Guidelines on harvesting threatened species

Dilys Roe, David Mallon, Rachel Hoffmann and Rosie Cooney

INTERNATIONAL UNION FOR CONSERVATION OF NATURE

SSC Species Survival Commission

SULi Sustainable Use and Livelihoods Specialist Group

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Photo: *Ray fishing by Quang Nguyen Vinh / Pexels*

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Executive summary

1. **Societies around the globe harvest wild species**, to a greater or lesser extent, for food, building materials, healthcare, medicines, pest control, ornamentation, income, recreation, and cultural and spiritual purposes. While this use of wild species directly contributes to the well-being of billions of people globally, over-exploitation of wild species is one of the key drivers of biodiversity loss. It is therefore critical to ensure that use of wild species is sustainable – both to reverse the global trend in biodiversity decline and also to ensure that wild species continue to provide the benefits on which so many people depend.
2. **While the harvesting of all species requires careful management** to ensure it is sustainable, harvesting of threatened species requires particular care because of the heightened risk of extinction of these species. These guidelines are intended to support decision-making in providing that care.
3. **Harvesting is best described as the process of** collecting, cutting, taking, or killing of wild species or their parts and/or derivatives. It encompasses hunting and collecting terrestrial animals, gathering terrestrial plants, logging and wood harvesting, fishing and harvesting aquatic resources.
4. **Threatened species are those that fall into the categories** of Vulnerable, Endangered or Critically Endangered on the IUCN Red List of Threatened Species™.
5. **Threatened species may be affected directly or indirectly by harvesting**. The full scale and impacts of harvest on threatened species are impossible to assess because use of wild species can be unregulated, unmonitored and/or illegal – and therefore undocumented or unknown. Furthermore, many species which are harvested have not yet had their conservation status assessed but may well be threatened. Nonetheless, some threatened species, even those in the highest category of threat, have been shown to be capable of supporting a carefully regulated sustainable harvest that both benefits conservation of the species and provides financial or other incentives for local communities and for conservation management.
6. **The likely impact of harvesting on threatened species** – and the degree to which harvesting is thus likely to be sustainable or not – is influenced by a number of factors including the biological characteristics of species and the ecosystems they inhabit, the institutions that govern the management of the species and the management of the harvest, the incentives that are or are not in place for conservation, and the supply of, and demand for, the species or the products and services the species generates. The intensity and form of harvest (for example whether it is lethal or not) is also important.
7. **The CITES Non-Detriment Findings process** is a useful approach for determining the sustainability of harvest, regardless of whether or not the species is intended for international trade. Clear guidance is available which can

help determine the likely sustainability of harvest based on the level/intensity, life history traits of the target species, the area of distribution of the species, its conservation and threat status, and the level of trade.

8. **The fact that a species is threatened does not mean that** harvesting is inherently unsustainable. However, additional safeguards are required. The preamble to the Convention on Biological Diversity (CBD) invokes the Precautionary Principle and notes that "where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat." This implies that in the case of harvesting threatened species, where information is lacking (for example on likely harvest impacts) precautionary risk mitigation measures should be put in place. It should be noted, however, that this does not necessarily mean harvest should be banned in all instances – the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) notes that any measures adopted should be proportionate to the anticipated risks to the species. Indeed, the CITES NDF Guidance notes that "Halting trade or harvests is not necessarily a risk-free or least-risk option." Precautionary measures might, however, include quotas, closed seasons, or restrictions on harvesting methods. In all cases close monitoring of the harvest and its impacts will be required with management adjusted accordingly in response to any negative impacts.

9. **Where species are listed as threatened due to having small populations**, harvesting should only proceed with great caution. For Vulnerable or Endangered species listed on this basis, harvesting should only take place where evidence can be produced to show that it is highly unlikely to increase the risk of extinction of the species in question or that it is actually likely to decrease the risk (e.g. will incentivize or fund necessary conservation efforts). For Critically Endangered species, harvest should only be permitted in exceptional circumstances when there is evidence that harvest will significantly benefit conservation at a very low risk to the population.

10. **In some cases, to reduce harvesting pressure on wild populations** of threatened species, individuals are brought into ranching, farming, captive breeding or artificial propagation systems (*ex situ* production) to supply the market. However, whether *ex situ* production is more or less beneficial/detrimental than direct removal of individuals from the wild is very context-specific. In some cases, it may reduce harvesting pressure on wild populations but generally only if consumers prefer products from captive sources. Furthermore, *ex situ* production may remove local incentives to sustainably manage the species in the wild and to conserve its habitat. It may also increase (illegal) harvesting of depleted wild populations if wild specimens are preferred to those from captive/artificial production. Similar considerations apply to the use of synthetic replacement products.

11. **In some cases, the biological and ecological conditions may indicate** that a sustainable harvest is feasible, but in practice it cannot be justified because the management regime or governance conditions are inadequate to ensure that the harvest remains sustainable, that quotas are enforced, or that benefits are shared equitably.

12. **Additionally, some forms of wild species use can present zoonotic** and other risks to human health as well as to animal welfare. These concerns were particularly highlighted during the Covid-19 pandemic of 2020-2021.

13. **Recognising the challenge of assessing sustainability of wild species** use in a comprehensive, but accessible way, IUCN SULi and partners[1] have developed a 5-dimensional sustainability assessment framework. The framework adds the dimensions of animal welfare and human health to the more conventional social, ecological and economic dimensions of sustainability and potentially provides a useful, progressive tool for broadening our understanding of the issues that should be considered when assessing whether or not the harvest and use of a species are genuinely sustainable.

14. **The context-specificity of different use situations** is something that cannot be emphasised enough. Too often metrics for assessing the status of species or the level of threat to them (from use or other threats) are calculated at a global level rather than a local level – even though the fortunes of different populations of the same species vary hugely across time and space. Building this nuance into some of the tools available could help further inform robust, evidence-based decision-making in the future.

[1] Partners include IIED (www.iied.org), TRAFFIC (https://www.traffic.org/), Endangered Wildlife Trust (https://ewt.org.za/) and EPIC Biodiversity (https://www.epicbiodiversity.com/) – supported through the UK government's Darwin Initiative (https://www.darwininitiative.org.uk/)

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Photo: *European eel by Michel Viard / Canva*

Photo*: Candelilla by Marco Granillo Chapo*

01

Introduction and purpose of these guidelines

Societies around the globe harvest wild species, to a greater or lesser extent, for food, building materials, healthcare, pest control, ornamentation, income, recreation, and cultural and spiritual purposes.

The IPBES Sustainable Use Assessment (SUA) (IPBES, 2022) found that the use of wild species occurs across almost all aquatic and terrestrial ecosystems and is embedded in local, national and global economic systems. It has been estimated that 40% of the global economy is based directly or indirectly on the use of biological resources (UNEP, 2010). The IPBES SUA highlighted that while the use of wild species directly contributes to the well-being of billions of people globally, it is particularly important to the world's more vulnerable people with an estimated 70 per cent of the world's poor directly dependent on wild species – both to meet immediate food, medicine, shelter and other basic needs but also to generate income (IPBES, 2022).

At the same time, over-exploitation of wild species is one of the key drivers of biodiversity loss. It is among the predominant threats to many species (di Minin et al. 2019; Maxwell et al. 2016) and the primary threat to aquatic species (IPBES, 2019). This is perhaps not surprising given the scale of wild species use it is estimated that use of wild species extends to 7,500 species of fish and aquatic invertebrates, 31,100 species of plants (including 7,400 species of trees), 1,500 species of fungi, 1,700 species of terrestrial invertebrates and 7,500 species of amphibians, reptiles, birds and mammals (IPBES 2022). Ensuring that this use is sustainable is therefore critical – both to reverse the global trend in biodiversity decline and also to ensure that wild species are able to continue providing products and services (provisioning, regulating, and cultural) on which so many people depend.

The harvesting of wild species involves the removal of organisms or parts of organisms from their natural habitat. Some forms of harvesting are lethal – for example, hunting, fishing and logging – while others are non-lethal – for example capture of live individuals (e.g., for breeding or for trade) or collection of parts of organisms such as seeds, leaves, roots and fibres, or collection of products such as honey, rubber, etc. Unintended mortality, however, may occur as a result of theoretically non-lethal practices if the harvesting process is not carefully managed.

The harvesting of all species requires careful management to ensure it is sustainable. The harvesting of threatened species requires particular care because of the heightened risk of extinction of these species. Indeed, to many people the very idea of even contemplating harvesting threatened species seems counterintuitive. It is sometimes believed that any use or harvest will have a further negative impact and should therefore be avoided as a matter of principle. Some countries have banned the harvest of any threatened species, although this practice is advised against (IUCN, 2022).

These guidelines are intended to support decision-making on harvest of threatened species. An initial draft was produced in 2018 which was subsequently revised and published as Annex 4 of the *Guidelines for Appropriate Uses of IUCN Red List Data* (version 4.0) (IUCN, 2022). A decision was then taken to develop a wider set of guidance covering all issues around the harvest and use of threatened species.

