UN environment programme

CMS

CONVENTION ON MIGRATORY SPECIES

UNEP/CMS/COP15/Inf.28.1b
3 March 2026
Original: English

15th MEETING OF THE CONFERENCE OF THE PARTIES
Campo Grande, Brazil, 23 to 29 March 2026
Agenda Item 28.1

IMPACTS OF TAKE AND TRADE OF MIGRATORY BIRDS FOR CONSUMPTION IN AFRICA-EURASIA

(Prepared by BirdLife international)

Summary:

The report contained in this document was prepared based on a small-scale funding agreement between the CMS Secretariat and BirdLife International as implementing partner, to deliver on the Decisions 13.109 *Addressing Unsustainable Use of Terrestrial and Avian Wild Meat of Migratory Species of Wild Animals*, and 14.182 to 14.185 *Illegal and Unsustainable Taking of Wildlife*. The study investigated, based on various sources, the direct and indirect impacts of wild meat taking, trade, and consumption on avian species listed in CMS Appendices I and II as well as the potential avian taxa for listing endorsed by CMS COP14, in Africa and Eurasia. The authors identified a substantial scale and impact of take and trade for consumption on CMS-listed avian species across the region, and the actions needed to address resulting population declines.

The project was made possible by a voluntary contribution from the Government of Switzerland.

This document should be read in conjunction with document UNEP/CMS/COP15/Doc.28.1 *Illegal and Unsustainable Taking of Wildlife*.

IMPACTS OF TAKE AND TRADE OF MIGRATORY BIRDS FOR CONSUMPTION IN AFRICA-EURASIA

February 2026

Report prepared for the Secretariat of the Convention on Migratory Species of Wild Animals

by

BirdLife International

in partnership with

CIFOR-ICRAF, IUCN Sustainable Use and Livelihoods Specialist Group and FAO

Authors:

Noëlle F Kümpel, Nik Long, Alix Wagret, Juanita Gomez, Victoria Jones, Lauren Coad, Nathalie van Vliet, Dilys Roe, Djedje Gnahoua, Eugenio Sartoretto, Bruno Portier, Willem Van Den Bossche, Lilla Barabas, Ding Li Yong, Muna Al Taq, Alex Ngari, Tammy E. Davies, Nina Mikander, Nicola Crockford, Daniel J. Ingram, Hannah N.K. Sackey

Funders:

This review was funded by the government of Switzerland, with major contributions from BirdLife International (NFK), the European Union through the Sustainable Wildlife Management Programme coordinated by the United Nations Food and Agriculture Organization (AW, JG, LC, NVV, DG, ES, BP, HNKS) and Jamma Conservation and Communities (NL, DR), and additional contribution through a UK Research and Innovation Future Leaders Fellowship (grant no. MR/W006316/1 awarded to DJI).

Table of Contents

1 Executive summary....4

2 Introduction....8

2.1 CMS and protection for migratory species....8
2.2 Migratory species and take and trade for consumption as wild meat: Relevant CMS Decisions....8
2.3 Scope of this report....9
2.4 Terms used in this report....10
2.5 The take and trade for consumption of migratory birds....10
2.6 Threats to migratory birds from take and trade for consumption....12
2.7 Impacts of take and trade for consumption of migratory birds....13
2.8 Key questions asked in this report....14

3 Methods....14

3.1 Species covered by this report....14
3.2 Data collection and analysis....16
3.3 Systematic online literature review....16
3.4 IUCN Red List Assessments: status and trends of hunted avian species consumed as food....18
3.5 Analysis of data from BirdLife International regional reviews on illegal taking of birds....19
3.6 Presence/absence of project species in hunting, trade and use databases....20
3.7 Information from CMS national reports....22
3.8 International governance review and legal analyses of case study countries....22

4 Results....24

4.1 Availability and quality of data on take and trade of CMS-listed avian species for consumption....24
4.2 Magnitude of take of CMS-listed avian species for consumption....31
4.3 Motivations for take and trade of CMS-listed avian species for consumption....37
4.4 Direct impacts of take of CMS-listed avian species for consumption....45
4.5 Indirect impacts of take and trade of CMS-listed avian species for consumption, including in relation to zoonotic disease transmission risk....54
4.6 Governance and legal protection of CMS-listed avian species....57

5 Discussion....71

5.1 Limitations of our study....71
5.2 Scale, motivations and impacts of take and trade of CMS-listed avian species for consumption....74
5.3 Legislation, enforcement and governance....77
5.4 Conservation and policy to address take and trade for consumption of migratory birds....78
5.5 Recommendations....84
5.6 Conclusions....85

6 References....86

7 Annexes....101



[1]

[1] Images copyright: Nature Conservation Egypt (left), Korsh Ararat (middle), RSPB (right)

1 Executive summary.....

Overexploitation is the most prevalent threat to migratory and CMS-listed birds, with the CMS 2024 State of Migratory Species report finding that nearly half of CMS-listed birds are threatened by overexploitation due to intentional use. Consumption for food is thought to be a major driver of unsustainable take and trade, but the scale and impacts have not been systemically reviewed to inform policy and management. Recognising this information gap, CMS Parties requested a review of the direct and indirect impacts of wild meat taking, trade, and consumption on avian species listed in CMS Appendices I and II**,** following on from equivalent reviews conducted for terrestrial mammals and aquatic megafauna.

Given the large number of CMS-listed birds, the review focused on the African-Eurasian region, as defined by the African-Eurasian Migratory Landbirds Action Plan (AEMLAP). It assessed **all African-Eurasian avian species listed at species level in CMS Appendices I and II as well as those on the list of potential avian taxa for listing endorsed by CMS COP14**, recognising that many additional species meet the criteria for listing and so an understanding of consumption of these species would also be useful. The **project species list is comprised of 302 species** from 18 orders: **224 species listed under the CMS appendices** (16 listed under Appendix I only, 59 listed under both Appendix I and II, and 149 listed under Appendix II only) and 78 species on the potential list.

The review addressed questions related to the scale and type of take for consumption, motivations, direct impacts on species populations including a selection of globally threatened avian species, indirect impacts on other species, ecosystems and people including zoonotic disease risks, governance frameworks, conservation action and policy needs, and knowledge gaps. Information was obtained through 1) a systematic online literature review including relevant data from a public call for information and expert input; 2) a review of information in the IUCN Red List database; 3) a review of three regional assessments of the illegal killing of birds (IKB) coordinated in the Africa-Eurasia region by BirdLife International and an unpublished dataset on legal killing in the European Union; 4) a search of relevant hunting, trade and use databases (the TRAFFIC Wildlife Trade Portal, WILDMEAT database and Sustainable Use Database – SpUD), and 5) a review of national reports submitted by Parties to CMS. Finally, a brief review of international and national governance frameworks, and analyses of the national interpretation of CMS and other relevant frameworks in relation to the take and consumption of Appendix I-listed species, including in six case study countries, was conducted.

The main findings and recommendations of the review are:

1. Widespread consumption of migratory birds

- **Species impacted**: 70% of CMS-listed species (157 out of 224) were recorded as consumed, with higher proportions for species listed under Appendix I only (95%) compared to Appendix II only or on the potential list (61%).
- **Geographical scope**: Consumption of CMS-listed project species was recorded in 84 (68%) out of 123 AEMLAP countries, with limited overlap between data sources.
- **Scale of consumption**: Information on the scale of consumption was patchy and variable across the region. Around 13-43 million (an average of nearly 30 million) birds were estimated to be illegally killed per year in Europe, North Africa, Middle East and the Caucasus, including around 3.5 million individual birds of CMS-listed species, of which the majority (97%) were consumed as food, with considerable variety between countries and sites. Legal hunting in areas such as the European Union (EU) is however far higher than this number (nearly 90% of a sample of species studied). These data **are** however not consistently collected, collated nor published to enable calculation of a clear quantitative total estimate of numbers of birds of all project species taken, both legally and illegally, across Africa-Eurasia.

2. Motivations for take and trade

- **Primary reasons**: Where consumption was compared with other motivations for take, food consumption was a major driver, though often with sport/recreation the primary driver, alongside taxidermy/egg collection. Reasons for consumption vary by region; consumption for subsistence dominates outside Europe, with consumption as a delicacy important in Europe and for trade in the Middle East and Africa, which may be for perceived medicinal (or belief-based) use as well as wild meat. Use was relatively more important at national and international scales (i.e. trade) for raptors compared to other groups, for which local use was more important.
- **Non-food uses**: Belief-based use, particularly for vultures, was significant in some areas, especially in West Africa.
- **Illegality**: 80% of the 69 CMS-listed species recorded as taken for consumption in the systematic review were reported as taken illegally, with the majority of take recorded as being illegal for all regions apart from Europe.

3. Direct impacts

- **Population declines**: The majority of the CMS-listed project species were assessed under the IUCN Red List as having decreasing populations globally (72% or 94 of 131 species with an assessment), of which most (81% or 76 of 94 species) were threatened by hunting and over half also used as food (56% or 53 of 94 species).
- **Unsustainable take**: 42% of species recorded in the systematic review were reported as taken at unsustainable levels in at least one study, compared to 10% reported as sustainable (with 69% of records not reporting on the sustainability of take).
- **Impacts on globally threatened species**: Examples where take for consumption is at least a major contributory factor to global population declines are the European Turtle-dove, Sociable Lapwing, Yellow-breasted Bunting, Yellow-casqued and other hornbills, Marbled Duck (previously Marbled Teal) and other birds in the Arabian Peninsula, the Islamic Republic of Iran and Iraq, and West African vultures.

4. Indirect impacts

- **Ecosystem services**: Declines in bird species including hornbills, seabirds and vultures disrupt ecosystem functions, such as seed dispersal, nutrient cycling, and disease control. Wider ecosystems are impacted by poisoning from lead shot in the United Kingdom and EU, and deliberate carbofuran pesticide poisoning of wetland birds including Black-tailed Godwit in Kenya.
- **Zoonotic disease risks**: While consumption of wildlife including birds is linked to risks of zoonotic disease transmission, evidence from the systematic review on direct links with the project species was limited. Conversely, many studies reported the positive role played by vultures in terms of reducing disease risk from carrion and opportunistic scavengers such as dogs and rats, and thus the indirect negative impacts of vulture declines as a result of consumption.

