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REVIEW OF THE CONSERVATION STATUS OF CMS APPENDIX II-LISTED TAXA

(Submitted by the Secretariat)

Summary:

This document has been prepared by the UNEP- World Conservation Monitoring Centre for the CMS Secretariat. It summarizes the results of a rapid assessment of the conservation status of Appendix II-listed taxa and identifies a selection of taxa that may be good candidates for further review in the form of case-studies.

Review of the conservation status of CMS Appendix II-listed taxa

Contents

Introduction

At the 13th meeting of the Conference of the Parties to CMS (COP13; Gandhinagar, 2020), the Parties to CMS adopted Decision 13.24 which, in part, calls for *"an in-depth review of the conservation status of individual CMS-listed species, starting with those species listed in Appendix I classified in the categories of lowest threat of extinction in the IUCN Red List of Threatened Species and whose conservation status has improved since first listed, and* ***those species listed in Appendix II classified in the categories Endangered, Critically Endangered and Extinct in the Wild****…".* This document focusses on the latter, Appendix II aspect of the Decision (the Appendix I species are covered elsewhere through a separate assessment).

To contribute towards the implementation of this decision, the CMS Secretariat engaged the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) to assess the conservation status of CMS Appendix II-listed taxa and help determine which individual taxa may be good candidates for an in-depth review in the form of cases studies.

This report summarizes the results of this assessment. It identifies taxa that could be potential priority candidates for further conservation measures under CMS, and highlights possible next steps, including further in-depth review of selected species in the form of case studies. The data underpinning this assessment are provided in a separate Excel file along with various meta-data (including, for example, data on threats) that have been compiled to help provide further insights. This Excel file provides a valuable resource of data on Appendix II taxa that can be used to help address different questions and priorities.

Methods

This assessment focused on taxa listed exclusively[1] in CMS Appendix II including species covered by higher-level[2] (i.e. order or family level) Appendix II listings (1011 taxa in total; hereafter referred to as "CMS Appendix II-listed taxa"). A decision tree approach was used to assign each of these 1011 taxa to one of several priority groups reflecting the degree to which taxa should be prioritized for further conservation measures under CMS, such as inclusion in Appendix I (see Figure 1). The priority group that a taxon was assigned to (**very high** / **high** / **medium** / **low** / **insufficient information**) was primarily determined by its IUCN Red List status, although the IUCN Red List population trend and an aggregate metric of biological vulnerability for each taxon were also taken into consideration. These supplementary inputs were included to help to identify taxa which would otherwise be considered a medium or low priority on the basis of their Red List status but may warrant further consideration due to their population trend and/or their level of biological vulnerability. Further details on the methods for assessing biological vulnerability are provided in Annex A.

The **very high** priority group equates to all Appendix II taxa categorised as Critically Endangered (CR) or Endangered (EN) in their IUCN Red List assessment. Following a precautionary approach, all taxa assessed in these two categories were included, regardless of the year of the IUCN Red List assessment (Figure 1). For the remaining taxa, only those with a Red List assessment made within the last ten years (≥ 2012) were allocated to the **high**, **medium** or **low** priority groups. Taxa assessed as Vulnerable (VU), Near Threatened (NT) or Least Concern (LC) but with an assessment over ten years

[1] The 118 taxa listed in both Appendices I and II were excluded from this assessment as these taxa have been assessed separately. However, the assessment did include two species (*Calidris canutus* and *Tursiops truncatus*) for which a subspecies is also listed on Appendix I (*Calidris canutus rufa* and *Tursiops truncatus ponticus*).

[2] For Appendix II birds covered under higher-level listings (i.e. at the order or family level), only those identified as meeting the CMS movement criteria by the CMS COP-appointed co-Councillor for Birds were included, regardless of conservation status. As work is ongoing to agree the list of species covered under the higher-level listings for birds, the numbers in this report are approximate.

old were assigned to a separate **insufficient information** group, alongside taxa categorised by the IUCN Red List as Data Deficient (DD), and any species not assessed by the IUCN Red List.