Drawing on insights from the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Sustainable Use Assessment (SUA) (IPBES, 2022) and informed by new CITES guidance on non-detriment findings (NDFs), these new guidelines are in accordance with the IUCN policy statement on sustainable use (IUCN, 2000) and complement existing guidance related to harvesting, including on the use of trophy hunting as a conservation tool (IUCN SSC, 2012) and the use of IUCN Red List data in harvest decisions (IUCN, 2022).

02

What is harvesting?

In the context of these guidelines, harvesting is best described as the process of collecting, cutting, taking or killing of wild species or their parts and/or derivatives.

This description is in line with what IPBES calls “extractive practices” which “involve temporary or permanent removal of organisms, part of them or materials derived from them from their habitat” (IPBES, 2022). This contrasts with “non-extractive practices” which IPBES (2022) uses to describe experiential uses of wild species (e.g., wildlife photography, whale watching). Under extractive practices IPBES lists gathering of whole or parts of plants, algae and fungi; logging or coppicing trees, collecting tree products; hunting or capturing terrestrial animals; collecting or taking animal products; fishing or capturing aquatic animals; collecting or taking aquatic animal products. Figure 1 summarises these different harvesting practices.

Photo: *Trillidium govanianum by Dipesh Pyakurel*

EXTRACTIVE PRACTICES	PRACTICE	ALGAE, FUNGI AND PLANTS	TREES	TERRESTRIAL ANIMALS	AQUATIC ANIMALS
	Harvest entire organism with mortality	GATHERING *(e.g., whole plant harvest)*	LOGGING *(e.g., sawn wood)*	HUNTING *(e.g., subsistence hunting)*	FISHING *(e.g., commercial fisheries)*
	Harvest part of organism with mortality	GATHERING *(e.g., excessive root harvest)*	LOGGING *(e.g., excessive branch removal)*	HUNTING *(e.g., amphibian's secretions)*	FISHING *(e.g., shark finning, fish roe)*
	Harvest entire organism with without intended mortality	GATHERING *(e.g., landscaping materials)*	LOGGING *(e.g., landscaping materials)*	"NON-LETHAL" TERRESTRIAL ANIMAL HARVESTING *(e.g., pet trade, green hunting)*	"NON-LETHAL" FISHING *(e.g., aquarium fish, catch and release)*
	Harvest parts or products of organism without mortality	GATHERING *(e.g., leaves, nectar, resin, latex, berries)*	LOGGING *(e.g., coppicing)* GATHERING *(e.g., leaves, fruits, bark)*	"NON-LETHAL" TERRESTRIAL ANIMAL HARVESTING *(e.g., wild honey, vicuña fiber, bird eggs)*	"NON-LETHAL" FISHING *(e.g., horseshoe crab's blood)*

Figure 1: Different types of wild species harvesting (extract from IPBES, 2022: Figure 1.6)

The IPBES practices also align with the activities listed by the IUCN Red List of Threatened Species™ under its threat category "Biological Resource Use". Activities comprising Biological Resource Use include:

- Hunting & collecting terrestrial animals
- Gathering terrestrial plants
- Logging & wood harvesting
- Fishing & harvesting aquatic resources

03

What are threatened species?

The IUCN Red List of Threatened Species™ is the acknowledged global standard for assessing extinction risk.

The IUCN Red List of Threatened Species™ (hereafter IUCN Red List or Red List) contains nine categories denoting higher-to-lower risk of extinction (Figure 2). The categories Critically Endangered, Endangered, and Vulnerable denote an 'extremely high', 'very high', and 'high' risk of extinction, respectively, and species in these three categories are collectively regarded as 'threatened'. In early 2024, 163,040 species had been assessed for the IUCN Red List, of which 45,321 (28%) were categorised as threatened.

Photo: *Snow leopard by Michel Viard / Canva*

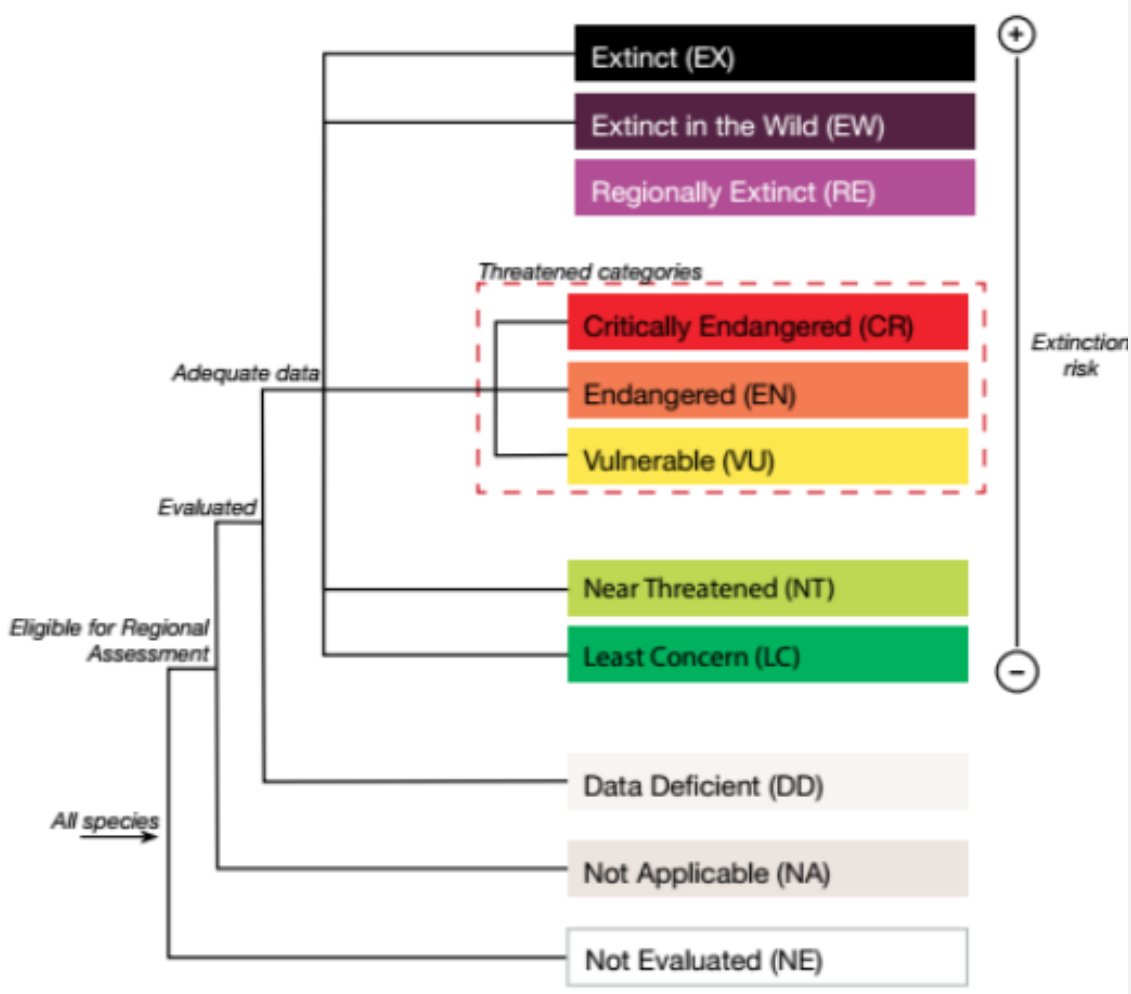


Figure 2: IUCN Red List of Threatened Species™ Categories of threatened species (Figure take from https://www.iucnredlist.org/about/faqs)

Species are assigned to a Red List Category based on one or more of five criteria (each accompanied by quantified thresholds) to account for differences in life history traits and biology across all taxa and situations.

1. Population size reduction. An observed, estimated, inferred, or suspected reduction in population size in the past, ongoing, or in the future.
2. Restricted geographic range. Small size of extent of occurrence or area of occupancy, plus fragmentation or small number of locations and/or continuing decline.
3. Small and declining population size. Limited number of mature individuals and continuing decline or extreme fluctuations.
4. Very small or restricted population. Species in this category are inherently at risk from stochastic events (disease, climate emergency, etc) due to their very small size. Their population may however be stable, increasing, or declining slowly.
5. Quantitative analysis. An analysis of extinction probability using e.g., Population Viability Analysis (PVA) or similar modelling programmes.

It should be noted, however, that there are limitations to the information available in the Red List including:

- An assessment (and hence the conservation status assigned to a species) may not be up to date. The percentage of species with outdated assessments on the Red List version 2020.3 was 23.8% (Marsh et al., 2021).
- Red List assessments reflect the status of a species globally but this can encompass wide regional or local variations in status and threats across the species' range. Thus, a globally threatened species could have local or regional populations that are not declining and could withstand a limited harvest. Or conversely, species that are not threatened globally may have local populations whose conservation status is unfavourable and for which harvest is inadvisable.
- In addition, some species assessed in the Data Deficient (DD) category, or that have not yet been assessed (Not Evaluated) may meet the thresholds for threatened status In fact, more than half (56%) of DD species are predicted to be threatened (Borgelt et al., 2022), so a similarly precautionary approach is needed when making decisions on harvesting species in these two categories.