5. Governance and legal protection

- **Weak implementation**: Many countries lack specific legal frameworks for migratory birds, and where species are legally protected, enforcement is often inadequate, with 80% of take for consumption reported as illegal in the publications reviewed in the systematic review.
- **Risks from direct use and trade to Appendix I species**: A large number of Appendix I species, including birds, are considered 'higher risk' in terms of vulnerability and threat from direct use and trade (including White-backed and Rüppell's vultures at 'highest risk'). Birds were subject to less management than other taxa, and were more likely to be harvested for domestic than international use.

- **Appendix I protections**: Only 20 out of 72 Appendix I project species were reported by CMS Parties to have 100% protection at national level, with average protection as low as 25% across all countries for one species (Cape Vulture *Gyps coprotheres*; caveated by incomplete submission of reports and the inclusion of CMS non-Parties (Range States)). Only 10% of CMS Appendix I species across five African case study CMS Party countries were listed as fully protected under national laws (though in most cases not exactly equating to CMS Appendix I obligations), with only 50% having any level of protection, and gaps were found regarding exceptions for the needs of traditional subsistence users. Some species are also only protected at family rather than species level.

6. Knowledge gaps

- **Challenges with CMS listings**: Discrepancies in species lists and lack of clarity on which species are protected hinder monitoring, legislative updates and effective implementation.
- **Data limitations**: Patchy and inconsistent data on consumption, hunting (even where this is legal), trade and impacts, including as reported by CMS Parties (in part due to the format of national reports), make comprehensive analysis and impact evaluation difficult.
- **Zoonotic links**: Limited research on the role of migratory bird consumption in zoonotic disease transmission.
- **Legal frameworks**: Weak or vague legislation in many countries, with gaps in enforcement and species-specific protections.

7. Conservation and policy examples

- **Cyprus**: Increased surveillance and enforcement reduced illegal bird trapping in the Eastern Sovereign Base Areas by nearly 90% between 2002 and 2024.
- **Lake Chilwa, Malawi**: Community self-regulation of waterfowl hunting in this Important Bird and Biodiversity Area was found to be more effective at ensuring sustainability than an outright ban.
- **West Africa**: The West African Vulture Conservation Action Plan has been developed to address severe declines due to consumption for belief-based use.
- **Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA):** This provides a model for adaptive harvest management of migratory birds.

8. Recommendations

- **Clarity on CMS listings:** Ensure consistency and clarity on which species are listed on the CMS appendices, with listings restricted to individual species; regularly review and update this list in accordance with COP decisions and ensure it is publicly accessible and communicated to and used by CMS Parties and Range States.
- **Strengthened legislation**: Update national laws to align with CMS provisions including through the CMS National Legislation Programme, regularly review and closely regulate any exceptions to the general prohibition of take for Appendix I species, and ensure species-specific protections. Monitor implementation and effectiveness of the National Legislation Programme.
- **Strengthened penalties:** Ensure deterrence of illegal activity and training of prosecutors and judiciary in wildlife crime cases.
- **Improved enforcement**: Allocate adequate resources and personnel with appropriate training, skills and legal powers, and ensure necessary political will and backing, with a high priority given to detecting and pursuing wildlife crime including that related to migratory birds, working with other stakeholders (for example within the framework of a National IKB Action Plan and committee).
- I**mproved compliance**: Conduct awareness-raising and training among hunter communities and ensure consistent messaging from international and national hunting organisations.

- **Alternative livelihoods:** Develop alternatives within communities reliant on subsistence consumption of wild birds.
- **Improved outreach and awareness raising**: Target areas with high levels of consumption of wild birds to help reduce demand.
- **Improved monitoring**: Enhance data collection and reporting on both legal and illegal taking and trade for consumption (including through market surveys and CMS and CITES reporting), with a greater focus on collecting and synthesising data to assess cumulative impact of take at population scale, including through employing adaptive harvest management approaches where possible. Improve monitoring of population size and trends to help in assessment of impact of take and track effectiveness of action.
- **International cooperation**: Promote coordinated conservation efforts across flyways, supporting frameworks like AEWA and CMS action plans and task forces, including with development of guidance, training and exchange of experience on best practice.

These findings highlight the urgent need for increased action at national scale as well as coordinated conservation efforts, improved legal frameworks, and enhanced data collection and reporting to address the unsustainable take and trade of migratory birds for consumption. Understanding the stakeholder groups involved in consumption of migratory birds and their motivations is key to devising and prioritising effective actions nationally. By facilitating coordinated international action through relevant thematic, flyway-level and/or often multi-species Agreements, Task Forces, Action Plans and the like, with adequate resourcing and political support, CMS and its Range States can and must play a vital role in addressing the unsustainable take and trade of migratory birds for consumption and ensuring they, and the ecosystems on which they and people depend, are well protected.



[2]

[2] Images copyright: Nature Conservation Egypt (left), Korsh Ararat (middle), RSPB (right)

2 Introduction .....

2.1 CMS and protection for migratory species……..

Adopted on 23 June 1979 and entering into force on 1 November 1983, the Convention on the Conservation of Migratory Species of Wild Animals (CMS) "provides a global platform for the conservation and sustainable use of migratory animals and their habitats. CMS brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range."[3] To date, 133 countries are Parties to CMS, with near-universal membership in Africa and Europe.[4]

Under CMS, migratory species enjoy varying degrees of special protection. Under Article III of the Convention, migratory species which are endangered[5] can be listed in Appendix I, under which CMS Parties are obliged to prohibit the 'taking' of these species, with a limited set of exceptions. Under Article IV of the Convention, migratory species in an unfavourable conservation status[6] requiring international agreements for their conservation and management[7], or whose conservation status would benefit "significantly"[8] from international cooperation resulting from an international agreement, can be listed in Appendix II. However, this listing is not definitive[9] and, "if the circumstances warrant, a migratory species may be listed in both Appendix I and Appendix II."[10] The main difference between the level of protection of one and the other of these two appendices is that, as a rule, taking of a species listed in Appendix I is prohibited.[11]

2.2 Migratory species and take and trade for consumption as wild meat: Relevant CMS Decisions.

Despite these measures, many CMS-listed species are widely exploited (UNEP-WCMC 2024). CMS-listed species are taken for human consumption across the world, but the scale and impact of this use on wild species populations has not been collated and analysed and therefore remains poorly understood. Responding to this information gap, the 13th meeting of the Conference of the Parties (COP13, held in Gandhinagar, India, February 2020) of CMS directed the Secretariat to prepare an analysis on the direct and indirect impacts of wild meat taking, trade and consumption of terrestrial and avian species listed on CMS Appendices I and II (CMS Decision 13.109 Addressing Unsustainable Use of Terrestrial and Avian Wild Meat of Migratory Species of Wild Animals). At its 14th meeting (COP14, held in Samarkand, Uzbekistan, February 2024), the CMS COP strengthened the relevant mandates by adopting, inter alia, Decision 14.182 to 14.185 Illegal and Unsustainable Taking of Wildlife, including through Decision 14.185 b) directing the CMS Secretariat, subject to the availability

[3] https://www.cms.int/, accessed 5/06/24.
[4] As of 1 March 2022; https://www.cms.int/what-are-migratory-species-and-what-role-cms
[5] Article I.1 (c), CMS: "'Endangered' means, for a given migratory species, that it is in danger of extinction in all or a significant part of its range".
[6] Article I.1 (d), CMS: " "Conservation status" will be taken as "unfavourable" if any of the conditions set out in sub-paragraph (c) of this paragraph is not met; "; Article I.1 (c), CMS: " Conservation status" will be taken as "favourable" when: (1) population dynamics data indicate that the migratory species is maintaining itself on a long-term basis as a viable component of its ecosystems; (2) the range of the migratory species is neither currently being reduced, nor is likely to be reduced, on a long-term basis; (3) there is, and will be in the foreseeable future sufficient habitat to maintain the population of the migratory species on a long-term basis; and (4) the distribution and abundance of the migratory species approach historic coverage and levels to the extent that potentially suitable ecosystems exist and to the extent consistent with wise wildlife management."
[7] Article IV.1, CMS.
[8] Article IV.1, CMS.
[9] Article III.3 and XI, CMS.
[10] Article IV.2, CMS.
[11] Article III.5, CMS.

of external resources, to undertake an analyses on the main drivers and scale of illegal and unsustainable take of species listed in CMS Appendices I and II; and on the impacts of illegal and unsustainable take on the conservation status of such species, including cumulative impacts on species at the migration range and population level; and the consequences of these impacts on affected ecosystems and the services they provide.

2.3 Scope of this report .....

The aim of this report is to contribute to the implementation of CMS Decision 14.185, in particular, by assessing, to the extent possible, the direct and indirect impacts of wild meat taking, trade and consumption for each of the CMS avian species covered by CMS Appendices I and/or II within the Range States listed in Annex 2 of CMS Resolution 11.17 (Rev.COP14) *African-Eurasian Migratory Landbirds Action Plan* (AEMLAP; Figure 1)[12], as well as the potential avian taxa for listing within this geographical area endorsed by COP14[13]. This report complements the earlier reviews of the consumption for wild meat of terrestrial mammals (Coad et al. 2021) and aquatic megafauna (cetaceans, sirenians, chelonians, and crocodylians in the global tropics and subtropics; Ingram et al. 2022) in support of the earlier Decision 13.109 on the topic and incorporates information from the above-mentioned assessment of the impact of direct use on the conservation status of species listed on Appendix I (UNEP-WCMC 2023).