Data sources

For each taxon listed in Appendix II, the decision tree (Figure 1) incorporates the following inputs:

- **IUCN Red List status:** Critically Endangered / Endangered / Vulnerable / Near Threatened / Least Concern / Data Deficient (Data source: IUCN Red List, version 2022-2)
- **IUCN Red List population trend:** increasing / stable / decreasing / unknown (Data source: IUCN Red List, version 2022-2)
- **Biological Vulnerability:** high / medium/ low (Data source: aggregate metric based on a set of three criteria, using data from multiple different sources; see Table A.1 for further details)

Throughout the analysis, all IUCN Red List data for Appendix II taxa listed at the species level was obtained from the most recent global assessment. For Appendix II taxa which are listed at the subspecies or population level, data from regional, subspecies or sub-population IUCN Red List assessments were preferentially used where available[3], but only in cases where sub-global assessments were judged to be more relevant to the conservation status of the subspecies or population listed in the CMS Appendices[4].

[3] Following guidance in CMS Resolution 13.7.

[4] Data from regional, subspecies and subpopulation IUCN Red List assessments were used for the following taxa: *Acipenser ruthenus* (Europe regional assessment), *Gavia immer* (Europe regional assessment), *Halichoerus grypus* (subpopulation-level assessment for the Baltic Sea), *Kobus kob leucotis* (subspecies-level assessment), *Lanius minor* (Europe regional assessment) and *Plecotus kolombatovici* (Europe regional assessment).