The Red List entry for each species details the type and nature of the pressures that are causing species to be threatened. Categories of threat include[2]:

1. **Residential & commercial development**
2. **Agriculture & aquaculture**
3. **Energy production & mining**
4. **Transportation & service corridors**
5. **Biological resource use**
6. **Human intrusions & disturbance**
7. **Natural system modifications**
8. **Invasive & other problematic species, genes & diseases**
9. **Pollution**
10. **Geological events**
11. **Climate change & severe weather**
12. **Other options**

The Red List scoring system estimates the impact of threats based on timing, scope, and severity of the named threat. This information is used to create an overall threat impact score to help distinguish major from minor threats.

A recent analysis of species on the Red List (Hogue & Breon, 2022) explored the key threats to threatened species. Of the 20,784 threatened species for which data were available, it found that ***the biggest threat is habitat destruction*** (associated Red List threat categories 1,2,3,4,7). This threatens more species than all other categories combined – with 88.3% of species having it recorded as a threat and 71.3% as the primary threat. Meanwhile overexploitation is recorded as a threat to 26.6% of threatened species and the primary threat to 7.4%.

[2] https://www.iucnredlist.org/resources/threat-classification-scheme

04

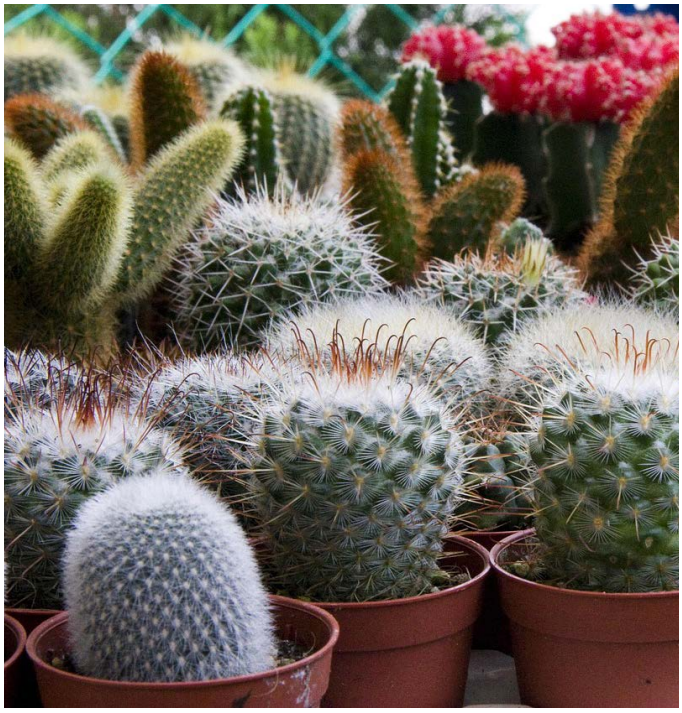
Examples of impacts of harvesting on threatened species

While habitat loss/degradation has been determined to be the main threat to threatened species, unsustainable use – or over-exploitation – is a major driver of biodiversity loss.

Many threatened species across a wide range of taxonomic groups have been negatively impacted by uncontrolled or indiscriminate harvest – both legal and illegal. The full scale and the impacts of harvest on threatened wild species are impossible to assess because use can be unregulated, unmonitored and/or illegal – and thus undocumented. Furthermore, many species which are harvested have not yet had their conservation status assessed but may well be threatened. The impacts also vary from species to species depending on various biological and ecological criteria such as life history traits, abundance, and distribution; from place to place, depending on management regimes, governance, conservation incentives; and on the intensity and form of harvesting – lethal or non-lethal, entailing removing all of the organism or only part, etc.

Threatened species may be affected directly, where they are the target of harvesting, with impacts including depleted population size, local extirpations, and heightened extinction risk. For example:

- Populations of some species are under constant pressure from poaching for high value products such as tiger bone, pangolin scales, rhino horn, elephant ivory, and tropical hardwood.
- Overfishing is the universal threat affecting all 391 threatened species of sharks, rays, and chimeras (*Class Chondrichthyes*) (Dulvy et al., 2022).
- One of the key drivers of extinction risk of cacti (*Cactaceae*) – where 31% of the 1,478 evaluated species are threatened – is the unscrupulous collection of live plants and seeds for the horticultural trade and private ornamental collections (Goettsch et al., 2015).



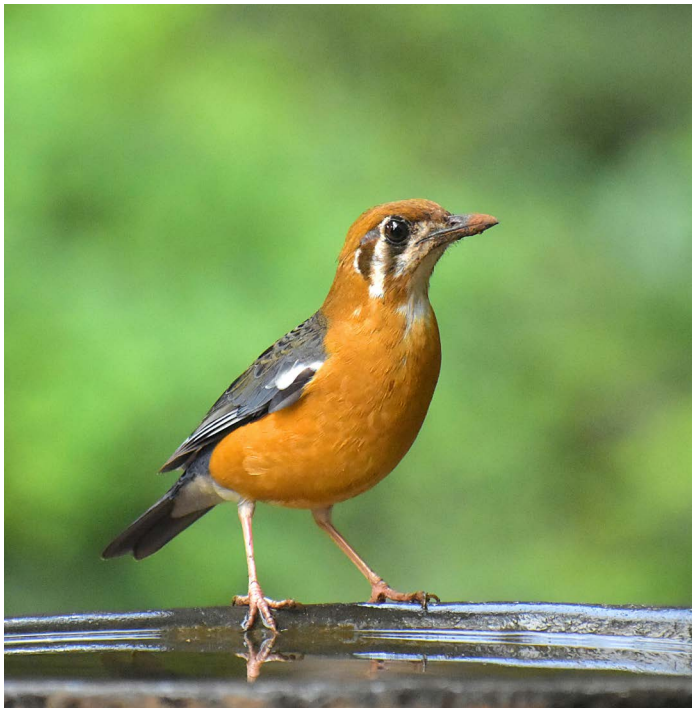


Photo 1 (top left)

Class Chondrichthyes. Overfishing is the universal threat affecting all 391 threatened species of sharks, rays, and chimeras (Dulvy et al., 2022).

Photo: *Shark fishing by Dedhez Anggara / Canva*

Photo 2 (bottom left)

Cactaceae. One of the key drivers of extinction risk of cacti – where 31% of the 1,478 evaluated species are threatened – is the unscrupulous collection of live plants and seeds for the horticultural trade and private ornamental collections (Goettsch et al., 2015)

Photo: *Cacti by @liqionary / Pixabay*

Photo 3 (top right)

Trillium govanianum. A perennial herb endemic to the Himalayas, in high commercial demand and subject to unsustainable collection. This has resulted in the loss of several known subpopulations with 30-50% of all known subpopulations suspected to have been extirpated over the past 10 years (Chauhan & Bisht, 2020; Chauhan et al., 2020).

Photo: *Trillium govanianum by Dipesh Pyakurel / TRAFFIC.*

Photo 4 (bottom right)

The Asian songbird trade affects impacts dozens of globally threatened species in Indonesia and the wider region. It is estimated that one-third of Java's 36 million households keep between 66 and 84 million birds (Lees & Yuda, 2022)

Photo: *Orange Headed Thrush by Shilpesh Patil / Pexels*

- *Trillium govanianum* (Endangered) is a perennial herb endemic to the Himalayas, in high commercial demand and subject to unsustainable collection. This has resulted in the loss of several known subpopulations with 30-50% of all known subpopulations suspected to have been extirpated over the past 10 years (Chauhan & Bisht, 2020; Chauhan et al., 2020).
- The Asian songbird trade affects dozens of globally threatened species in Indonesia and the wider region. It is estimated that one-third of Java's 36 million households keep between 66 and 84 million birds (Lees & Yuda, 2022). The Javan pied starling (*Gracupica jalla*) is now Extinct in the Wild, the Bali myna (*Leucopsar rothschildi*) (Critically Endangered) is close to extinction in the wild, the straw-headed bulbul (*Pycnonotus zeylanicus*) (Critically Endangered) has disappeared from much of its formerly vast range, and the Javan white-eye (*Zosterops flavus*) (Endangered) has declined by 80% in a decade. Demand for caged birds is so intense that many of the remaining forests have been emptied of their songbirds, a phenomenon labelled the 'Asian Songbird Crisis' (Marshall et al., 2020).
- International trade poses a threat to 1041 Critically Endangered and Endangered species, including 402 plants (mainly cacti, dipterocarps, legumes and orchids), 260 ray-finned fishes, 202 birds (about one-third of which are parrots), 200 anthozoans (mainly stony corals), and 196 reptiles (Challender et al., 2023).