Figure 1. Map of the area included within the African-Eurasian Migratory Landbirds Action Plan[14]

[12] https://www.cms.int/en/document/action-plan-migratory-landbirds-african-eurasian-region-aemlap-10, with map and list of range states provided in UNEP/CMS/COP11/Doc.23.1.4/Rev.1/Annex 2 (version 28 April 2014) at: https://www.cms.int/sites/default/files/document/cop11_Doc_23_1_4_Rev1_Landbirds_AP_E.pdf

[13] Available as Annex to CMS Resolution 14.20 *Potential Avian Taxa for Listing*: https://www.cms.int/en/document/potential-avian-taxa-listing-3

[14] https://www.cms.int/document/african-eurasian-migratory-landbirds-action-plan-aemlap-improving-conservation-status

2.4 Terms used in this report .....

In this report we use the following terminology:

- African-Eurasian region: For the purposes of this report, this comprises the 123 Range States within the AEMLAP boundary (the African-Eurasian flyway covering Africa, Europe, the Middle East and Central Asia up to and including India; Figure 1).
- Take: This follows the broad definition of 'taking' in CMS (Article I (1)(j)), covering 'taking, hunting, fishing, capturing, harassing, deliberate killing, or attempting to engage in any such conduct'. In the frame of this study, any taking of CMS avian species (both land- and seabirds) for human consumption, legal or illegal, regulated or unregulated, is relevant.
- Human consumption: This includes consumption of wild meat (see below) or other wildlife parts (nests, eggs, etc.) by people for food or non-food purposes, including for medicinal or belief-based use. Take of birds as food for falconry, for use in falconry to catch other birds for human food or for veterinary medicinal use is not considered.
- Project species: This includes all avian species individually listed on CMS Appendix I and/or II following COP14 (('CMS-listed species'), plus the potential avian taxa for listing endorsed by COP14, [15] within the AEMLAP region (see section 3.1).
- Sustainable take: Taking 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.[16]
- Trade: The sale or barter of wildlife, wildlife products or wild meat. This refers to all levels of trade, from local to international, unless otherwise stated in the text.
- Threatened by taking: We follow the IUCN Red List definition of a threat, which is "the proximate human activities or processes that have impacted, are impacting, or may impact the status of the taxon being assessed". In the context of the Red List, the 'status' refers to the Red List Extinction Risk Assessment status. More generally in this report a species threatened by taking would be one that is experiencing significant population declines or is at risk from extinction due to the level of take.
- Wild meat: The meat of wild animals, including birds, used for food, also referred to in the hunting literature as 'bushmeat,' and not including wild fish (Milner-Gulland et al. 2002).

2.5 The take and trade for consumption of migratory birds .....

The use of wild animals, including birds, for meat (sometimes termed 'bushmeat' in Africa; herein described as 'wild meat') and other wildlife products such as eggs, is widespread across the globe and provides a key source of income and food (including key nutrients) for many rural communities, especially in the global south (Cawthorn and Hoffman 2015; Nasi et al. 2011). It has been estimated that over 150 million households in the global south may hunt wildlife for food at least once a year (Nielsen et al. 2018), and that 20% of the recommended amount of daily protein in Central African villages is provided by wild meat (Bessone et al. in review). In times of hardship and socio-economic shocks (such as war, economic downturns or the recent COVID-19 pandemic), wild meat provides a 'safety net' (de Merode et al. 2004; Emogor et al. 2024), providing a freely accessible form of food and income when other sources are unavailable.

Wild meat sales can also provide hunting households with an important source of income. For example, in Central Africa over half of a hunter's catch, on average, is sold to traders who then generally transport it to urban areas for sale (Ingram et al. 2025), and wild birds may supply an

[15] As above

[16] Adapted from the Convention on Biological Diversity (CBD) definition of sustainable use (CBD, Article 2)

important part of the income of people selling birds in local markets in the Middle East (e.g. Alahgholi 2015, Elhalawani 2016, reported in Brochet et al. 2019). This can change over time, however; Eason et al. (2015) note that while capturing Common Quail *Coturnix coturnix* in Egypt may once have been primarily for subsistence (and remains so for many Bedouin), they are now a source of income and sold in markets as a seasonal delicacy and food.

While wild meat can still play an important food security role in emerging towns, where affordable alternatives are not yet available (Fa et al., 2015; van Vliet et al. 2015), consumers in large towns and cities generally consume wild meat for reasons relating to culture, tradition, taste preference, health or prestige as a luxury item (Chausson et al. 2019; East et al. 2005; Ingram 2023; Eason et al. 2015) rather than as a necessity. The percentage of the world's population living in urban areas rose from 30% in 1950 to 55% in 2018 (UN 2019) due to rural to urban migration coupled with population growth. As a result, while per capita consumption of wild meat in urban areas is lower than in rural areas, urban populations are responsible for a growing proportion of all wild meat consumption – in Central Africa it has recently been estimated that 40% of all wild meat consumption occurs in towns and cities (Bessone et al. in review). Similarly, in East and Southeast Asia, wild meat consumption is increasingly widespread, in part driven by urban population growth (Yong et al. 2024).

Consumption of wild animals for belief-based use, such as the use and trade in vulture parts (usually bones, heads and suchlike rather than meat per se), is also prevalent and increasing in many areas, including for international trade (Chandra et al. 2024). Birds of 354 species from 25 orders were reported to be used for belief-based use in 25 African countries (Williams et al. 2013) and trapped to obtain fat for medicinal and cosmetic purposes in Yemen (Brochet et al. 2019).

However, while much of the focus on illegal wildlife trade is at international scale, most wild meat trade is local and national (and to some extent cross-border), probably in part due to the short shelf life of the product. Major confiscations of wild meat products in Asia are typically en route to domestic locations (Yong et al. 2024). Transport of wild meat to Europe and the United States from areas such as West and Central Africa does occur but is thought to be at a far lesser scale than the in-country trade. For example, estimates of illegal wild meat flows into Europe through major airports are thought to be in the 100s to 1000s of tons (Chaber et al. 2010); estimates of in-country consumption of wild meat across Central Africa (which may not be illegal) range between 1 and 5.5 million tonnes per year (Ingram 2018).

While adequate data exist to show widespread consumption of wild meat, including of birds, by rural communities, disentangling wild meat 'use' from 'dependence' can be difficult. This has only been robustly assessed in a few cases (e.g., Allebone-Webb 2009; Nunes et al. 2019) and has been identified as a major data gap by Ingram et al. (2021). Similarly, establishing consumption as the primary driver for take of birds can be difficult, as often birds taken for sport – either legally or illegally – are subsequently consumed in areas such as Europe, Central Asia and the Middle East (Brochet et al. 2016, 2017, 2019).

While market data are often used to gauge the scale and type of wildlife trade and consumption, they can give a biased picture, particularly for birds. Trade volumes underestimate the numbers taken: the total number of individual birds sold each year in international trade at the start of the 1990s was estimated to be c.2–5 million, but the number *taken* each year for this trade may have been up to 10 million, since as many as half the birds could have died before they reached a dealer (Mulliken et al. 1992). The relative proportion of birds traded to market can also be much lower than that actually taken where other larger, usually mammal, species are more valuable and still common, or as a result of higher decomposition rates of birds (Kümpel 2006). For example, in Equatorial Guinea, 36% of animals were estimated to have escaped/been scavenged from traps, 9% of all animals were recorded

as discarded from traps (many of which were birds as they decompose quickly), and a further 12% less favoured/semi-decomposed species were recorded as eaten in hunter camps so missed from the village offtake record, around one-third of which were birds (Kümpel 2006).

The take, trade and consumption of wild birds is widespread across the world, with significant differences between regions in scale, methods and motives. Birds and their parts are captured by a variety of means: shooting, trapping (including using mist or other types of net or trap, lime-sticks, wire snares etc.), poisoning, and egg taking (BirdLife International 2019). Migratory birds can be a particular target due to large congregations stopping off on their long migration routes at a predictable time of year and in a relatively confined area, sometimes in an exhausted state after completing a long sea or desert crossing.

Almost half of all bird species (4,561 bird species; 46%) have been recorded as used by humans, with 15% taken for food (BirdLife International 2022), though this is likely an underestimate due to the limited documented records of species hunted for food (BirdLife International 2016; Butchart et al. 2008). An even greater proportion (over 60%) of CMS-listed migratory birds are taken (UNEP-WCMC 2024). In areas such as the Mediterranean, migratory birds are specifically targeted in their millions along known bird migration routes (Brochet et al. 2016). In terms of hunting for sport and food, at least 102 million individuals of the 82 bird species listed on Annex II of the EU Birds Directive were estimated to be killed in the EU during 2001-2003 (Hirschfeld and Heyd 2005), and millions of birds are estimated to be taken from the wild each year for food and other reasons around the world (BirdLife International 2022).

However, systematically collected data on consumption of birds, and specifically migratory/CMS-listed birds, is patchy for a number of reasons. The prevalence of taking and targeting of birds, and associated dependency or use for subsistence or commercial trade, varies between countries and regions. Whereas the legal and illegal killing of birds is relatively well-documented (if not well-monitored) in some regions, as noted above, in areas where wild meat is a staple source of protein and the take and trade of larger, preferred mammalian species is more prevalent, such as central Africa, the proportion of take of birds for consumption is less well-documented and recognised. Regional analyses of hunter offtake data from across Central Africa found birds accounted for 2% of total catch (Ingram et al. 2025), though, as noted, offtakes of bird species can be significantly under-reported in hunter, household and market surveys, with birds often not being identified to species or even higher taxonomic level, particularly where they are not the target (Kumpel 2006; Sackey et al. 2022). In parallel, data availability and research and conservation focus vary across these same scales.

2.6 Threats to migratory birds from take and trade for consumption.....

Unsustainable take or overexploitation is the most geographically widespread threat to birds (BirdLife International 2022), including migratory birds (UNEP-WCMC 2024). Hunting and trapping affects 37% of globally threatened birds and has been a factor in the extinction of at least 50 bird species in the last 500 years (BirdLife International 2022). Overexploitation is a key threat to migratory species, affecting 70% of CMS-listed species, and the most prevalent threat to migratory and CMS-listed birds, mainly from direct exploitation (UNEP-WCMC 2024).

Consumption for food is thought to be a major driver of unsustainable take and was found to be the most common reason (usually combined with other motivations) behind the illegal killing and taking of an estimated 11-36 million birds per year in the Mediterranean, much of which was of migratory species, as well as a further 0.4-2.1 million birds in the rest of Europe and the Caucasus, and 1.7-4.6 million in the Arabian Peninsula, Iraq and the Islamic Republic of Iran (BirdLife International 2022). In Southeast Asia, Yong et al. (2024) estimated that at least 5 million Barn Swallows *Hirundo rustica*

alone, and several other hirundines, are taken each year for domestic consumption, alongside at least 500 other species of birds. A systematic review of information sources on the illegal taking of birds in sub-Saharan Africa by BirdLife International (in prep.) found reports of an estimated 176,000 to 470,000 gamebirds illegally poisoned in South Africa each year (Berruti et al. 2005) and an estimated 1.2 million waterbirds illegally caught each year for bushmeat by at least 460 trappers at Lake Chilwa in Malawi (Waterland et al. 2015). Where take may be legal under national law, it can still be unsustainable if not adequately monitored and managed.