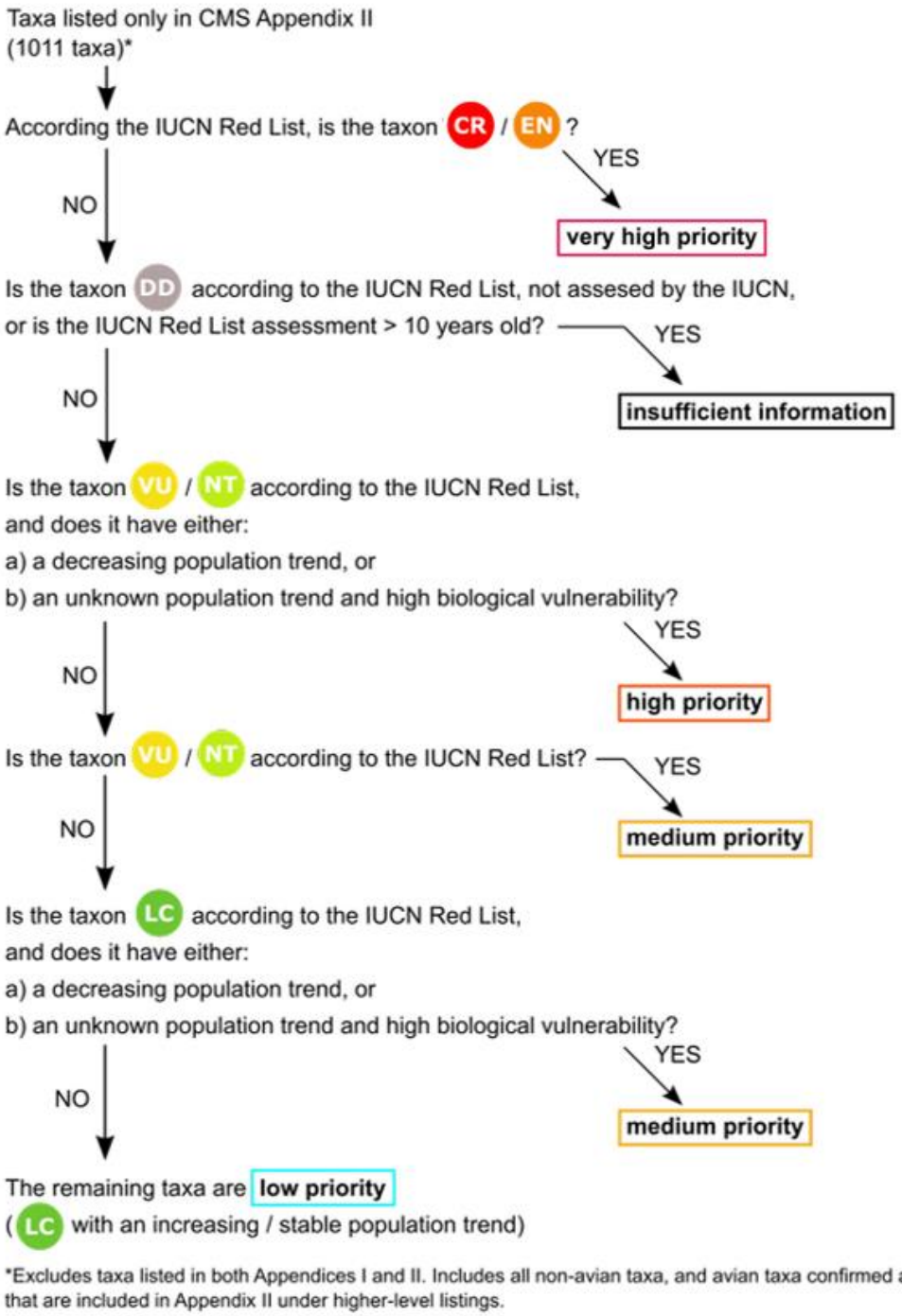

Figure 1: **Decision tree:** Overview of the decision process for identifying CMS Appendix II-listed taxa that might benefit from additional conservation measures, and would be suitable candidates for in-depth review, based on their conservation status and an aggregate metric for biological vulnerability. IUCN Red List status categories: CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern, DD = Data Deficient. Taxa categorised as Extinct by the IUCN Red List (n=1) were not allocated to a priority group and considered separately throughout the analysis.

In addition to the decision tree inputs detailed above, the analysis presented in this document also summarizes information on the threat posed to Appendix II taxa by intentional biological resource use[5] according to the IUCN Red List (version 2022-2). As one of the core obligations of CMS Parties for Appendix I taxa is the prohibition of take, this threat was considered alongside the results of the prioritization exercise in order to identify the Appendix II taxa which might benefit the most from potential inclusion in Appendix I.

Prioritization of Appendix II taxa based on conservation status and biological vulnerability

The 1011 taxa listed in CMS Appendix II have been assigned to five conservation priority groups based on their IUCN Red List category, population trend and biological vulnerability. Fifty-two taxa (5.1%) were classified as very high priority, 127 taxa (12.6%) as high priority, 265 taxa (26.3%) as medium priority and 554 taxa (54.8%) as low priority (Figure 2). Twelve taxa (1.2%) were classified as having 'insufficient information' as there was not sufficient available and/or up-to-date data to assign a priority classification. One (0.01%) taxon has been categorised in the IUCN Red List as Extinct (Chinese Paddlefish; *Psephurus gladius*) and was therefore excluded from the priority groups[6]. Further details of the individual taxa assigned to each priority group are provided in the associated Excel file.

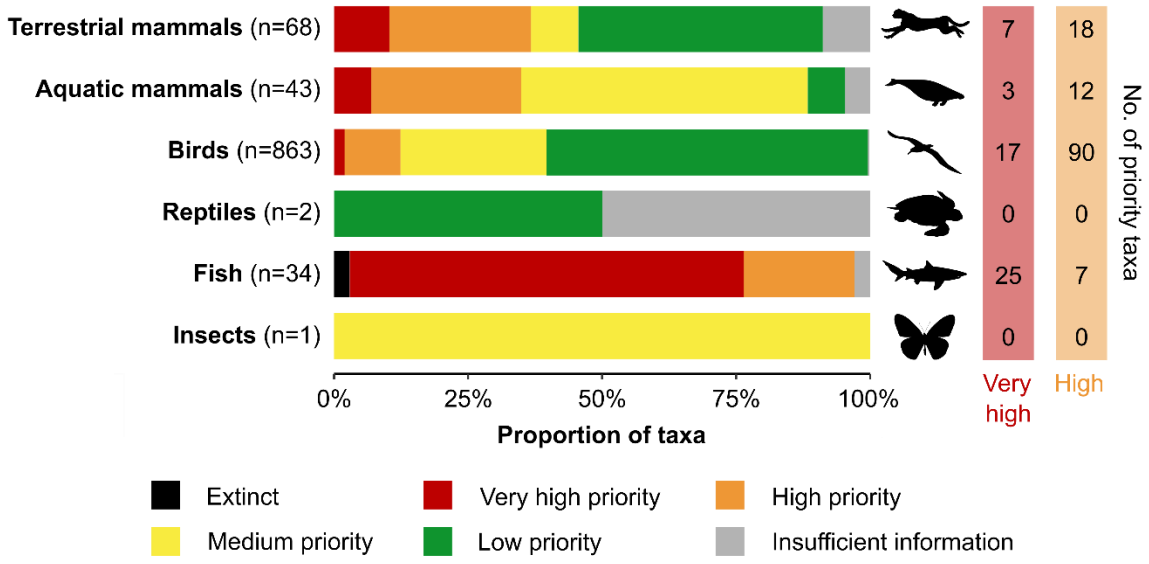

Figure 2: Proportion of CMS Appendix II-listed taxa assigned to each priority group, by taxonomic group. Taxa were allocated to the different priority groups using a decision tree, incorporating information on their IUCN Red List status, population trend and biological vulnerability. The one extinct CMS Appendix II-listed taxon (Chinese Paddlefish; *Psephurus gladius*) is also shown in the chart.