In other cases, threatened species can be affected indirectly through bycatch or through disturbance from harvest of other species. For example:

- An analysis of fisheries records between 1990 and 2008 documented more than 85,000 marine turtles caught as bycatch but due to the very small proportion of fishing fleet effort sampled (typically <1%), this figure was likely underestimated by at least two orders of magnitude (Wallace et al., 2010), implying that the actual total may have been 8,500,000 turtles.
- There are numerous other examples of fisheries bycatch affecting non-target marine species. Seahorses (*Sygnathiformes*) (of which 14 species out of 42 are threatened) are harvested at levels that drive declines in the number of mature individuals primarily through targeting for traditional cultural practices and medicinal purposes but also through bycatch (Pollom et al., 2022).
- Clear-felling for timber can destroy non-target trees, plants in the understorey and ground layer, and animal species in the forest ecosystem – an estimated 55% of threatened and Near Threatened bird species are impacted by the unintentional effects of logging (IUCN, 2020). Himalayan pheasants (*Phasianidae*) are very susceptible to disturbance and in many areas the Western tragopan (*Tragopan melanocephalus*) (Vulnerable) has experienced negative effects from collectors of medicinal plants and fungi (*Morchella spp.*) (BirdLife International 2001, Shah et al., 2022).
- A sharp rise in the price of caterpillar fungus (*Cordyceps spp.*), highly valued for a range of medicinal properties, has led to large scale incursions of collectors to Himalayan grasslands in Nepal causing widespread damage to the alpine turf and severe disturbance to wildlife including the Vulnerable snow leopard (*Panthera uncia*) (Farrington, 2016).
- Many species of bat, threatened and non-threatened, roost together in caves, sometimes in huge numbers. Harvesting bat guano from these caves, which does not involve removal of any living part of the organism, may appear to be inherently

sustainable, but excessive disturbance and use of lights by collectors has caused bats to abandon caves, a serious threat to nursery populations, and can disrupt the delicate ecology of cave interiors. Guidelines on sustainable collection of bat guano have been produced to address these concerns (IUCN, 2014).

Nonetheless, some threatened species, even those in the highest category of threat, have been shown to be capable of supporting a carefully regulated sustainable harvest that both benefits conservation of the species and provides financial or other incentives for local communities and for conservation management. For example:

- The yellow-spotted river turtle (*Podocnemis unifilis*) (Vulnerable) is found in the Amazon and Orinoco River basins of South America and is threatened by habitat loss and overharvest of eggs and adults for food. In 2010, a sustainable ranching programme was established in Peru which involves local villagers collecting eggs from the wild and incubating them on protected beaches. Some hatchlings are released into the wild to help restore wild populations, while others are exported as pets. Nest counts have shown a steady population increase, for example, in the Reserva Pacaya Samiria, the number of nests increased five-fold between 2012 and 2017 from 13,947 to 68,979. Poaching and illegal trade of turtles and other species has also decreased, due to enhanced community monitoring of the nesting beaches (CITES, 2019a).

An analysis of fisheries records between 1990 and 2008 documented more than 85,000 marine turtles caught as bycatch but due to the very small proportion of fishing fleet effort sampled (typically <1%), this figure was likely underestimated by at least two orders of magnitude (Wallace et al., 2010), implying that the actual total may have been 8,500,000 turtles.

Photo: *Marine Turtle in net by @Placebo365 / Canva.*

- The saker falcon (*Falco cherrug*) (Endangered) is much sought after by falconers in the Middle East. An artificial nest programme has been implemented in Mongolia to increase the number of potential breeding sites, boost reproduction, and allow a sustainable harvest of chicks (Dixon et al., 2011). More than 5,000 artificial nests have been installed and this programme has produced >10,000 fledglings since 2011 (BirdLife International, 2022).

- Jatamansi (*Nardostachys jatamansi*) (Critically Endangered) is a flowering plant growing at high altitudes in the central and eastern Himalaya. The species is threatened by intensive harvesting and habitat degradation, and it has been described as Nepal's most vulnerable commercially traded species. The aromatic oil extracted from its rhizome is used for medicinal purposes, aromatherapy, and cosmetics. Since collecting the rhizome involves removal of the entire plant, populations are highly sensitive to the level of harvest. The Nepal Forest Act of 1993 devolves ownership of forests to local communities on approval of a sustainable management plan and these community forests have been found to be the most effective option for ensuring harvest is sustainable. A TRAFFIC-led project found that 75% of more than 2000 wild-harvesting households earned an average of USD 352 per year from jatamansi collection – more than the income earned from any other non-timber forest product. Most jatamansi habitats are managed: The plant must only be collected from specific sites, between October and November, and monitored regularly to ensure adherence to permit requirements and with fines for illegal harvesting. All District Forest Officers must carry out an inventory every five years to identify the population trend and conservation status of forest species, including jatamansi, as part of their Five-year District Forest Management Plans. The Department of Forests and Soil Conservation has reported positive outcomes for sustainable conservation of jatamansi and reductions in illegal harvesting (CITES, 2022a; Schindler et al., 2022).
- In South Africa and Namibia, hunting of the Critically Endangered black rhino (*Diceros bicornis*) is permitted under special circumstances. Some populations have a problem of excess males and in 2004, South Africa and Namibia obtained an annual CITES quota of up to five black rhino trophies each, amended in 2019 in South Africa to 0.5% of the total population to adjust automatically for changes in overall population size. The criteria stipulate that only specific individuals (notably old males) can be hunted where their removal will further demographic and/or genetic conservation of breeding populations. Between 2005 and 2018, 47 black rhinos were hunted in South Africa and 12 in Namibia. South Africa only issued four permits for the black rhino in 2020. Black rhino populations increased throughout that period and continue to increase, and there is evidence to show enhanced population demography, genetic diversity and range expansion, suggesting that management, including trophy hunting, is having a positive conservation impact ('t Sas-Rolfes et al., 2022).
- The pirarucu (*Arapaima gigas*) (Data Deficient globally but previously considered threatened nationally) is the largest scaled freshwater fish in the world, found across the Amazon Basin. Its life history characteristics and high economic value (as a source of exotic leather as well as meat) led to widespread overexploitation from the late 1960s to 1990s and numbers became so low that fishing was banned in Brazil in 1996. Government agencies were unable to enforce these restrictions over the vast areas involved so from the late 1990s, Brazil began allocating management rights to communities who could establish access rules, exclude other users from protected lakes, and monitor populations. Widespread and rapid recoveries of pirarucu populations have taken place in areas with community management in place (CITES, 2019b).

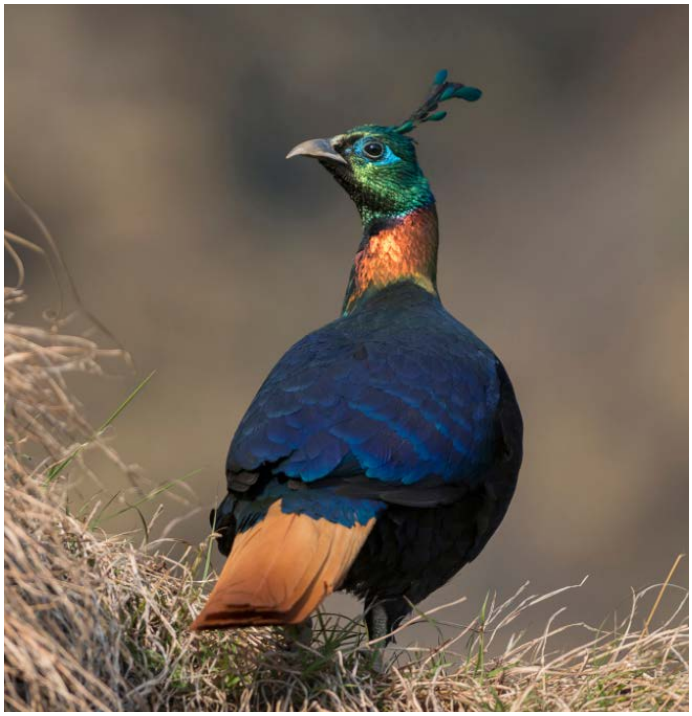


Photo 1 (top left)

Phasianidae. Himalayan pheasants are very susceptible to disturbance and in many areas the Western tragopan (*Tragopan melanocephalus*) (Vulnerable) has experienced negative effects from collectors of medicinal plants and fungi (*Morchella spp.*) (BirdLife International 2001, Shah et al., 2022).

Photo: *Himalayan phesants by Amit Rane / Canva.*

Photo 2 (bottom left)

Cordyceps spp. Highly valued for a range of medicinal properties, has led to large scale incursions of collectors to Himalayan grasslands in Nepal causing widespread damage to the alpine turf and severe disturbance to wildlife including the Vulnerable snow leopard (*Panthera uncia*) (Farrington, 2016).

Photo: *Caterpillar fungus by Nina Aleksandryuk / Canva.*

Photo 3 (top right)

Nardostachys jatamansi. Critically Endangered species, is a flowering plant growing at high altitudes in the central and eastern Himalaya. The species is threatened by intensive harvesting and habitat degradation, and it has been described as Nepal's most vulnerable commercially traded species.

Photo: *Jatamansi collection by Khilendra Gurung / TRAFFIC.*

Photo 4 (bottom right)

Diceros bicornis. In South Africa and Namibia, hunting of the Critically Endangered black rhinos permitted under special circumstances. Some populations have a problem of excess males and in 2004, South Africa and Namibia obtained an annual CITES quota to five rhino trophies in overall population size.