Migratory birds are particularly vulnerable to overexploitation due to their tendency to congregate in large numbers in particular sites at known times of the year. However, inter-regional variations, and the global scale and impacts of avian take for human consumption, including that of migratory species, have not been specifically reviewed and compiled, with resulting policy and conservation gaps.

2.7 Impacts of take and trade for consumption of migratory birds.....

Birds play many important roles within ecosystems, as predators, scavengers, prey, pollinators, seed dispersers and ecosystem engineers (BirdLife International 2022). For example, seabirds cycle nutrients between the sea and land, hornbills disperse large seeds in tropical forests aiding carbon storage, insectivorous birds consume an estimated 400-500 million tons of prey every year, suppressing insect pest populations, vultures dispose of organic waste (e.g. livestock carcasses), and 'avitourism' provides income and jobs to local people and economies as well as health and wellbeing benefits (*ibid*). Migratory birds undertake diverse ecological roles in both their breeding and non-breeding distributions. Migratory birds also hold strong cultural significance around the world, inspiring art, music and literature and being associated in particular with journeys, new beginnings and the coming of seasons (UNEP-WCMC 2024). For example, the arrival of the Egyptian Vulture *Neophron percnopterus* is associated with health and productivity and that of the White Stork *Ciconia ciconia* with birth and prosperity (*ibid*).

While many migratory bird species are threatened with local or global extinction, even common and widespread species are declining rapidly in many cases, which can impact ecosystem function and resilience and the provision of ecosystem services (BirdLife International 2022). This also undermines the sustainability of the resource base and can have a knock-on impact on local people who might depend on avian wild meat for their subsistence (whether as protein or income). Conversely, the disruption of natural ecosystems by people and the exploitation of wild species such as birds can increase the risk of transmission of zoonotic diseases (those transmitted from animals to humans) (*ibid)*. Bacterial and viral zoonoses associated with wild meat have caused spillover events in the last few decades, resulting in localised outbreaks (e.g. Marburg virus disease and anthrax), epidemics (e.g. Ebola virus disease and avian influenza) and occasionally pandemics (e.g. COVID-19 and HIV/AIDs) (Tumulty et al. 2023). In addition to emerging zoonotic diseases, endemic food-borne diseases (caused by pathogens infecting animals or contaminating meat) are routinely transmitted to humans and are an important cause of morbidity and mortality and a significant barrier to socio-economic development worldwide (*ibid*). However improved understanding of the role of consumption by humans, disease transmission pathways and relative species risk is still needed.

2.8 Key questions asked in this report.....

With regard to the avian component as outlined in CMS Decision 13.109, we focus on the following key questions regarding the avian species in the AEMLAP area already listed on CMS Appendices I and II ('CMS-listed species') as well as those species evaluated as having potential for listing on CMS Appendices I and II (together, 'the project species': see section 3.1):

- Which of and how are these species impacted by take for human consumption (both legal and illegal)?
- What information is available on the scale of take for consumption, types of use, trends, and geographical variation?
- What are the motivations and drivers for taking and trade of these species for consumption?
- What are the direct and indirect impacts of the consumption of these species across their range? How does this compare with other drivers of decline?
- What are the linkages between taking, trade and consumption of these species and the spread of zoonotic diseases?
- How well are these species protected from illegal and/or unsustainable take, including where this pertains to consumption?
- What are our knowledge gaps concerning the take of these species for human consumption and how could these be filled?
- Are there any recommendations for policy and management to ensure the legality and sustainability of any take for consumption of these species, and strengthened protection where take is illegal or unsustainable?

3 Methods.....

3.1 Species covered by this report.....

We investigated the consumption of all wild migratory bird species individually listed in CMS Appendices I and II together with the potential avian taxa for listing prepared by the Scientific Council for CMS COP14[17] across the AEMLAP region,[18] covering Africa, Europe, the Middle East and Central Asia up to and including India. This is referred to henceforth as the 'project species list' or our 'project species'. Separate reviews of the consumption of CMS terrestrial migratory mammal and aquatic migratory megafauna species have already been conducted.[19]

Following the definition of 'migratory species' in CMS Article I 1 (a), we only included species listed at species-level, rather than including families or other groups of species that represent less specific units of classification and may include multiple species, not all of which might be found in the relevant country or migratory or in need of management/regulation.

We obtained the project species list as follows:

[17] https://www.cms.int/en/document/potential-avian-taxa-listing-0. Version endorsed by CMS COP14 available as Annex to CMS Resolution 14.20 *Potential Avian Taxa for Listing*: https://www.cms.int/en/document/potential-avian-taxa-listing-3

[18] The geographic scope of the study is limited to the Range States listed in the Annex of CMS Resolution 11.17 (Rev.COP14) African-Eurasian Migratory Landbirds Action Plan (AEMLAP; map available on page 21)

[19] The terrestrial migratory mammal review can be accessed here: https://www.cms.int/en/publication/impacts-taking-trade-and-consumption-terrestrial-migratory-species-wild-meat-report (Coad et al. 2021) and the aquatic migratory megafauna review here: https://www. cms.int/en/document/report-aquatic-mammals-working-group-aquatic-wild-meat (Ingram et al. 2022)

1. We first extracted all global avian species listed at species-level in the official CMS Appendices following COP14[20] (giving 202 species).
2. In order to account for those migratory species in unfavourable conservation status which are not individually listed in the above appendices but covered by higher taxonomic listing only, we then added the 85 (global) species previously covered by higher-level taxonomic appendix listings and identified as being migratory and in unfavourable conservation status in the annex to CMS Resolution 14.19.[21]
3. While these two sets of data should total 287 species, two species (*Gypaetus barbatus* and *Pluvianellus socialis*) appeared in Resolution 14.19 but were subsequently listed on Appendix I at COP14, and therefore appear in both lists; the resulting duplicates were therefore removed, giving 285 species total at global level.
4. We also wanted to consider avian species that are not yet CMS-listed but may merit being so. Given a significant proportion of avian species are migratory and have an unfavourable conservation status but are not yet listed under CMS Appendix I or II, a new strategic approach has been used by Scientific Councillor Stephen Garnett to prepare a list of potential avian taxa that would meet the criteria defined in the guidelines for preparing and assessing proposals for the amendment of CMS Appendices in Resolution 13.7. Given the relevance of these species to this review, we added these 157 species[22] to the above set to create an initial global species list of 442 species.
5. Country occurrences of each of the 442 species in this initial global species list were extracted from the latest IUCN Red List dataset for birds.[23]
6. Finally, only species with their distribution falling within Africa-Eurasia[24] were included in our 'project species list,' totalling 302 species.

The project species list is comprised of 302 species from 18 orders: 224 species listed under the CMS appendices[25] (16 listed under Appendix I only, 59 listed under both Appendix I and II, and 149 listed under Appendix II only) and 78 species on the list of potential avian species for listing (Table 1).

Table 1. Summary of calculation of the project species list, including CMS Appendix-listed species (sources of information detailed in text)

	CMS Appendix I and II species pre-COP14 (a)	Disaggregated species to include post-COP14 (CMS Resolution 14.19) (b)	Total CMS-listed species post-COP14 (a + b)	Potential species for CMS listing (CMS Resolution 14.20) (c)	Total project species (a + b + c)
Global number of individual species	202	85 (inc. 2 duplicates with source a)	285	157	442

[20] https://www.cms.int/sites/default/files/uploads/revised-appendices_cop14_e.pdf
[21] https://www.cms.int/sites/default/files/document/cms_cop14_res.14.19_disaggregation-higher-taxa-listed-cms-appendix-ii_e_0.pdf: note that while the legend of the annex cites 86 species, there are actually only 85 species listed in the table.
[22] Potential Avian Taxa for Listing from CMS resolution 14.20: cms_cop14_res.14.20_potential-avian-taxa-for-listing_e_0.pdf
[23] BirdLife International (2024) IUCN Red List for birds. Downloaded from https://datazone.birdlife.org 13/9/24
[24] As delineated by the AEMLAP geographic boundary
[25] This comprised 164 African-Eurasian species listed by species name under Appendices I and II of the Convention and 61 additional African-Eurasian disaggregated species according to the annex to Resolution 14.19 (of which one was a duplicate and subsequently removed).

Africa-Eurasia number of individual species	164	61 (inc. 1 duplicate with source a)	224	78	302

3.2 Data collection and analysis

Information on take and trade for consumption of the project species was obtained through the following means: a systematic online literature review including relevant data from a public call for information and expert input, a review of information in the IUCN Red List database, a review of three regional assessments of the illegal killing of birds (IKB) in the Africa-Eurasia region coordinated by BirdLife International, a search of relevant hunting, trade and use databases, and a review of national reports submitted by Parties to CMS. Finally, a brief review of international and national governance frameworks, including detailed legal analyses of the national interpretation of CMS and other relevant frameworks in relation to the take and consumption of Appendix I-listed species in a set of 6 African case study countries, was conducted.

Where relevant, we evaluated the systematic literature review, Red List and combined regional IKB review datasets in combination or alongside each other to see whether these different sources of data showed similar patterns of and reasons for consumption across regions and taxonomic groups. Combined analyses were limited however by differences in data format and parameters.