Several taxonomic orders or classes contained a disproportionately high number of taxa (18%) classified as very high and high priority compared to other groups of Appendix II-listed taxa. These

[5] Intentional biological resource use refers to the deliberate targeting of species for harvest, and corresponds to IUCN Red List threat categories 5.1.1, 5.4.1 and 5.4.2 for animals, excluding threats considered 'past, unlikely to return'.

[6] The Syr-Dar shovelnose sturgeon (*Pseudoscaphirhynchus fedtschenkoi*) which is categorised as CR and therefore classified as very high priority, is noted to be 'Possibly Extinct' in the IUCN Red List due to a lack of confirmed sightings within the last 60 years.
Mugue, N. 2010. *Pseudoscaphirhynchus fedtschenkoi. The IUCN Red List of Threatened Species* 2010: e.T18599A8496937. https://dx.doi.org/10.2305/IUCN.UK.2010-1.RLTS.T18599A8496937.en. Accessed on 24 January 2023.

included the **Elasmobranchii** (sharks) and **Actinopterygii** (ray-finned fishes), with 100% and 89% of taxa from these classes assigned to either the very high or high groups, respectively. Among orders of aquatic and terrestrial mammals, nearly three quarters (73%) of **Artiodactyla** (even-toed ungulates), 50% of **Carnivora** (carnivores), 33% of **Cetacea** (cetaceans) and 24% of **Chiroptera** (bats) were categorised as a very high or a high priority. Focusing on birds, more than half (54%) of the **Procellariiformes** (albatrosses, petrels and shearwaters) and 23% of **Gruiformes** (including cranes, crakes and rails) were classified as a very high or high priority.