Photo credits: *Black rhino by Rachel Kramer / Canva.*

05

Factors influencing sustainability of harvest and use

An overarching principle for any harvesting and use of any species – threatened or not – is that it must be sustainable.

Sustainable use has been defined by the Convention on Biological Diversity (CBD) as "the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations".

Sustainable use is specifically referenced in the Kunming-Montreal Global Biodiversity Framework, adopted in 2022, with one target (Target 5) to "Ensure that the harvesting, trade and use of wild species is sustainable, safe and legal" in order to, amongst other things, prevent over-exploitation; and another (Target 9) to "Ensure that the management and use of wild species are sustainable" in order to, amongst other things, provide "social, economic and environmental benefits for people".

The IPBES SUA (2022) further notes that "sustainable use is an outcome of social-ecological systems that aim to maintain biodiversity and ecosystem functions in the long term, while contributing to human well-being". The assessment also reports sustainability (or lack of sustainability) to be a result of the interaction of different factors taking place with each use regime, within complex biological, ecological, socio-economic, and legal systems which are dynamic and change over time, at different spatial scales and among the species themselves.

IUCN's *Policy Statement on Sustainable Use of Wild Living Resources* affirms that sustainable use of wildlife can be consistent with, and contribute to, conservation of biodiversity (IUCN, 2000). IUCN recognizes that the likelihood of a harvest being sustainable or unsustainable is not solely a biological question, but is determined by a complex interplay of biotic, social, cultural, and economic factors (and see Chapter 8

for further discussion of potential additional dimensions of sustainability). Harvest takes place within a complex and dynamic social-ecological system, and decisions about whether to harvest, how to harvest, and what to harvest can affect the incentives facing key stakeholders which will in turn influence their behaviour and management approaches. The IUCN Policy Statement highlights four key factors that influence the sustainability of use of wild living resources:

- **Biological:** Use is limited by intrinsic biological characteristics of both species and ecosystems, including life history traits, productivity, resilience, and stability, which themselves are subject to extrinsic environmental change;
- **Governance:** Institutional structures of management and control require both positive incentives and negative sanctions, good governance, and implementation at an appropriate scale. Achieving this involves engaging all relevant stakeholders and taking account of land tenure, access rights, regulatory systems, traditional knowledge, and customary law;
- **Incentives:** Wild living resources have many cultural, ethical, ecological, and economic values, which can provide incentives for over-harvest, but also for conservation. Where an economic value can be attached to a wild living resource, perverse incentives removed, and costs and benefits internalised, favourable conditions can be created for investment in the conservation and the sustainable use of the resource, thus reducing the risk of resource degradation, depletion, and habitat conversion;
- **Supply and demand:** Levels and fluctuations of demand for wild living resources are affected by a complex array of social, demographic, and economic factors. Attention to both demand and supply is necessary to promote sustainability of uses.

The intensity and form of harvest is also, obviously, critical. Removal of entire individuals from the ecosystem is generally more likely to raise risks to species than non-lethal removal of parts (seeds, flowers, shearing of fibre, etc). Removal of entire individuals is usually lethal – although it can also involve removal of live individuals (including eggs or young) for breeding or for trade. However, non-lethal harvest of parts of a species can also be damaging to the individual and increase the threat of extinction. For example, harvest of ornamental leaves from the Central American xate fishtail palms (*Chamaedorea spp.*) for the floriculture industry, combined with habitat destruction, has resulted in a number of xate species being assigned threatened categories on the Red List (e.g. Perez-Farrera, 2015).

Furthermore, some individuals or specimen parts may play a disproportionate role in successful reproduction (e.g. adult males in harem breeding mammals, seeds and fruits vs foliage in plants). Thus, considerations of harvest should consider not only the number and rate of individuals or parts removed from a population, but also their role in reproduction, breeding success, recruitment, or fitness.

Box 1

Ticktin et al. (2023) assessed information on the life history of 27 harvested orchid species and used expert knowledge to identify characteristics that were expected to influence the sustainability of a harvest. They listed 23 characteristics within four themes: abundance and distribution; species traits related to growth and reproduction; local management practices; and demand, then selected 12 characteristics for which information was both observable in the field and available for many species. This formed the basis of a decision-making key that identifies if and how the harvest of a given population at a given point in time can be conducted more sustainably and offers sets of considerations that harvesters and managers can adapt to the local context.

In 2004 the CBD adopted the Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity which provides further guidance, setting out 14 interdependent principles (each of which is underpinned by a set of operational guidelines) to promote the sustainability of use of biodiversity (Box 2). Both the IUCN Policy Statement and the Addis Ababa Principles highlight the importance of supportive policy and IPBES provides useful insights into key policy conditions that enable or constrain sustainable use (Figure 3).

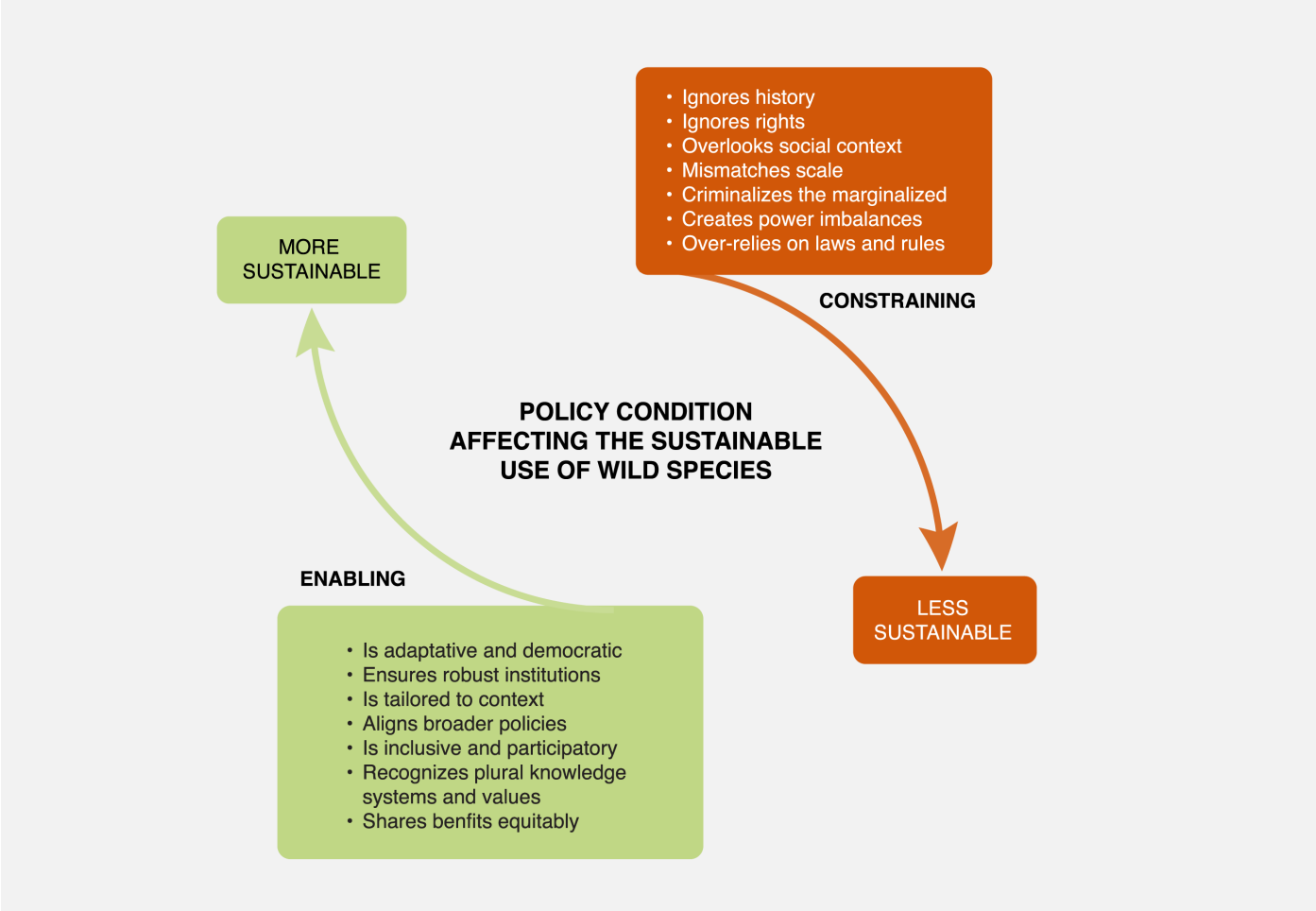


Figure 3: Enabling and constraining policy conditions for sustainable use (replicated from IPBES, 2022).