3.3 Systematic online literature review

A systematic online literature review, supplemented by an open call for information, was carried out to search for publications relating to consumption of each of the 302 species, collecting data on type of publication and survey method, scale and sustainability of take, type of use, motivations, management and impacts, and supplemented with information gathered through an open call for information. The search was conducted in English and French, given the high proportion of French-speaking countries in the AEMLAP region; other languages were not possible due to capacity limitations. Data were gathered and analysed according to the following steps:

Online search

- Formulation of the keywords and scoping searches: To systematise our searches, we created a list of pre-defined search terms. Initial searches were carried out to test and finalise search keywords. We used Google Scholar as our main search platform. An initial search was carried out to obtain an overview of the level of information available online regarding avian wild meat. Original searches incorporating general taxonomic terms and geographical qualifiers rendered >20,000 returns so our search terms were refined accordingly.
- Finalisation of keywords: Our main searches focused on each of the project species and were conducted in English and French, as listed under (1) below and after refining the inclusion/exclusion criteria as noted. Following this, we carried out a further search focusing on 'migratory birds' with geographical qualifiers (in English only, listed under (2) below) in order to check we were not missing substantial amounts of information, and this only returned a limited number of additional publications (6570 results, rendering 9 relevant publications, of which only 2 were additional sources used in final data extraction).
    1. **("*Latin name*" OR "Common Name") AND (poach* OR troph* OR cultur* OR conflict OR medicine OR bycatch OR bushmeat OR trade OR sale OR traffic* OR legal OR illegal OR seiz* OR hunt* OR harvest* OR trap* OR tak* OR net* OR kill* OR poison* OR consum* OR meat OR wildmeat OR food OR market)**
    2. **("migratory bird") AND ("Africa" OR "Europe" OR "Central Asia" OR "Middle East" OR "India" OR "African-Eurasian Flyway" OR "Central Asian Flyway") AND (consum* OR meat OR wildmeat OR food)**

Initial selection of relevant publications: We then searched the first 20 pages of results from Google Scholar (later reduced to 10 pages as limited relevant information was being obtained after this point) to select the most relevant publications for each species, using abstracts and titles. Up to a total of 15 publications were considered for each species, due to the time available for review and analysis of these publications, but no search returned more publications than this. We included peer-reviewed articles, peer-reviewed and published reports, and unpublished reports (i.e., 'grey literature'), but not news articles or blogs. Where a publication referenced primary data from another source, we located the publication containing the primary data when available and selected this instead of the primary source. Relevant publications provided data or information on the hunting, use, or trade of reviewed species.

Addition of information from open call

- Open call for information: In addition to the online literature review, we put out a public and expert call for information through relevant networks (including BirdLife International's global and regional secretariat offices and Partner NGOs), listserves (including the IUCN Sustainable Use and Livelihoods Specialist Group global and relevant regional listserves), social media and a side event and associated promotion at CMS COP14 in Samarkand in February 2024.
- Information received included several papers and reports not picked up in the online literature review including a number of papers identified through a recent regional literature review of illegal taking of birds in sub-Saharan Africa (BirdLife International unpubl.). Information from other regional reviews on illegal taking of birds conducted by BirdLife International was only included where project species were named in the published paper in relation to consumption; relevant information on many project species had however been collected and was made available and analysed separately (see section 3.4 below).
- Combination of data from all sources into single database: Data from these additional sources was combined with that from the online literature review into a single project database, recording a total of 126 unique publications (Table 2).

Table 2. Sources of information compiled into the project database and analysed as the 'systematic review'.

Source of information	Number of publications
General call	4
Snow-balling	6
Species Use Database (SpUD)	2
BirdLife literature review of illegal take of birds in sub-Saharan Africa (unpubl. data)	30
Systematic online review conducted by project team (as above)	85
Total publications	127
Total unique publications	**126**

Data review and extraction

- Refinement of inclusion/exclusion criteria: To reduce the number of publications down to only species taken for food/medicine (thus removing those referring to other forms of take such as due to bycatch or human-wildlife conflict), we searched for key terms within the publications (food, consum*, meat) and read abstracts to ensure relevance, following the steps described in Table 3; full results in Annex 4). This resulted in 83 project species (69 CMS Appendix-listed species) identified as taken specifically for consumption – 80 (66) for food and 32 (27) for medicine (with some taken for both food and medicine) (Table 3).

Table 3. Steps to include/exclude publications following the systematic online literature review.

Systematic online review search step	English (string 1)	English (string 2)	French (string 1)	TOTAL
Number of references output from online search	44,439	6570	4,265	55,274
Number of relevant references following scoping review	538	9	328	875
Number of unique papers once duplicates removed	342	7	178	527
Final publications with relevant information	**68**	**2**	**15**	**85**

- Data extraction. We built an Excel database to collate quantitative and descriptive information from each publication, focusing on cases where consumption was mentioned as a reason for take. The database has been supplied separately as part of this report (Annex 5) and all references obtained are also available in Annex 6. For each species we recorded the search terms used and the number of results returned in Google Scholar. For each publication we recorded information on:
    - The publication itself: authors, year of publication, countries covered in the publication, type of publication
    - The type of data presented in the publication (for example, hunter surveys, seizures, patrols, questionnaires etc.)
    - The motivation for use (for instance for food consumption, trade, medicine, culture, bycatch, human-wildlife conflict etc.)
    - The type of use (traditional, rural, urban, subsistence, commercial, bycatch/not intended for use, and whether adequate alternative protein was available/accessible)
    - The geographic location of the use (at the scale given)
    - The legality of the use (legal, partly illegal or illegal, and any reference to CMS)
    - Enforcement (whether legality and/or sustainability was enforced or not)
    - Sustainability (whether assessed as sustainable or not)
    - Details of any trade, and the scale of the trade (local, local but transboundary (crossing national borders), national, international, transboundary)
    - Details of any large-scale drivers, where given (i.e., the development of roads, civil conflict, or extractive industry development)
    - Whether any quantitative data on take was recorded (amounts, type and frequency)
    - The direct impacts (whether in relation to trade or not, and any species population declines) and indirect impacts (including effects on other species or food webs, effects on ecosystem functioning or services, and impacts on human societies such as food security) of the use
    - Any record of zoonotic disease risks from the use of the species.

3.4 IUCN Red List Assessments: status and trends of hunted avian species consumed as food….

The IUCN Red List of Threatened Species is a checklist of taxa that have undergone an extinction risk assessment using the IUCN Red List Categories and Criteria. It divides species into nine categories: Not Evaluated, Data Deficient, Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered, Extinct in the Wild and Extinct. Of these, Vulnerable, Endangered, Critically Endangered are considered the "Threatened Categories" (IUCN, 2021).

As the Red List Authority for birds, BirdLife International has comprehensively assessed all avian taxa for the Red List, and carries out regular updates, though most species have not been reassessed for some years. As part of the Red List assessments, a range of other information on each species is

recorded, including information on the current trend of the population (declining, increasing, stable, not known), the threats facing the species (using a hierarchical Threat Classification Scheme), and the current use and trade of the species (using a General Use and Trade Classification Scheme), which also records the scale of the use (subsistence, national, international). It should be noted that this information covers the species as a whole and is not specifically linked to any region, with no information on volumes or timing. It also does not distinguish between whether the threat comes from legal or illegal hunting.

We used the most recent IUCN Red List data available for birds, downloaded in December 2023 (BirdLife International 2023) to investigate the current Red List Classification and population trend for each of our 302 project species, as well as whether they were threatened by intentional hunting[26] and consumed as human food,[27] at subsistence, national or international scale. See Annex 2 for a species-by-species breakdown of this information. We then used a combination of the IUCN threat and use data to look at whether those species consumed as food by humans and threatened by hunting are more likely to be at risk of extinction or are experiencing declines in their populations.

3.5 Analysis of data from BirdLife International regional reviews on illegal taking of birds……..

Three regional-scale reviews have been conducted by BirdLife International to evaluate the illegal killing and taking (here termed taking) of birds, covering the Mediterranean/peri-Mediterranean (Brochet et al. 2016; recording a mean of 25 million birds illegally taken across 26 countries, across Europe, North Africa and the Middle East), north and central Europe and the Caucasus (Brochet et al. 2017; a mean of 1.3 million birds illegally taken across 29 countries/territories) and the Arabian Peninsula, the Islamic Republic of Iran and Iraq (Brochet et al. 2019; a mean of 3.2 million birds illegally taken across 9 countries). Following the methodology of Brochet et al. (2016), the reviews aimed to estimate how many individuals of each species may be killed or taken illegally each year, identify the species that may be most affected, assess the most important types of illegal activities and reasons for killing or taking birds, and identify the countries in which this threat is most significant. The reviews focused on illegal taking (according to national legislation) of all native birds (excluding vagrants) and for any purpose.

They were based on expert opinion, with national experts/organisations (identified within the BirdLife Partnership) completing a questionnaire for all non-trivial illegal taking of birds for each country in the region, based on their own data, experience and/or knowledge, as well as any available, relevant information (data from publications, grey literature, relevant databases, animal rehabilitation centres, police reports, bird ringing schemes, etc.) and in consultation with other relevant experts as appropriate. The data were then made available online for peer-review by external experts from conservation and ornithological organisations, hunting associations, and the scientific/technical bodies and/or national focal points of relevant international conventions, and revised based on corrections or provision of additional information to ensure they were as accurate as possible.

[26] The IUCN Red List assesses whether a species is directly threatened by hunting under the IUCN Threats Classification Scheme, where taking of birds would be recorded under Threat category 5.1 Hunting and trapping terrestrial mammals. Assessors further classify the hunting threat into four sub-categories: 5.1.1 Intentional mortality (human use), 5.1.2 Unintentional or accidental mortality (bycatch), 5.1.3 Persecution/control and 5.1.4 Motivation Unknown/Unrecorded. We therefore used only category 5.1.1 in our comparative analyses in order to exclude any take for which the species being assessed was not the target or may not have been for consumption.

[27] There are seven IUCN Red List Use/Trade categories relevant to avian species: Food – human; Food – animal; Medicine – human & veterinary; Wearing apparel, accessories; Handicrafts, jewellery, etc; Pets/display animals, horticulture; Sport hunting/specimen collecting. We however considered only 'Food – human' as the only form of direct consumption by people (the medicine category includes veterinary purposes so was excluded, meaning our Red List analyses excluded any use of birds for medicinal purposes such as belief-based use).

For species known or likely to be illegally killed in insignificant numbers, species-specific estimates were used when provided (this was not available for Saudi Arabia, for example), or where a single estimate was provided for the whole group of species this was divided by the number of such species. Estimates with credible wide range limits were possible, to take into account the level of uncertainty (e.g. 100–10,000 individuals), and were at national level bar for Saudi Arabia and the Islamic Republic of Iran.