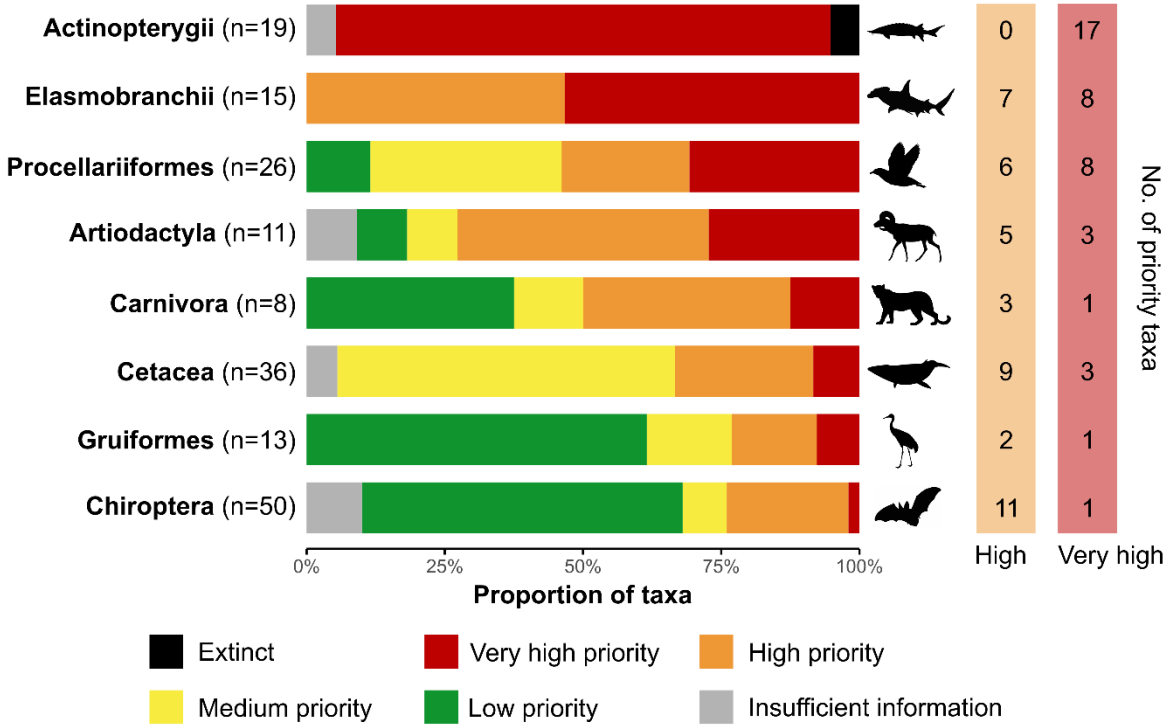

Figure 3: Proportion of CMS Appendix II-listed taxa assigned to each priority group, within taxonomic classes or orders which contained disproportionately high numbers of very high and high priority taxa. Only taxonomic groups that contain five or more Appendix II-listed taxa are shown (178 taxa in total, which represents 17.6% of all taxa listed in Appendix II).

Very high priority taxa (n=52)

Following the methods outlined above, taxa were classified as very high priority if they were categorised as either Critically Endangered (46%; 24 taxa), or Endangered (54%; 28 taxa) by the IUCN Red List. Almost half of the Appendix II listed taxa classified as very high priority (48%; 25 of the 52 taxa) were fish, of which 16 taxa were members of the family Acipenseridae (representing 94% of the 17 Acipenseridae species). Other taxonomic groups represented in the very high group were birds (33%; 17 taxa), terrestrial mammals (13%; 7 taxa) and aquatic mammals (6%; 3 taxa). There were no reptiles within the very high priority group. Intentional biological resource use was considered to be a threat to over three-quarters (77%; 40 of 52 taxa) classified as very high priority. Considering that the *Guidelines for preparing and assessing proposals for the amendment of CMS Appendices* in Resolution 13.7 suggest that taxa categorised by the IUCN Red List as Critically Endangered or Endangered are '*eligible for consideration for listing in Appendix I*', taxa in this category could be considered for such a measure.

High priority taxa (n=127)

Taxa assessed as Vulnerable or Near Threatened by the IUCN Red List, which either had a decreasing population trend (94%; 120 taxa) or had an unknown population trend and high levels of intrinsic biological vulnerability (6%; 7 taxa) were assigned to the high priority group. Most taxa within the high priority group were birds (71%; 90 taxa), over half of which are taxa from the taxonomic orders

Passeriformes (35%; 32 taxa) and Charadriiformes (22%; 20 taxa). The remaining taxa within this category included eighteen (14%) terrestrial mammals, twelve (9%) aquatic mammals and seven (6%) fish. Intentional biological resource use was considered to be a threat to over half (52%; 66 of 127 taxa) classified as high priority.

Medium priority taxa (n=265)

The 265 taxa (26% of 1011 App. II taxa) within the medium priority group were classified as such based on three criteria:

- Taxa were assessed to be Vulnerable or Near Threatened by the IUCN Red List and had stable or increasing populations (6%; 16 taxa)
- Taxa were assessed as Least Concern by the IUCN Red List and had a decreasing population trend (82%; 216 taxa)
- Taxa were assessed as Least Concern by the IUCN Red List and had an unknown population trend and high intrinsic biological vulnerability (12%; 33 taxa).

Birds represented the highest percentage of species within this category (89%; 235 taxa). This category also contained the only insect species listed in CMS Appendix II (Monarch butterfly; *Danaus plexippus*). The remaining taxa in this category were all mammals: 23 (9%) aquatic mammals and six (2%) terrestrial mammals.

Low priority taxa

Taxa assessed as Least Concern by the IUCN Red List with a stable or increasing population trend were classified as low priority. This group contained more than half of all taxa listed in CMS Appendix II (554 taxa). Birds represented the overwhelming majority of taxa categorised as being of low conservation priority (94%; 519 taxa), followed by terrestrial mammals (6%; 31 taxa), aquatic mammals (<1%; 3 taxa) and reptiles (<1%; 1 taxon). There were no fish taxa categorised as low priority.

Taxa with insufficient information

Twelve taxa were assigned to the insufficient information group, as they had been categorised as Data Deficient by the IUCN Red List (eight taxa) and/or their IUCN Red List assessment was over ten years old (three taxa), or because they have not yet been assessed by the IUCN Red List (one taxon, *Gazella erlangeri*[7]). Further details concerning these taxa, including the justification cited for their IUCN Red List status, can be found in Table 1.

