by MADS was also utilized. MADS also provided data on registered plantations of Cedrela species shared by the Colombian Agricultural Institute - ICA. The years 2018 and 2019 were the years with the highest logging volumes during the period under review. Logging permits for timber in natural forest were mainly for the departments of Nariño (36%), Santander (30%) Antioquia (14%) and Boyacá. The main places where those products were commercialized were Valle del Cauca (26%), Bogotá (15%) and Santander (8%). Exports for the period 2013-2020 were sourced from CITES (https://cites.org/).

There have been exports of *Cedrela* timber to Spain (90 m^3 from natural forests) and also to Cuba (80 m^3 from plantation stock). From the information review, relevant aspects were identified for conducting future NDF for *Cedrela* spp. together with knowledge gaps. It was observed that there are issues in species identification which hinders knowledge of populations and control of wood exploitation. Data on population dynamics (growth, reproduction, mortality and recruitment), are scarce in particular for the specific harvesting localities– as has also been noted in Bolivia. The gaps in knowledge as well as the traceability and management adjustments between the national and local scale on usable stocks of Cedrela spp. which may reveal discrepancies, represent a challenge for both the Management and Scientific Authorities in the country. Additional information on the distribution and status and trends of Cedrela spp. populations needs to be sourced from national forest inventory and research initiatives.

Source: Gutierrez, E., Correa, A. and Castaño, N. (undated) Evaluación del Estado de conservación de las poblaciones Naturales de Cedrela odorata, para el fortalecimiento técnico del DENP en Colombia.

Source: Vasquez Valderrama, M. (2021) Documento con la información secundaria y análisis sobre ecología, aprovechamiento, manejo y comercio sobre las especies de Cedrela spp. (cedro), consolidada y analizada de acuerdo con los lineamientos del supervisor del contrato y siguiendo las directrices de la metodología de los nueve pasos como base para elaboración de Dictámenes de Extracción no Perjudicial -DENP. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt.

8.8. NDFs for *Dalbergia* spp. in Viet Nam

A process to develop NDFs for two native species, *Dalbergia cochinchinensis* and *Dalbergia oliveri*, was undertaken based on data collection and review workshops following methodology provided Rosser & Haywood, 2002. The guidance includes two steps of review. After the initial review relating to harvest of the species, it was found that there are negative opinions. Therefore, the assessors carried out a thorough review to see if the international trade could be detrimental to the survival of *D. cochinchinensis* and *D. oliveri*. The second review looked at parameters on biology, distribution, population size, population trend, main threats and management, harvest management, capacity for monitoring the harvest, benefits of harvest, and strict protection. These parameters were divided into seven categories of biological characteristics; national status; harvest management; control of harvest; monitoring of harvest; incentives and benefits from harvest and protection from harvest. 26 indicators were developed corresponding to multiple-choice questions. Data and information were collected to fill in these indicators. In each question, there are five answers ranked in order from 1 to 5. Score 1 reflected the lowest risk, whilst score 5 represents the highest risk. These values were then formed up a radar plot to indicate the level of each indicator to help understand an overview of NDF for *D. cochinchinensis* and *D. oliveri*. As the populations of both species are small and fragmented, facing major threats of illegal logging and trade and habitat loss, and no management plans are in place, the CITES Viet Nam Scientific Authorities have seen that the harvest for export of *D. cochinchinensis* and *D. oliveri* timbers will be detrimental to the current vulnerable populations. Thus, the NDFs are negative and annual zero export quotas are being applied for 2022-2027.

Source: Center for Nature Conservation and Development (2021) Non-detriment findings for *D. cochinchinensis* and *D. oliveri* in Viet Nam. CITES Management Authority of Viet Nam, Ha Noi.

Source: Rosser, A. and Haywood, M. (2002) Guidance for CITES Scientific Authorities Checklist to assist in making non-detriment findings for Appendix II exports. Occasional Paper of the IUCN Species Survival Commission No. 27. IUCN, Gland, Switzerland and Cambridge, UK.

8.9. Potential for NDF development for tree species in Mozambique

In Mozambique, the Forest and Wildlife Policy and Strategy and the Forest and Wildlife Law (LFFB) - Law No 10/1999 divides forests into ‘conservation’, ‘productive’, and ‘multiple use’. An exploitation licence is required to fell trees, with associated fees, except in cases of personal consumption. There are two main types of licence: simple licence and forest concession agreement. The legislation allows for enforcement by forest and wildlife inspectors and community agents. Concession authorisations are at three levels: up to 20,000 hectares (ha) authorised by the provincial governor, 20,000 to 100,000 ha by the Minister for Agriculture, and over 100,000 ha by the Council of Ministers. Concession holders are required to carry out sustainable exploitation of forest resources in accordance with the approved management plan, harvest and process the timber and guarantee inspection of the concession, in accordance with the legal provisions.

Two timber species recently listed in CITES Appendix II, *Afzelia quanzensis* and *Pterocarpus angolensis* are of great significance in Mozambique as together with *Millettia stuhlmannii* they account for 78% of the country’s total timber production. The current available commercial volume for *Afzelia quanzensis* in Mozambique is about 2,514,000 m^3. The regulation size for harvesting is a DBH ≥ 50 cm. The estimated available volume of *Pterocarpus angolensis* in Mozambique is about 5,620,000 m^3 and the regulation DBH for harvesting is ≥40 cm. Studies of the growth rate of *P. angolensis* indicate that it takes 29 years for a tree to reach a DBH of 10 cm, and

around 100 years to reach a DBH of 30 cm–40 cm; but ages up to 300 years are possible and growth rates vary depending on environmental factors at specific sites.

Another timber species of Mozambique already listed on CITES Appendix II is *Dalbergia melanoxylon*. Mozambique is currently the major exporter of timber of this species as recorded in CITES Wildlife Trade View. A quota was developed for exploitation of this species in Mozambique laid out in Ministerial Decision (1 April 2016) by province from 10t to 400t. It is not known whether NDFs have been formulated for the species which is currently categorised as Near Threatened by IUCN as it almost qualifies for Vulnerable under Criterion A (population decline due to levels of exploitation in Mozambique and Tanzania).

Source: Macqueen, D (ed.) (2018) China in Mozambique's forests: a review of issues and progress for livelihoods and sustainability. Research report. IIED, London.

Source: Mate, R., Johansson, T.& Sitoe, A.(2014) Biomass Equations for Tropical Forest Tree Species in Mozambique. Forests 2014, 5, 535-556; doi:10.3390/f5030535