National experts also provided the potential primary and secondary reason(s) for illegal killing (multiple reasons were permitted): (i) 'predator/pest control'; (ii) 'sport'; (iii) 'food': asking for responses to specify 'for subsistence' (*i.e.* where the kill is a source of affordable protein), 'for culinary delicacy' (*i.e.* where the kill is not a source of subsistence protein, but is prized for its taste, is considered to have health-giving properties or is food of traditional/cultural importance) or 'for commercial sale' (*e.g.* liming or trapping of songbirds to sell them to restaurants or onto markets or to trade for other supplies); (iv) 'taxidermy/egg collection'; (v) 'cage bird': capture for pets and associated trades; and (vi) 'other' (with details requested). Brochet et al. (2017 and 2019) applied a 'confidence rating' on the data quality, which for the latter paper is 'good' for Bahrain, Kuwait, Oman and Qatar; 'moderate' for Iraq, the Islamic Republic of Iran and Saudi Arabia (but only partial coverage for the latter two) and 'poor' for Yemen. Where food was registered as a reason for take, these two latter studies also asked about the reason for this (whether for subsistence, as a delicacy, or for trade).

Using the unpublished, combined raw dataset for all three of the above studies (totalling 13-43 million or an average of approximately 30 million birds), we carried out analyses in relation to the taking of the subset of named species from our project species list (approximately 3.5 million birds) for food specifically (approximately 3.4 million birds), to provide estimates of the scale of this take across the three regions and six sub-regions and per country, and in relation to other types of illegal taking. Due to the limitations of the data (not covering all species and necessarily all parts of a country or all countries in a particular region, not always based on quantitative or systematic studies, with some large ranges in estimates), these should be taken as conservative estimates. Our total number of individual birds is also significantly lower due to our analyses only including species CMS-listed at species level, excluding those listed at higher taxonomic level or with no current or potential listing.

In addition to these datasets, an internal analysis had been conducted by BirdLife International for all EU Member States to compare the numbers of birds of six species legally taken in 2016 (from EU Birds Directive Article 12 reporting of hunting bags, alongside derogations to the EU Birds Directive in order to prevent birds from causing damage to human activities and property and to allow for research and the use of small numbers of birds, which included actual numbers of birds killed as well as nests destroyed and eggs taken) with the annual average number of birds of those species illegally taken (as registered by Brochet et al. 2016 and 2017). These results were reviewed and summarised to understand the impacts on our project species and implications for the wider proportion of legal to illegal take in the region.

3.6 Presence/absence of project species in hunting, trade and use databases……..

We considered the global, regional and national databases containing species-level records on illegal wildlife trade and use listed by Coad et al. (2021) and for a recent study of global bird trade (Donald et al. 2024; P. Donald, pers. comm.). Excluding those focused on non-avian taxonomic groups (e.g. ETIS (Elephant Trade Information System)) or focused on geographical areas outside the AEMLAP region (e.g. the United States Fish and Wildlife Service's (USFWS) Law Enforcement Management Information System (LEMIS)), these included TRAFFIC's Wildlife Trade Portal (part of its Wildlife Trade Information System, or WiTIS), the UNODC World WISE (World Wildlife Seizures) database, the World Customs

Organization Customs Enforcement Network Database, the EU-TWIX (European Union – Trade in Wildlife Information eXchange) database and CITES Annual Illegal Trade Reports.

However, all these only record trade in species, not the intended purpose (i.e. whether for consumption or not), the CITES and UNODC databases cover only international trade in CITES-listed species, and only TRAFFIC's Wildlife Trade Portal is open access (with prior approval from TRAFFIC). We therefore only interrogated the Wildlife Trade Portal, and only to record presence/absence of each of the project species.

We also reviewed two databases focused on the use of wild species for meat (the WILDMEAT database) and the sustainability of use of wild species (the new Species Use Database, SpUD). Details of the analyses conducted under each of these three databases are provided below, with summary results for each of the project species in the results section.

TRAFFIC Wildlife Trade Portal

The Wildlife Trade Portal[28] is an interactive tool that displays a portion of TRAFFIC's open-source wildlife seizure and incident data relating to illegal trade of wildlife species. Detailed information was obtained directly from TRAFFIC following a request to the Wildlife Trade Information System. This information includes details such as a description of the incident, primary source, incident country, suspect details, commodity type and quantities, etc. We investigated data available for the period 1995 to 10/03/2024 and recorded the presence/absence of each of the 302 project species.

WILDMEAT database

The WILDMEAT database[29] is managed by the Center for International Forestry Research (CIFOR), the Wildlife Conservation Society (WCS) and the University of Stirling and collates available published and unpublished wild meat data within one database and in one standardised format. Three different types of data are held in the database: hunting offtakes (the number of individual animals harvested by hunters over a given period), wild meat consumption (the quantity of animal biomass consumed by individuals or within households over a given period) and wild meat market sales (data on the price and number of individual animals, or pieces thereof, on offer at wild meat markets over a given period). Data are currently predominately from Latin America and sub-Saharan Africa, but efforts are being made to systematically expand its geographical coverage with the intention that the database has global coverage.

Sustainable Use Database (SpUD)

The Species Use Database (SpUD)[30] was created by the IUCN Sustainable Use and Livelihoods Specialist Group (SULi) in 2023 to collect and synthesise information on the utilisation of wild species globally, including for food, and specifically on the sustainability of that use. It is open-access and relies on self-population and systematic data entry by SULi researchers according to capacity and thematic priorities.

Each record in the database documents a specific use of a species in a specific location, based on a wide range of sources, including (but not limited to): grey literature and peer-reviewed papers, indigenous/local knowledge, data, knowledge and research from individuals working in a relevant area, and reports (internal and external), articles and blog posts. To be admissible each record must provide details on the source of the information it includes. The purpose of the database is to collect information from as wide a range of species and use regimes as possible, including published evidence about sustainability, but NOT to provide a formal assessment of whether use is sustainable (or of the quality of any evidence recorded).

[28] https://www.wildlifetradeportal.org/
[29] www.wildmeat.org
[30] https://speciesusedatabase.com/

We searched the database for records of consumption of project species and found records for three relevant species (see Table 1 for summary). These had not been picked up in the systematic online review) so the primary publications acting as the data source were reviewed and information was included in the project database and analysed as part of the systematic review.

3.7 Information from CMS national reports……..

National reports, following a set template, are the official documents by which countries report to the decision-making bodies of CMS and/or its instruments on the measures they have undertaken to implement the priorities of the instruments. National reports provide an official record of national implementation of each instrument over time and collectively they provide a picture of the overall implementation of the instrument. The UN Environment Programme's World Conservation Monitoring Centre (UNEP-WCMC) provided us with an edited version of the data contained in the CMS National Reports to COP14, which had been downloaded from the CMS Online Reporting System on 12/06/23 and comprised 55 reports from Parties (40 in the AEMLAP region) submitted at that point. Particularly relevant questions to this review were those on the legal prohibition of the taking of Appendix I species (question IV), sustainable production and consumption (question IX), pressures and legislative/management responses (question X), conservation status (question XI) and ecosystem services provision (question XIV), on which we focused our search.

We then used a separate dataset taken from CMS national reports to COP13, which UNEP-WCMC had compiled for their assessment of Appendix I species in direct use and trade (UNEP-WCMC 2023), to review whether Parties reported the taking of Appendix I species as prohibited by national or territorial legislation in accordance with CMS Article III(5). This covered 72 species in the AEMLAP region and was based on reports submitted by 61% of Parties, with 96% completing the question relating to prohibition of take.

3.8 International governance review and legal analyses of case study countries

Review of relevant international conventions, policy frameworks and national laws

We briefly reviewed relevant international and regional conventions and policy frameworks, as well as national laws of countries across the Africa-Eurasia region as feasible, in terms of history, aims, coverage, effectiveness, challenges and gaps in addressing consumption of migratory birds.

Legal analyses in case study countries of national transposition of CMS Appendix I protection and provisions under CMS Article III.5 (c)

Following the Sustainable Wildlife Management (SWM) Programme methodology (Box 3.1), we analysed the transposition of CMS Appendix I protection for all CMS Appendix I bird species occurring in the country into the domestic law of six African countries (Republic of Congo, Democratic Republic of Congo, Gabon, Madagascar, Zimbabwe and Zambia)[31] covered by the SWM Programme.[32] This study was based on the results of the legal analyses acquired through the implementation of the relevant legal diagnostic tools whose results have been subsequently approved by the governments of each country.[33] The review focused on those CMS Appendix I-listed species in the project species list occurring in the relevant country, based the latest (2023) IUCN Red List dataset for birds.

Box 3.1. EU-SWM Legal Hub tools and methodologies for analysing legal and institutional frameworks (see https://www.swm-programme.info/)

The Sustainable Wildlife Management (SWM) Programme is a 7-year initiative (2017-2024) of the Organisation of African, Caribbean and Pacific States (OACPS) implemented in 15 countries which aims at conserving biodiversity, whilst at the same time improving food security and livelihoods of the people who depend on these resources. This includes support to participatory and evidence-based processes to strengthen normative frameworks, both statutory and customary, for enabling and supporting effective management and sustainable use of wildlife.

As part of this work, a cross-sectoral review of legal frameworks that regulate different aspects of both wild and farmed meat and fish value chains in the SWM Programme partner countries has been carried out, with the support of national experts. These results have been compiled into legal country profiles and further displayed on a Legal Hub section of the SWM Programme website. To guide this process, a comprehensive set of legal diagnostic tools and methodologies have been produced, namely for:

- Mapping the relevant statutory legal framework (Tool), (Methodology). This tool facilitates the identification of potential obstacles to legal certainty (ambiguities deriving from legislative drafting techniques, existence of obsolete normative texts, etc.).
- Reviewing domestication of relevant international instruments (T), (M). This tool helps to understand how State obligations arising from international agreements and conventions are reflected in the national legal framework. The tool currently focuses on six international instruments including the Convention on the Conservation of Migratory Species of Wild Animals (CMS), but its conceptual framework can be adapted to other instruments, including regional and non-binding ones.
- Analysing consistency across sectoral legislations and identifying potential gaps (T), (M). This tool provides a cross-sectoral analysis of the strengths and weaknesses of national legal framework applicable to wildlife management, ranging from land tenure to food safety, but also including hunting and fishing as well as animal production and animal health.
- Clarifying the relationships between statutory and customary law (T), (M). This tool aims at identifying, understanding and documenting the rights of indigenous peoples and local communities to land and associated natural resources, such as wildlife, as well as the multiple challenges associated with promoting the recognition of customary rights to support creation of synergies between statutory law and customary law.
- Identifying the barriers to implementation and/ or enforcement of laws (T), (M). The tool helps identify the structural and conjunctural factors that explain the insufficient or lack of implementation and enforcement of certain legal instruments in a jurisdiction.