[7] In the IUCN Red List assessment for *Gazella arabica*, *Gazella erlangeri* is noted as being a 'mystery' species. See: IUCN SSC Antelope Specialist Group. 2017. *Gazella arabica*. The IUCN Red List of Threatened Species 2017: e.T117582065A88018124. https://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T117582065A88018124.en. Accessed on 31 May 2023.

Table 1: Overview of Appendix II-listed taxa assigned to the insufficient information priority group. Data from global IUCN Red List assessments were used for all taxa, with the exception of *Plecotus kolombatovici* and *Acipenser ruthenus*, for which regional assessments for Europe were judged to be more relevant to the conservation status of the population listed in CMS. *[IUCN Red List status: VU=Vulnerable, NT=Near Threatened, DD=Data Deficient; population trend: ↓ =decreasing, ? =unknown].*

Taxon (Common name) Listing note	Year of CMS App. II listing	IUCN Red List status (Population trend)	Year of IUCN assessment	Justification for IUCN Red List status
Terrestrial mammals				
Gazella erlangeri (Neumann's Gazelle)	1979	*Not assessed*	-	-
Tadarida insignis (Oriental Free-tailed Bat)	1994	DD (?)	2018	Insufficient information on population status, threats, and ecological and habitat requirements.
Myotis alcathoe (Alcathoe Myotis) Only European populations	1985	DD (?)	2016	Recently described species, hard to identify and insufficient information on population size and trends.
Myotis punicus (Felten's Myotis) Only European populations	1985	DD (?)	2016	Insufficient information on population size and demographic trends.
Myotis schaubi (Schaub's Myotis) Only European populations	1985	DD (?)	2016	Rare species, classified as DD in view of taxonomic uncertainty.
Plecotus kolombatovici (Kolombatovic's Long-eared Bat) Only European populations	1986	NT (↓)	2006	-
Aquatic mammals				
Balaenoptera omurai (Omura's whale)	1979	DD (?)	2017	Recently described species, rare records.
Orcinus orca (Killer Whale)	1991	DD (?)	2017	Taxonomic uncertainty. Some regional populations (which may warrant designation as subspecies or even species) are considered likely to meet the criteria for threatened status.
Birds				
Charadrius dealbatus (White-faced Plover)	1994	DD (?)	2016	Recently split from *Charadrius alexandrinus*, insufficient information on its distribution, threats and likely population trend.
Oenanthe dubia (Sombre chat)	1994	DD (?)	2018	Poorly known, insufficient information to estimate range size, population size or trend.
Reptiles				
Natator depressus (Flatback turtle)	1979	DD (?)	1996	Poorly known, uncertainty surrounding population trends.
Fish				
Acipenser ruthenus (Sterlet) Danube populations only	1999	VU (↓)	2009	-

Conclusions and next steps

A substantial proportion of CMS Appendix II-listed taxa (18%; 179 taxa) emerged as either very high or high priorities in the context of this assessment. This includes 52 taxa categorised as Critically Endangered or Endangered in the IUCN Red List (classified as very high priority). Most notably, a striking proportion of fish taxa (both Actinopterygii and Elasmobranchii) were included in these highest categories. The 179 very high and high priority Appendix II taxa are most likely to require or benefit from further conservation measures and therefore deserve closer attention.

Next steps for Appendix II-listed taxa identified as very high and high priorities

Decision 13.24 calls for an in-depth review of the conservation status of individual CMS-listed species, prioritizing, for Appendix II taxa, those species classified in the categories Endangered, Critically Endangered and Extinct in the Wild (assigned to the very high group in this assessment). Based on available resources, five of the 52 very high priority taxa have been considered further in the form of case studies.

- *Loxodonta cyclotis* (African Forest Elephant)
- *Phoebastria irrorata* (Waved Albatross)
- *Galeorhinus galeus* (Tope Shark)
- *Sphyrna lewini* (Scalloped Hammerhead)
- *Anguilla anguilla* (European Eel)

These five taxa (as selected by the CMS Secretariat) are all categorised as Critically Endangered and are threatened by intentional biological resource use. The proposed taxa were chosen to ensure that each of the taxonomic classes within the very high priority group were represented (mammals, birds and fish). Three of these candidates are fish species reflecting the high proportion of this taxonomic group in the very high priority category.

The consideration of these five species in case studies is intended as a starting point; many of the remaining taxa identified as very high priorities, as well as those identified as high priorities in this assessment, are also likely to require further conservation measures, and therefore merit further consideration.