Box 2: The Addis Ababa Principles

1. Supportive policies, laws, and institutions are in place at all levels of governance and there are effective linkages between these levels.
2. Recognizing the need for a governing framework consistent with international/national laws, local users of biodiversity components should be sufficiently empowered and supported by rights to be responsible and accountable for use of the resources concerned.
3. International, national policies, laws and regulations that distort markets which contribute to habitat degradation or otherwise generate perverse incentives that undermine conservation and sustainable use of biodiversity, should be identified and removed or mitigated.
4. Adaptive management should be practiced, based on:
5. Science and traditional and local knowledge;
6. Iterative, timely and transparent feedback derived from monitoring the use, environmental, socio-economic impacts, and the status of the resource being used; and
7. Adjusting management based on timely feedback from the monitoring procedures.
8. Sustainable use management goals and practices should avoid or minimize adverse impacts on ecosystem services, structure and functions as well as other components of ecosystems.
9. Interdisciplinary research into all aspects of the use and conservation of biological diversity should be promoted and supported.
10. The spatial and temporal scale of management should be compatible with the ecological and socio-economic scales of the use and its impact.
11. There should be arrangements for international cooperation where multinational decision-making and coordination are needed.
12. An interdisciplinary, participatory approach should be applied at the appropriate levels of management and governance related to the use.
13. International, national policies should take into account:
14. Current and potential values derived from the use of biological diversity;
15. Intrinsic and other non-economic values of biological diversity and
16. Market forces affecting the values and use.
17. Users of biodiversity components should seek to minimize waste and adverse environmental impact and optimize benefits from uses.
18. The needs of indigenous and local communities who live with and are affected by the use and conservation of biological diversity, along with their contributions to its conservation and sustainable use, should be reflected in the equitable distribution of the benefits from the use of those resources
19. The costs of management and conservation of biological diversity should be internalized within the area of management and reflected in the distribution of the benefits from the use.
20. Education and public awareness programmes on conservation and sustainable use should be implemented and more effective methods of communications should be developed between and among stakeholders and managers.

Source: https://www.cbd.int/sustainable/addis.shtml

06

Determining ecological sustainability of harvest
the non-detriment findings approach

For species that are harvested for international trade and are covered by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) a process called a non-detriment finding (NDF) is regularly carried out to determine – as the name suggests – that the trade is not detrimental to the survival of the species in the wild.

The NDF process provides useful insights into determining the sustainability of harvest of all species, whether destined for international trade or not, CITES-listed or not, threatened or not.

The status of a species, and the variety and severity of the threats it faces, may encompass wide regional or local variations across its global range so the NDF process considers the global status of a species and also the local population level where the harvest may take place. In its simplest form an NDF requires consideration of five basic criteria:

1. Annual harvest level

2. Life history traits

3. Area of distribution

4. Conservation and threat status

5. Illegal trade levels

Scores are allocated to each criterion and only species which score low across all criteria would NOT be subject to a further, more detailed, assessment to determine the sustainability of harvest. So, species with high or unknown harvest levels, slow or unknown life history strategies; and small or unknown areas of distribution would automatically be subjected to a more rigorous assessment to determine non-detriment. Similarly, species that are threatened would score more highly than those that are not. This includes species that are in the Red List categories of Vulnerable, Endangered, or Critically Endangered (or equivalents if other non-IUCN categories are used, such as 'overfished' or 'depleted') as well as those where the species conservation status has not been assessed or where there is inadequate information to assess the status (Data Deficient). The CITES NDF guidance further explains that NDFs should take account of all forms of trade, legal as well as illegal.

In a more comprehensive analysis of the sustainability of harvest the assessor will consider the level of risk from harvest based on:

- Species biology and life history characteristics
- Species range (current and historic)
- Population structure, status and trends
- Conservation status (globally, nationally and locally)
- Threats (harvest and other potentially compounding threats)

The risk assessment will then be followed by an evaluation which considers the likely ecological impacts of harvesting and the management and monitoring measures in place. The results of the evaluation determine if there is likely to be high or low impact from harvest and good or poor management and monitoring in place, and a decision as to whether harvest is likely to be detrimental to species survival or not is made on this basis with the potential for conditions and/or required remedial actions being put in place even for evaluations which conclude there is a low risk of harvest being detrimental.

Full details on both the simplified and comprehensive assessment processes as well as assessment templates are available on the CITES website[4].

Box 3

The Critically Endangered European eel (*Anguilla anguilla*) provides an illustration where many factors make attaining sustainable harvest very challenging despite a relatively large population size. These factors include a panmictic population with various life stages facing multiple and diverse threats across very widely dispersed geographic regions, lack of enforceable local property rights due to migratory nature through shared water bodies, distribution across many jurisdictions requiring collaboration for effective management, difficulty of identification of some life stages in trade, strong global demand, and relative ease of illegal trade (Jacoby & Gollock, 2014).

[4] The simplified and comprenhensive NDF processes are documented here: https://cites.org/sites/default/files/eng/prog/ndf/ndf_guidance/module_2.pdf. Additional NDF modules – including for Annex I species, aquatic species, migratory species, as well as many taxa and thematic issues – are available here: https://cites.org/eng/prog/ndf/index.php

07

Safeguards for threatened species

As discussed in Sections 4 and 5, the fact that a species is threatened does not mean that all harvesting is inherently or inevitably unsustainable. However, additional safeguards are required.

The Precautionary Principle,[5] which is integrated into many environmental treaties, means not using a lack of full scientific certainty as a reason not to take measures to prevent environmental degradation. As the risk of serious damage increases, the level of certainty required before action is taken reduces, but there must be evidence that the risk of damage is plausible. The Preamble to the CBD refers to this noting that "where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat." This implies that in the case of harvesting threatened species, where information is lacking (for example on population distribution or likely harvest impacts) precautionary risk mitigation measures should be put in place.

CITES also notes that in cases of uncertainty (as to the impacts of harvest) decisions should be made in the best interest of the conservation of the species concerned. It should be noted, however, that this does not necessarily mean harvest should be banned in these instances – CITES also notes that any measures adopted should be proportionate to the anticipated risks to the species. Indeed, the CITES NDF Guidance Module 1[6] notes that "Halting trade or harvests is not necessarily a risk-free or least-risk option – in the presence of high and continued demand, trade might shift to being illegal and become harder to regulate or control." Precautionary measures might, however, include:

- Quotas limiting the number of individuals or the weight or volume of specimens that can be harvested.
- Sex, age, size or weight restrictions on the specimens (whole individuals or parts) that can be harvested.

[5] See https://www.monachus-guardian.org/library/iucn07a.pdf and https://portals.iucn.org/library/node/8528 for more information on the precautionary principle
[6] See: https://cites.org/sites/default/files/eng/prog/ndf/ndf_guidance/module_1.pdf

- Closed seasons or closed areas when harvesting is not allowed.
- Restrictions on harvesting methods – for example line fishing rather than small mesh nets.
- Restrictions on the amount of a whole individual that can be taken – for example proportion of bark, leaves or roots that can be removed.
- Restrictions on types of use or users – for example subsistence only, not commercial.
- Harvest only by recognized local rights holders for their own use.
- Baseline population levels below which harvesting is not allowed.

In all cases close monitoring of the harvest and its impacts will be required with management adjusted accordingly in response to any negative impacts. In situations of weak governance where effective monitoring and management appears unlikely then more extreme precautionary measures may be required which could, at times, entail a ban on harvest.

Where species are categorised on the Red List as threatened due to having populations that are small and declining (IUCN Red List criterion C) or very small but stable/increasing (IUCN Red List criterion D) harvesting should only proceed with great caution, since the small population size itself is posing a threat, and harvesting will normally reduce this still further. An overall assessment must be made as to whether the specific form of harvesting and the number and type of individuals (or parts) removed will increase the level of threat faced by the species, and harvesting should not take place if this is the case. In general, and consistent with *Guidance on the Appropriate Use of IUCN Red List Data in Harvesting Threatened Species* (IUCN, 2022):

- For small populations, in the case of species listed as Vulnerable under criterion D1 (less than 1000 mature individuals and stable) or Endangered under criterion C (less than 2500 mature individuals and declining), harvest should only take place where evidence can be produced to show that the specific harvest proposed (form, number, age/sex classes) is very unlikely to increase the risk of extinction of the species in question (e.g. is non-lethal and does not otherwise harm the species) or is likely to decrease it (e.g. will incentivize or fund necessary conservation efforts).
- For very small populations, in the case of species listed as Critically Endangered under criteria C or D, and as Endangered under criterion D (in all these cases there are less than 250 mature individuals), lethal harvest should not normally take place. Harvest of many of these species would necessarily be unsustainable. For example, the Critically Endangered Tasmanian Western Leek Orchid (*Prasophyllum favonium*) has a known wild population of only 20-32 (Romand-Monnier & Chadburn, 2013). Harvest should only be permitted in exceptional circumstances when there is evidence that harvest will significantly benefit conservation at a very low risk to the population. For example, the very limited sport hunting of a small number of post-reproductive male black rhinos which has been shown to be beneficial for its conservation (‘t Sas-Rolfes, 2023).