[31] Noting that Zambia is not a Party to CMS so legal obligations to CMS do not apply

[32] The Sustainable Wildlife Management (SWM) Programme is a major international initiative that aims to improve wildlife conservation and food security. We are developing innovative, collaborative and scalable new approaches to conserve wild animals and protect ecosystems, whilst at the same time improving the livelihoods of indigenous peoples and rural communities who depend on these resources. The SWM Programme is implemented in 15 countries: https://www.swm-programme.info/where-we-work

[33] SWM Legal Hub: https://www.swm-programme.info/legal-hub

4 Results.....

4.1 Availability and quality of data on take and trade for consumption of CMS-listed avian species

Systematic literature review

Our systematic literature review resulted in 124 relevant publications relating to the taking of the 302 CMS Appendix I and/or II listed or ought-to-be-listed species in the AEMLAP region (the 'project species'), or 105 publications relating to CMS Appendix I and/or II listed species only in the AEMLAP region ('CMS-listed species'), made up of a variety of peer-reviewed articles, reports and other grey literature. This comprised 222 separate records covering 83 of our total project species (195 records covering 69 CMS Appendix I and/or II listed species, 'CMS-listed species'), where consumption (for either human food or medicinal purposes) motivated take.

A total of 168 records for CMS-listed species could be attributed to a country, covering 43 countries within the AEMLAP range (Figure 2; Annex 1). Countries with more than 10 records were France (16), India (14), Niger (12), Nigeria (12) and South Africa (22).

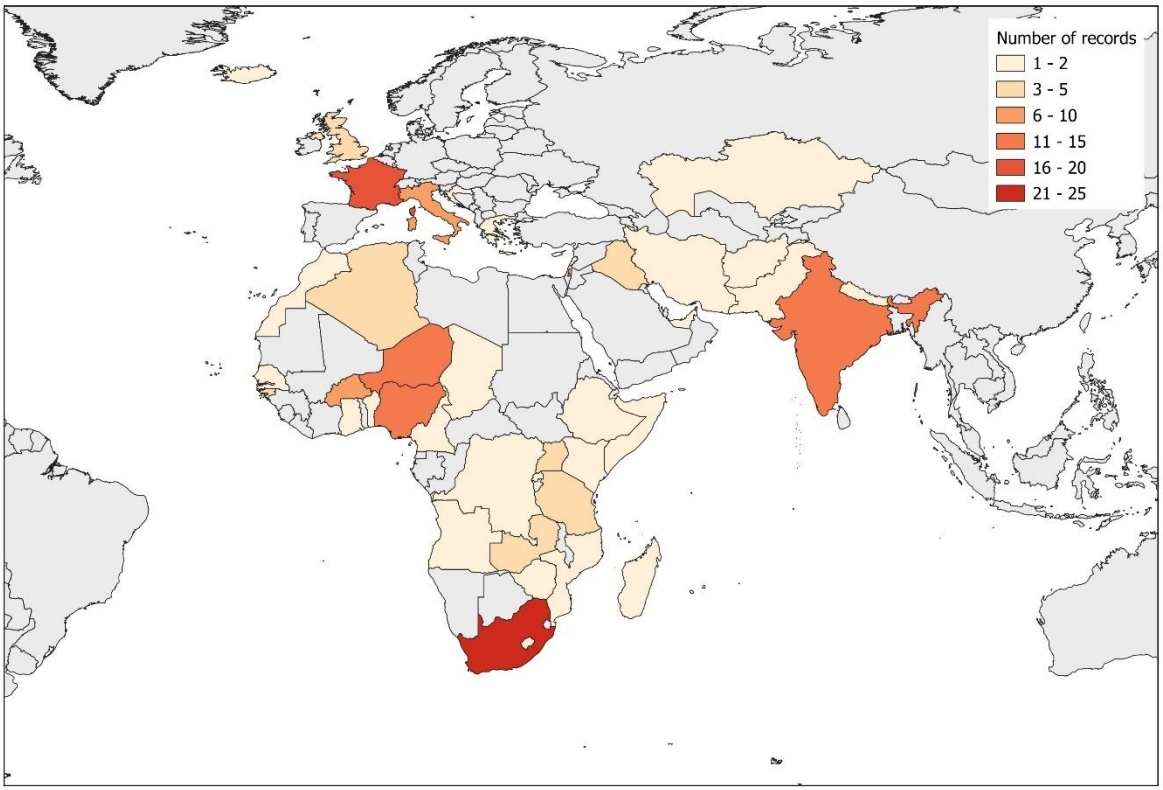


Figure 2. Number of records of consumption of CMS-listed species found in the systematic review by country (n = 162 records; records attributed to a region or other geographical area rather than specific country removed)

Records were obtained using a variety of methods, with the majority coming from interview-based methods, followed by hunter catch and then household surveys (Table 4). The earliest publication date was 1982, with no further records until 1996 and then a gradual increase with the majority (69%) published in the past decade (Table 5). Species consumed fell into 18 orders of birds (Table 6).

Table 4. Summary of type of data providing records of consumption found in the systematic review (some records based on data collection by more than one method)

Type of data	Number of records, project species (n = 222)	Number of records, CMS-listed species (n = 195)
Interview, focus groups, other type of survey (inc. online)	66	58
Market	19	17
Hunter catch	13	11
Household survey	13	11
Seizure	8	8
Patrol	1	1
Other (e.g. literature review, field observations, counts)	106	100

Table 5. Publication dates (in 5-year intervals) for records of consumption found in the systematic review

Period	Number of records, project species (n = 222)	Number of records, CMS-listed species (n = 195)
2020-2024	76	66
2015-2019	70	66
2010-2014	29	22
2005-2009	23	19
2000-2004	15	13
1995-1999	2	2
1982	5	5
No date	2	2

Table 6. Breakdown of number of species and records relating to consumption of the project species collated in the systematic review by scientific order

Scientific order	Common name	Number of species		Number of records	
		Project species (n = 83)	CMS-listed (n = 69)	Project species (n = 222)	CMS-listed (n = 195)
Accipitriformes	Hawks, Eagles	19	19	95	95
Anseriformes	Ducks, Geese, Swans	7	7	14	14
Bucerotiformes	Hornbills	2	0	5	0
Charadriiformes	Sandpipers, Snipes, Phalaropes, Plovers, Auks, Gulls, Terns, Skimmers	12	11	19	18
Ciconiiformes	Storks	4	3	8	6
Columbiformes	Pigeons, Doves	1	1	9	9
Coraciiformes	Rollers	1	1	1	1
Falconiformes	Falcons, Caracaras	1	1	2	2
Galliformes	Pheasants, Partridges, Turkeys, Grouse	1	1	12	12
Gruiformes	Cranes, Rails, Gallinules, Coots	6	5	11	9

Otidiformes	Bustards	6	4	13	11
Passeriformes	Waxwings, Shrikes, Swallows and Martins	6	6	7	7
Pelecaniformes	Herons, Ibises, Spoonbills, Pelicans	6	5	7	6
Phoenicopteriformes	Flamingos	1	1	1	1
Procellariiformes	Petrels, Shearwaters, Albatrosses	6	2	12	2
Psittaciformes	Parrots	1	0	3	0
Sphenisciformes	Penguins	1	1	1	1
Strigiformes	Typical Owls	0	1	0	1
Suliformes	Frigatebirds, Gannets, Boobies	2	0	2	0

IUCN Red List

Of the 302 project species (224 CMS-listed species) investigated for this review, as part of their Red List assessment, 248 project species (179 CMS-listed species) had whether or not they were "used" logged under the IUCN Use and Trade Classification scheme, and 240 project species (164 CMS-listed species) had one or more threats logged under the IUCN Threats Classification Scheme. Of the 200 project species (147 CMS-listed species) used for various purposes, 183 project species (131 CMS-listed species) had a threat assessment, of which 143 project species (100 CMS-listed species) belonging to 18 (13) taxonomic orders are recorded as threatened by intentional hunting (IUCN Threat category 5.1.1; intentional use).

In terms of consumption, 147 project species (101 CMS-listed species) belonging to 18 (14) scientific orders are recorded as used for human food under the IUCN Use and Trade Classification scheme. Together, Charadriiformes (32 species), Procellariiformes (13 species), Pelecaniformes (12 species) and Anseriformes (11 species) accounted for the bulk (67%) of the CMS-listed species consumed by humans.

Of the species used as human food, 134 project species (89 CMS-listed species) had logged one or more threats under the IUCN Threats Classification Scheme. Of these, 110 project species (71 CMS-listed species) belonging to 18 (11) scientific orders are recorded as threatened by hunting (IUCN Threat category 5.1.1). Together, Charadriiformes and Anseriformes made up just over half of CMS-listed species (51%), with at least 10 species per order. See Annex 2 for details per species.

TRAFFIC Wildlife Trade Portal

We found that 52 project species (49 CMS-listed species) were recorded as seizures in the Wildlife Trade Portal (Annex 2; 4 Appendix I only species, 21 species listed under both Appendix I and II, 24 Appendix II only species and 3 potential avian species for listing), with information on incidents and locations where the incidents took place (192 incident records, of which 188 were for CMS-listed species, between 01/04/1995 and 01/03/2024). However, no information or details are systematically recorded on the intended use or purpose of the species/commodity in the database, e.g., for food or other consumption purposes (see Table 7 for examples). Occasionally, relevant information was recorded (e.g. "2.5 kg of bird meat seized and 1 arrested, Chilika Lake, India", though listed under 'seizure' rather than 'poaching/illegal harvesting'), though not necessarily providing detail on the species (this is sometimes mentioned, but often only in 'description' of incident and often just the common name, e.g. "Large Whistling Teal" in this example).