Research needs for Appendix II-listed taxa classified as having insufficient information

Further research is needed to understand the status of the twelve taxa assigned to the insufficient information group (see Table 1). Of these, the eight Data Deficient taxa assessed by IUCN within the last ten years would benefit from further research on their distribution, population size and trends, threats, and ecological and habitat requirements. It should also be noted that for two of these nine species (*Orcinus orca* and *Myotis schaubi*) there are taxonomic uncertainties that must be resolved before their status can be fully understood. For the three species with IUCN Red list assessments made over ten years ago, reassessment would be beneficial. The remaining species classified in this group, *Gazella erlangeri*, has not been assessed by the IUCN Red List and has been noted to be a 'mystery' species[8]. Further investigation into the taxonomic status of this species would be helpful.

Recommendations for Appendix II-listed taxa identified as medium and low priorities

While an in-depth assessment is not currently recommended for the 819 Appendix II taxa classified as medium (265 taxa) or low (554 taxa) priorities, it is still vital to monitor these taxa in case their conservation status deteriorates in the future and/or new threats emerge. Monitoring of this kind could

[8] IUCN SSC Antelope Specialist Group. 2017. *Gazella arabica*. The IUCN Red List of Threatened Species 2017: e.T117582065A88018124. https://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T117582065A88018124.en. Accessed on 31 May 2023.

be achieved through some form of "**periodic review**", which would **enable changes in the conservation status of taxa listed in the CMS Appendices to be tracked at regular intervals**. Such a mechanism would merit further consideration from CMS.

Annex A: Assessing biological vulnerability

The intrinsic biological vulnerability of each taxon was taken into account as an additional precautionary step in the decision tree when assigning taxa to the **high** and **medium** priority groups (Figure 1). Using data from several publicly available datasets, biological vulnerability was assessed by scoring taxa against three criteria chosen to reflect susceptibility to a range of threats: body size, reproductive output (a composite metric based on two life-history traits: the number of offspring produced and age at female maturity) and habitat breadth. Where data were available, taxa were scored along a scale ranging from 0 (low threat) to 1 (high threat) for each of the three criteria. Taxa with a large body size, low reproductive output and narrow habitat breadth were considered to have a higher vulnerability and so received higher scores. Full methods explaining how the individual criteria were scored, along with data sources used, are detailed in **Table A.1**.

An overall biological vulnerability score for each taxon was calculated based on the mean score across all criteria for which data were available, to avoid skewing the results due to missing data. Taxa with a mean vulnerability score >0.66 were classified as having 'high' biological vulnerability, whereas those with a mean score ≤0.66 were classified as 'medium/low'.

Body size, reproductive output and habitat breadth were selected as the three criteria used to assess biological vulnerability as these variables perform well as predictors of susceptibility to a range of threats, or vulnerability to extinction, across multiple taxonomic groups[9,10,11]. Data on these variables covering the range of taxa listed in CMS Appendix II are also available in publicly accessible datasets (for further details on the data sources used see Table A.1).

The three criteria were included to capture different aspects of biological vulnerability.

Body size: considered a key proxy for life history strategy across multiple taxonomic classes[12,13]. Large-bodied taxa tend to follow a 'slow' life history characterised by low productivity and slow rates of population growth. Populations of large-bodied taxa may be more vulnerable to extinction[14] because they are often slower than smaller-bodied taxa to rebound from anthropogenic threats such as over-exploitation[15,16]. Although body size is a good general proxy for life-history strategy, additional traits are needed to capture the full range of variation in life-history strategies between taxa[7,17].

Reproductive output: populations of taxa with low reproductive output (i.e. producing fewer offspring and maturing at a later age) are less well equipped to compensate for decreases in adult survival, and are more likely to be threatened with extinction, compared to taxa with a high reproductive output[8,9,11].

[9] Cooke *et al*. 2019 Projected losses of global mammal and bird ecological strategies. *Nature Communications*, 10: 2279.
[10] Carmona *et al*. 2021. Erosion of global functional diversity across the tree of life. *Science Advances*, 7: eabf2675.
[11] He *et al*. 2021. Combined effects of life-history traits and human impact on extinction risk of freshwater megafauna. *Conservation Biology*, 35(2): 643-653.
[12] Bielby *et al*. 2007. The fast-slow continuum in Mammalian life history: An empirical re-evaluation. *American Naturalist*, 169: 748-757.
[13] Hutchings *et al*. 2012. Life-history correlates of extinction risk and recovery potential. *Ecological Applications*, 22: 1061-1067.
[14] Dulvy et al. 2014. Extinction risk and conservation of the world's sharks and rays. *eLife* 3: e00590.
[15] Jennings *et al*. 1998. Life history correlates of responses to fisheries exploitation. *Proceedings of the Royal Society: B*, 265: 333-339.
[16] González-Suárez *et al*. 2013. Which intrinsic traits predict vulnerability to extinction depends on the actual threatening process. *Ecosphere*, 4: 1-16.
[17] Davidson *et al*. 2009. Multiple ecological pathways to extinction in mammals. *Proceedings of the National Academy of Sciences U.S.A.*, 106: 10702-10705.