Box 4

Guaiac wood (*Gonopterodendron (Bulnesia) sarmientoi*) is an Endangered tree of the Chaco ecoregion in South America. Indigenous and local people use the wood for timber and the resin for medicinal oil, insect repellent, and in rituals. The species has declined due to large scale forest clearance by agribusiness and on a local scale by subsistence farmers. International demand for the wood for furniture has increased in recent decades and it is now heavily traded (Barstow, 2018). Wild-sourced Guaiac from Paraguay has received a 'Negative opinion' from the EU which prevents imports, except for six designated harvest areas that have a 'Positive opinion', certifying that harvesting is sustainable and ethical, thus allowing trade with the EU. A private company manages one of these harvest areas. The harvest is low impact, with cutting of six Guaiac trees per hectare over a harvest cycle of 20 years, and a projected harvest of 1,440 trees per year. The company contracts people from local communities for management, maintenance, harvesting, and transportation. The processing plant also provides employment opportunities to at least 18 local people and apprenticeships for students at the adjacent agricultural school. The project manages the forest sustainably, encourages regeneration, and protects biodiversity (CITES, 2022b).

In some cases, to reduce harvesting pressure on wild populations of threatened species, individuals are brought into ranching, farming, captive breeding or artificial propagation systems (*ex situ* production) to supply the market. However, whether *ex situ* production is more or less beneficial/detrimental than direct removal of individuals from the wild is very context-specific. Ranching involves the collection of early life stage individuals (usually eggs or juveniles) from the wild population for raising within *ex situ* facilities in order to supply markets (sometimes with release of a proportion back to the wild). It is an approach widely used for crocodilians and other reptiles in particular with higher rates of survivorship of juveniles in captivity compared to in the wild.

Vulnerable yellow-spotted river turtle numbers have increased in certain populations managed by a community harvesting programme wherein wild turtle eggs are harvested and reared in captivity. Some of the hatchlings are released back into the wild, while others are exported for the live pet trade (Sinovas et al., 2017). Australian saltwater crocodiles (*Crocodylus porosus*) have increased in numbers to the extent that their status has changed from Endangered to Least Concern assisted by a ranching programme involving egg collection and rearing of juveniles for the luxury skin trade (Fukuda et al. 2011). Here there is no release to the wild, but royalties paid to landholders for each egg collected help incentivize toleration of and habitat maintenance for crocodiles. Many species of wild orchids (*Orchidaceae*) are particularly susceptible to over-harvesting due to naturally small populations and high sensitivity to other threats. Improvements in horticultural technology have enabled mass-production of specimens of a few genera as well as a wider range of other species and hybrids thus reducing pressure on wild populations (e.g. Hinsley et al. 2015).

Overall, however, systematic evidence of the impact of *ex situ* production in the form of captive breeding or cultivation, on the conservation of wild species and habitats is currently lacking (Phelps et al., 2013). Multiple opposing dynamics can potentially operate. *Ex situ* production may reduce harvesting pressure on wild populations but generally only if consumers prefer captive produced specimens. Furthermore, *ex situ* production may remove local incentives to sustainably manage the species in the wild and to conserve its habitat (where these exist). It may also increase (illegal) harvesting of depleted wild populations if wild specimens are preferred to those from captive/artificial production. This is particularly undesirable where it is difficult to protect small or declining populations in the wild. Finally, *ex situ* facilities may replenish captive populations from the wild (especially where captive breeding/cultivation is difficult), therefore exacerbating harvest pressures, and/or releases from captive facilities could introduce diseases to wild populations (IUCN SSC, 2013). Careful assessment of such factors in specific harvesting contexts is required to ensure an appropriate form of harvest that does not increase the level of threat facing the species.

In a few cases, synthetic replacement products have been developed, for example 'faux' furs of the Vulnerable leopard (*Panthera pardus*) in South Africa, made from plastic, leather, or vinyl (Naude et al., 2020), artificial rhino horn consisting of compacted horsehair glued with a matrix of regenerated silk (Mi et al., 2019), and herbal alternatives to tiger bone (Moorhouse et al., 2020). The aim is to provide a legal product and reduce pressure on wild populations but as with farmed and cultivated products there are similar concerns that synthetics may increase demand, attract new customers to the market or allow illegal products to be passed as legal, if they are not easily distinguishable. For an example of some of the complexity associated with farmed and synthetic products, see Box 5 below.

Australian saltwater crocodiles (*Crocodylus porosus*) have increased in numbers to the extent that their status has changed from Endangered to Least Concern assisted by a ranching programme involving egg collection and rearing of juveniles for the luxury skin trade (Fukuda et al. 2011)

Photo credits: *Hatchling Saltwater Crocodile by @oqlpo / Canva.*

Box 5: Bear bile

Bile from the gall bladder of the Vulnerable Asiatic black bear (*Ursus thibetanus*) has been used in traditional Asian medicine for at least 1400 years. The species is protected by law in most countries, and has been included on CITES Appendix I since 1979, but hunting, including commercial poaching, remain a major threat to many populations and extensive illegal trade persists. Bear farms have been established since the early 1980s to supply a legal product and help reduce pressure on wild populations and laboratory production of the active ingredient has made synthetic bile available and widely used (Dutton et al., 2011; Foley et al., 2011; Garshelis & Steinmetz, 2020). Bear bile is therefore available from three different sources, wild, farmed, and synthetic, one illegal, one legal and one nominally legal but potentially associated with some illegal practices.

In the countries of Southeast Asia there is no evidence that bear farms breed bears and therefore have to be regularly restocked by wild-caught young bears, with a negative impact on local populations. Many farms in China breed bears successfully but it is not known whether some restocking with wild bears occurs or whether the supply of legal bear bile reduces demand for the wild product – and hence poaching of wild bears – or whether it stimulates greater demand, as has happened in the Lao PDR (Garshelis & Steinmetz, 2020). Some consumers are reported to prefer the natural over the synthetic product, but detailed market surveys show that consumer preferences are in fact very varied and different types of consumer group consider many factors when making decisions on switching between legal and illegal products and vice versa (Hinsley et al., 2021).

Asiatic black bear (*Ursus thibetanus*) – Bile from the gall bladder of the Vulnerable Asiatic black bear (*Ursus thibetanus*) has been used in traditional Asian medicine for at least 1400 years. The species is protected by law in most countries, and has been included on CITES Appendix I since 1979, but hunting, including commercial poaching, remain a major threat to many populations and extensive illegal trade persists.

Photo credits: *Asiatic black bear by @anankkml / Canva.*

08

Beyond ecological sustainability
taking other dimensions into consideration

Establishing in principle whether a species can be harvested sustainably – that is without increasing extinction risk or preventing recovery – and determining an appropriate level of offtake, are fundamentally biological and ecological questions that require assessment of life history traits, abundance, population trend, reproductive rate, and other characteristics, as well as the potential impacts on other species and the habitat.

However, establishing whether a harvest could be sustainable in practice, including allocation of revenues and benefits to different stakeholders, should also consider a wider set of factors, including indigenous rights and knowledge, local needs and priorities, customary law and land tenure, national legal frameworks, management and governance structures, access rights to resources, and the effectiveness of regulatory systems.

In some cases, therefore, the biological and ecological conditions may indicate that a sustainable harvest is feasible, but in practice it cannot be justified because the management regime or governance conditions are inadequate to ensure the harvest remains sustainable, quotas are enforced, or benefits are shared equitably. As a general principle, good benefit-sharing favours sustainability.

Furthermore, some forms of wild species harvest use can present zoonotic and other risks to human health as well as to animal welfare. These concerns were further highlighted by the Covid-19 pandemic of 2020-2021.

Recognising the challenge of assessing sustainability of wild species use in a comprehensive, but accessible, way IUCN SULi and partners[7] have developed a 5-dimensional sustainability assessment framework. The framework adds the dimensions of animal health and welfare and human health to the more conventional social, ecological and economic dimensions of sustainability. For each of these five dimensions it articulates seven key principles. In addition, seven cross-cutting principles are relevant to all dimensions (Figure 4). The principles are derived from an analysis of existing global standards and guidelines that address one or more dimension of sustainability.

Each of the principles is underpinned by four indicators which identify how closely the use of wild species is aligned with the principle. Each indicator has a score from 0-3. A score of 0 indicates no alignment with the principle (bad practice); 1= emerging good practice with evidence for some but insufficient alignment with the principle; 2 = good practice with evidence for good overall alignment albeit with some weaknesses; and 3 = exemplary or best practice with evidence that the provisions of the principle are met or even exceeded.

For more information about this framework and how to apply it please see https://www.iied.org/assessing-sustainability-wild-species-use

Photo: *Fishtail palm by Wichitra Watchasang / Canva*

[7] Partners include IIED (www.iied.org), TRAFFIC (https://www.traffic.org/), Endangered Wildlife Trust (https://ewt.org.za/) and EPIC Biodiversity (https://www.epicbiodiversity.com/) – supported through the UK government's Darwin Initiative (https://www.darwininitiative.org.uk/)

SUSTAINABILITY DIMENSIONS AND PRINCIPLES					
Nº	**Animal health & welfare**	**Human health**	**Ecological**	**Social**	**Economy**
1	Captive or enclosed animals are provided with, or have access to, species specific and appropriate nutrition, feed, and water which encourages natural behaviours and promotes health.	People coming into contact with / working with wild species and their products (including in production facilities, markets, slaughterhouses etc) understand and practice good personal health and hygiene measures and biosecurity	There is a current formal / informal system (e.g., species or area management plan) in place which considers and governs the scale and rate of use of the target species in its harvest range taking into account its life history strategy and tailored to the local social and ecological context	The use (harvesting, processing, sale etc) of the species does not involve any harmful discrimination (e.g., gender-based, race-based or any other barriers) to effective participation and leadership	There is a formal/ informal business plan in place which specifies the likely market for the product/output of the species use
2	The captive physical environment allows for species-specific comfortable resting places, free and normal movement, substrates and apparatus, thermal regulation, and adequate shelter.	Facilities (incl. vehicles and equipment) handling wild species and/ or their products (particularly food) have appropriate biosecurity, hygiene, food safety and sanitation measures in place to monitor, minimise and mitigate the risk of disease or hazards and cross-contamination / transmission	The species use is aligned with international national, regional, and/or local/customary plans for sustainable management, conservation, or restoration / regeneration of biodiversity	Local communities and indigenous people with legal or customary access and/or use rights are able to maintain control over the species use to the extent necessary to protect their rights, traditional knowledge and customary institutions and uses	There is an enabling environment (policy, legislation, incentives etc) supporting the species use and no external factors (e.g. pressure groups, conflict, political insecurity, global pandemics) undermining its financial viability
3	The catching, maintaining, breeding raising, transporting, handling (and where relevant, killing) of animals is carried out in a way that promotes physical and psychological welfare, minimising the risk of pain, injury, or disease.	Activities involving any interactions with wild species and products are planned, organised and performed in a manner that enables health and safety risks to be identified and appropriate avoidance, minimisation and mitigation measures put in place	The species use does not adversely affect the conservation status of the target species in its harvest range. This includes population, structure and distribution and genetic diversity	Agreements with local communities and indigenous people are based on Free Prior and Informed Consent (FPIC), appropriate and adequate knowledge of customary tenure and access rights	There is a competitive market for the outputs/products of the species use
4	Stocking densities and group composition of captive or enclosed animals ensure (most) normal behaviours, and positive species-specific social interactions.	Condemned, decaying, contaminated or toxic plants, sick animals and mortalities do not enter human food chains. Sick animals are investigated and either quarantined for treatment or euthanized and disposed of according to strict health and safety protocols (e.g., no contact with body fluids)	The species use does not adversely affect the conservation or restoration / regeneration of non-target elements of biodiversity (e.g. non-target species, ecosystems, ecological processes, natural habitats, soil and water condition and quality)	Where the species use occurs on sacred sites or other lands and waters traditionally occupied or used by IPs and/ or LCs, a protocol or code of conduct is in place to regulate the behaviour of personnel and visitors	The type of use of the species (e.g., hunting, tourism, ranching) and/ or product (e.g., skins, resin, meat) is competitive with other available alternatives and does not sacrifice the persistence of the resource

5	The catching, maintaining, breeding, raising, transporting, handling, and slaughtering of animals is carried out in a way that does not facilitate disease or parasite transmission	Trade chains are as short and simple as possible to reduce the number of interfaces at which there could be cross-contamination and transmission of hazards / pathogens and to facilitate traceability	The species use does not facilitate the introduction or spread of invasive or nonnative species that have a detrimental conservation impact	Fair employment conditions, and labour rights, which maintain or enhance social and economic well-being, are provided for all workers including no use of any forced labour including child labour	The species use makes a positive contribution to local economic development and potentially also to sub-national or national economies (e.g., GDP contributions)
6	Captive or enclosed animals with physical or psychological health issues are isolated (where appropriate) and treated/ addressed promptly or killed humanely if treatment is not feasible or recovery is unlikely	An inspection and/or surveillance system is in place to detect signs of disease / pathogens in both animals and people working with the animals	Practices involved in the use of the species do not result in pollution and are efficient in terms of energy and water use and minimise waste generation	The use of the species does not result in the undermining or physical or economic displacement of local communities/ segments within a community (e.g. traditional women harvesters displaced by commercial collectors)	Economic relations (prices, rates of pay, payment schedules etc) in the supply chain are understood and acceptable to those involved
7	People working with animals have sufficient knowledge and understanding of animal behaviour and physiology to ensure good care practices and welfare standards are applied	People working with wild species and their products have appropriate safe and hygienic training, working environments, equipment, and practices	Practices, processes and facilities associated with the species use do not have a negative impact on areas important for biodiversity including e.g., High Conservation Value areas, Protected Areas, Key Biodiversity Areas, ICCAs, OECMs	The use of the species makes a positive contribution to the well-being of local communities in the area where the wild species is harvested	The revenue generated by the species use initiative allows for long-term viability and investment in the restoration and maintenance of the resource

Cross-cutting principles	
1	Wild species use operations and practices are compliant with applicable local, regional, national, and international legal regulations
2	Wild species use operations and practices take note of, and apply, existing authoritative best practice guidance where relevant
3	Wild species use operations and practices are subject to regular monitoring (of disease/health, species population, social context and of the impacts of any processes involved in the use) to facilitate adaptive management
4	Wild species use operations and practices adopt a precautionary approach ensuring risks are anticipated, assessed and addressed in ways as to mitigate or minimise adverse conservation and social consequences
5	Wild species use operations and practices are well-governed and based on robust institutions, demonstrating clearly defined roles and responsibilities, accountability and transparency
6	Wild species supply chains are traceable from the point of off-take and systems in place for monitoring
7	People working with wild species are provided with sufficient training and awareness to ensure compliance with relevant best practices and regulations

Figure 4: The Five Dimensional Sustainability Assessment Framework (source IIED, 2023).

09

Conclusions

Harvest and use of wild species provides benefits to billions of people across the world and can provide an incentive to species conservation, but at the same time, over-harvesting and unsustainable use can drive biodiversity loss and species extinctions.

Getting the balance right between the benefits and risks of harvesting wild species is tricky – and even more so when the species being harvested are threatened. Monitoring use and managing for sustainability in an often rapidly changing external context is challenging and a precautionary approach is required to ensure continued benefits to people without compromising biodiversity.

The context specificity of different use situations is something that cannot be emphasised enough. Too often metrics for assessing the status of species or the level of threat to them (from use or other threats) are calculated at a global level rather than a local level – even though the fortunes of different populations of the same species vary hugely across time and space. Building this nuance into some of the tools available – including IUCN tools such as the IUCN Red List of Threatened Species™, the Green Status of Species and the Species Threat Abatement and Restoration (STAR) metric – could help further inform robust, evidence-based decision-making in the future.

Meanwhile, we hope these guidelines will support policy-makers and practitioners to think through some of the issues involved in a systematic way in order to improve the robustness of decision-making.

Photo: *Pirarucu by TatianaMironenko / Canva*

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Photo: *Saltwater crocodile by @Byronsdad / Canva*

Annex

Using the IUCN Red List as a source of information in making decisions on harvesting threatened species

The IUCN Red List indicates whether the species is assessed is threatened, the criteria used, accompanied by a set of supporting information which may include information needed to make decisions on a harvest. There are, however, several potential limitations on the data in Red List assessments:

An assessment may not be up to date. The percentage of species with outdated assessments on the Red List version 2020.3 was 23.8% (Marsh et al. 2021). For example, frankincense Boswellia sacra was classified as Near Threatened in 1998 yet resin collection harvest rates have increased greatly in intensity during the past 25 years. Where a Red List assessment is several years old, or is marked as 'needs updating' it is advisable to contact the relevant SSC Specialist Group, Red List Authority, or Red List Partner for further guidance on current status and whether a reassessment is in progress or is planned.

A global Red List assessment can encompass wide regional or local variations in status and threats across the species' range. Thus, a globally threatened species could have local or regional populations that are not declining and could withstand a limited harvest. On Conversely, species that are not threatened globally (Least Concern or Near Threatened) may have local populations whose conservation status is unfavourable and for which harvest is inadvisable. In all such cases, the Green Status of Species (GSS) assessment, if available, may contain relevant information at sub-global scale. If not, this information should again be sought from the relevant SSC Specialist Group, Red List Authority, or Red List Partner.

The supporting information presented may be comprehensive at the global level, but it will often not include the fine scale data needed at an individual site or population level.

Demographic data on growth form, life stage, sex/age classes and other life history parameters may not contain the amount of detail needed to inform a decision on use or estimate an appropriate level of harvest.

A Red List assessment only rarely contains detailed information on management effectiveness, governance regime, indigenous and local rights, land tenure, benefit sharing, and other factors that are essential considerations in sustainable harvest. This information will need to be obtained from other sources.

Some information coded in the classification schemes is required for all assessments, some information is recommended, while some is optional or discretionary. For example, the recording of major threats is mandatory for threatened species, but recording of use and trade is only recommended, and may thus not be consistently documented across all species on the Red List. Similarly, coding of threat timing is recommended information, whereas severity and scope are discretionary and often not included. This coding is included in published assessments, but the threats classifications scheme is in the process of revision.

Hence, great care is needed when using Red List information and considerations of harvest should be prepared to supplement this by consulting a wide range of up-to-date and population-specific sources.

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