Habitat breadth: indicates the number of habitat types occupied by a taxon and is considered a universal predictor of extinction risk across taxa[18]. Taxa occurring in a narrow range of habitats (specialists) are more likely to be threatened than those occupying a broad range (generalists)[8], as these taxa are considered less able to cope with rapid environmental change. Comparative analyses of trait variation across mammals and birds indicate that habitat breath is only weakly correlated with body size and other measures of life history[7], suggesting that it reflects a different aspect of vulnerability, distinct from the other two criteria used to assess biological vulnerability.

Table A.1: Overview of the scoring criteria used to assess the biological vulnerability of Appendix II taxa. Where data were available, individual taxa received a score ranging from 0 (low) to 1 (high) for each of the three criteria: body size, reproductive output and habitat breadth. Individual criteria were not scored when data were missing for a given taxon.

Criteria (Data sources)	Methods	Scoring criteria
1.1 Body size (Amniote Life History Database[19], AnAge[20], FishBase[21], additional data on sharks and rays[22])	**High biological vulnerability:** Large-bodied taxa received a higher score. Upper (top 33%) and lower (bottom 33%) thresholds were calculated for each class based on measures of **adult body mass** (or maximum length for fish) for all species with available data within that class. In cases where a range of measures are available for a taxon the mean value was used. The body size for each Appendix II taxon was then scored against these thresholds.	**1:** > upper threshold **0.5:** between upper and lower threshold **0:** < lower threshold
1.2 Reproductive output (Amniote Life History Database, AnAge, additional data on sharks and rays)	**High biological vulnerability:** taxa with relatively slow life-histories (producing fewer offspring or reaching maturity at a later age) received higher scores. Reproductive output was scored based on two metrics. These are considered complementary metrics and combined to maximise data coverage without 'double counting': (a) Number of offspring produced (i.e. clutch/litter size) (b) Age at maturity Upper (top 33%) and lower (bottom 33%) thresholds for these two metrics were calculated separately for each class based on data available for all species in that class. Where a range of measures are available for a taxon, the mean value was used. Values for both (a) and (b) were then	**1:** 'slow' life history (> upper threshold for age at maturity AND < lower threshold for number of offspring) **0.66:** > upper threshold for age at maturity OR < lower threshold for number of offspring (but not both) **0.33:** between upper and lower threshold for at least one metric **0:** 'fast' life history (<lower threshold for age at maturity AND > upper

[18] Chichorro *et al.* 2022. Trait-based prediction of extinction risk across terrestrial taxa. *Biological Conservation* 274: 109738.
[19] Myhrvold *et al.* 2015. An amniote life-history database to perform comparative analyses with birds, mammals, and reptiles. *Ecology* 96:3109
[20] Available at: https://genomics.senescence.info/
[21] Available at https://www.fishbase.se/
[22] Rigby, C. and Simpfendorfer, C. A. 2015. Patterns of life history traits of deep-water chondrichthyans. *Deep Sea Research Part II: Topical Studies in Oceanography* 115: 30-40.

Criteria (Data sources)	Methods	Scoring criteria
	scored against these thresholds for each Appendix II taxon. Where data were only available for one metric, taxa were scored based on that metric only.	threshold for number of offspring)
1.3 Habitat breadth (IUCN Red List)	**High biological vulnerability:** taxa occupying a narrow range of habitats (specialists) received higher scores. Upper (top 33%) and lower (bottom 33%) thresholds were calculated for each class based on **the number of habitat types**, according to the habitat classifications used in IUCN Red List assessments. Thresholds were calculated based on data available for all species in that class. The habitat breadth for each Appendix II taxon was scored against these thresholds.	**1:** > upper threshold **0.5:** between upper and lower threshold **0:** < lower threshold