Table 7. Examples of information provided in Wildlife Trade Portal database in relation to example CMS-listed avian species: incident details, commodity type and intended purpose/use

Category of incident	Country of incident	Date of incident	Outcome	Species	Commodity type (count)	Intended purpose / use
Poaching / illegal harvesting	South Africa	23/12/2019	Investigation ongoing (at the time)	*Gyps africanus*	Individual - dead (15 birds)	Believed to be deliberately poisoned for belief-based use
Seizure	United Kingdom of Great Britain and Northern Ireland	06/01/2023	Confiscation	*Pandion haliaetus*	Eggs	No details given
Seizure	Pakistan	01/09/2023	Confiscation	*Streptopelia turtur*	Individual - live (54 doves)	No details given
Seizure	Malta	01/09/2023	Confiscation and arrest	*Numenius arquata*	Individual - dead (15 birds)	No details given

WILDMEAT database

Three project species (two CMS-listed) were found to be present in the database (*Bycanistes cylindricus*, *Threskiornis aethiopicus, Platalea alba*), from two countries which were not picked up in the systematic review (Annex 1 and Table 8). Given the different format and focus of the information held in the database (focusing on often unpublished hunting data but not wider aspects such as causes, impacts, drivers, etc.), this information was not incorporated into the project database but is summarised in Table 8.

Table 8. List of project species found in the WILDMEAT database with relevant information

Species	CMS listing	Amount	Type of data	Country	Source
Bycanistes cylindricus Brown-cheeked Hornbill	Potential species for listing	One individual - dead	Hunting	Republic of Congo	Eves and Ruggiero 1995-1996: Individual hunting data from two sites in northern Congo between May 1995 and May 1996
Threskiornis aethiopicus African Sacred Ibis	II	One individual - alive	Market (traded in wild meat market (market price - 10000 CDF)	Gabon	Project Gibier 2000-2006: Individual market data from 23 markets in Gabon from 2000 to 2006
Platalea alba African Spoonbill	II	12 kg, 2 pieces, 7 piles and 8 tins	Consumption	Gabon	Abernethy 2005: Unpublished individual household consumption data from multiple towns and villages in Gabon from February to December 2005

CMS national reports

We first did a search of these reports (provided in Excel) to see if consumption was mentioned, searching for the terms 'food', 'meat' (which would also have picked up 'wildmeat' or 'bushmeat') and 'consum' (which would have picked up 'consumption', consumed', etc.). This rendered very few relevant references (the majority in relation to sustainable consumption plans). This is consistent with the fact that only one CMS national report was returned in our systematic online review. One country reported no consumption of migratory species (Kenya, under question IX: "There is no consumptive utilization of wildlife including of migratory species in the country currently. The recommendations of the National Wildlife Utilization Task Force reported on in the previous reporting period are pending adoption and implementation") and only one reported specifically on consumption in reference to a project species, though it is unclear whether the species was consumed itself or whether it was the consumer (Israel, under question XIV: "A study was conducted on black kite - Milvus migrans - association with disposal of carcasses and other meat-based garbage - over 1,000 tons consumed per year while migrating or over-wintering in Israel!").

We then interrogated responses to particular questions to see if any project species were referenced. Under question X.1, Parties were asked to rate the severity of different pressures (severe/moderate/low/unknown), and also describe significant negative trends, and significant advances in relation to each threat, naming the species or species group affected in each case. We searched for mention of the project species within Parties' responses under four of the five categories under the pressure 'Intentional taking': Illegal hunting, Legal hunting, Other harvest and take, Deliberate poisoning (though with no explicit mention of consumption), as well as the final part of this question in relation to 'Levels of knowledge, awareness, legislation, management etc'. A total of 41 records (range 1-5 records) for 24 CMS-listed project species were mentioned under intentional taking (Annex 2). However, explicit information for our project species was limited (with only 5 species named) as most references were to family group or other higher taxonomic grouping – see Table 9 for examples.

Table 9. Examples of responses to question X.1 on pressures from relevant categories of intentional take in CMS national reports submitted to COP14. References to project species are emboldened.

Type of intentional taking as listed under question X.1	Country	Response
Legal hunting	Spain	"Aves acuáticas, tórtola europea, codorniz" [assumed to be **European Turtle Dove** and **Common Quail**]
	Morocco	'Birds'
	Armenia	"**Common Quail** (Appendix I), All Ducks and Geese (Appendix I and II), all Waders (Appendix I and II), **Turtle Dove** (Appendix I)"
	Croatia	"Appendix II Bird species"
	Hungary	"***Aythya nyroca*** (I), Anatidae (II). In addition to these groups, ***Microcarbo pygmeus*** (II) can be affected during the legal shooting of *Ph.carbo*"
	Liechtenstein	"All CMS ssp."
	Kenya	"Appendix II Anatidae (Geese and Ducks)"
Illegal hunting	Spain	"Pequeñas aves (fringílidos y túrdidos), rapaces" [small birds (finches and thrushes) and raptors]
	Armenia	"All Raptors (included in both Appendix I and II), **Common Quail** (Appendix I), All Ducks and Geese (Appendix I and II), all Waders (Appendix I and II), **Turtle Dove** (Appendix I), all Herons and Egrets (Appendix I), **Great Bustard**

		(Appendix II), all Storks, Ibises and Spoonbills (Appendix I), Pelicans (Appendix II)"
	Croatia	"Appendix I and Appendix II Bird species"
	North Macedonia	"Migratory Birds, Raptors, vultures, fish (Anguilla)"
	Latvia	"*Mergus* spp., *Cygnus* spp."
	Netherlands (Kingdom of the)	"Mainly birds of prey (App. II)"
	UAE	"Birds Mainly from Appendix II"
Deliberate poisoning	Burundi	"All species inscribed on Appendix II"
	Czech Republic	"Raptors"
	Morocco	"Raptors"
	Senegal	"All waterbirds"
	Spain	"All total or partial scavenging species"
Other harvesting and take	Armenia	"All songbirds (Appendix I)"
	Czech Republic	"Birds of prey (II); taking eggs and nestlings (both legal and illegal) for uses of falconry" [demonstrating that take is not necessarily for consumption]
	North Macedonia	"Fish/birds"
	Pakistan	"Family Falconidae"

Under question XI.1, Parties were asked whether major changes in the conservation status of migratory species included in the CMS Appendices (e.g. national Red List category changes) had been recorded in their country during the reporting period, naming the species or species group affected in each case. Responses to this question were searched as above and information on conservation status was found for 21 CMS-listed avian species as reported by 12 countries and is detailed in Table 10 and included in Annex 2. Around twice as many species (14 records) were recorded as declining or becoming more threatened compared to having an increasing population trend, becoming less threatened or with breeding established (8 records).

Table 10. Information on change in CMS-listed avian species conservation status as reported by Parties to CMS within the AEMLAP region in their national reports to COP14 (n = 40 reports, 23 records, 21 species, 12 countries; change in status as worded in the reports). Green shading

represents improvement in status, red worsening and yellow no change. Emboldened species are those that appear more than once.

Species/subspecies	Change in status (including time period concerned)	Party
Platalea leucorodia	VU to NT between 2008 and 2016	France
Haliaeetus albicilla	RE to CR between 2008 and 2016	France
Lanius excubitor	Strong short-term decline (2007-2019)	Luxembourg
Sterna hirundo	Established as breeder	Luxembourg
Haliaeetus albicilla	Population increased significantly 1998 - 2018	Sweden
Porzana porzana	Strongly negative population development 1998 - 2018	Sweden
Crex crex	Negative population trend, but uncertain long - term development 1998 - 2018	Sweden
Botaurus stellaris	Decline (trend derived from data analysis 1999-2022)	Hungary
Limosa limosa	Decline (BD 2019 report covering 2013-2018, compared to data from 2019-2021)	Hungary
Aquila heliaca	Increase (BD 2019 report covering 2013-2018, compared to data from 2019-2021)	Hungary
Haliaeetus albicilla	Increase (BD 2019 report covering 2013-2018, compared to data from 2019-2021)	Hungary
Aquila nipalensis	From least concern (LC) to endangered (EN)	Jordan
Streptopelia turtur	Decreasing	Montenegro
Falco vespertinus	Decreasing	Montenegro
Coracias garrulus	Stable	Montenegro
Coturnix coturnix	Decreasing	Montenegro
Circus macrourus	New breeding bird in 2017, 2018, 2019, 2020	Netherlands
Anser erythropus	Growth in population	Norway
Polysticta stelleri	Decline in winter pop due to climate change (less ice)	Norway
Falco cherrug	Declining	Kenya
Necrosyrtes monachus	From unknown to Critically Endangered, 2017	Rwanda
Geronticus eremita	Extinct in the wild	Syrian Arab Republic
Plegadis falcinellus	The species is increasing throughout the Arabian Peninsula (1996 t0 2020)	United Arab Emirates

Information on responses and legislation and management in relation to threats from intentional taking was even more limited. In order to evaluate whether CMS Parties were putting in place appropriate measures to address potentially unsustainable take of consumed project species, we limited our review of this question to those project species which were recorded as consumed, threatened by hunting and having declining populations in their Red List assessment.[34] Tables 11 and 12 present summaries of this information relating to the handful of project species named. However, there is no clear link between intentional take and legislation/enforcement aspects at species-level as these are addressed in separate questions under section X of the report template.

[34] Of the 147 CMS-listed project species consumed by humans according to the Red List, 131 had been assessed under the IUCN Threats Classification Scheme. Of these, 71 species belonging to 13 scientific orders were recorded as threatened by hunting (IUCN Threat category 5.1.1; intentional use), with 53 of them having decreasing populations. Annex 2 includes the 53 species by their CMS listing: 9 species are listed in Appendix I only, 21 are listed in Appendix II only and 23 are listed in both Appendices.

Table 11. Summary of information on threatened/consumed/declining project species (as recorded in their Red List assessment) from CMS national reports to COP14 on advances in addressing intentional taking and in levels of legislation and enforcement since previous report, as listed under question X.1 of the national report template

Country	What are the most significant advances that have been made since the previous report in addressing intentional taking?
Israel	New restrictions have stopped the legal hunting of ***Coturnix coturnix*** and ***Streptopelia turtur*** in Israel.
Country	**What are the most significant advances that have been made since the previous report in levels of knowledge, awareness, legislation, management etc?**
Serbia	Directorate for Forests has adopted the Rulebook of Amendments of the rulebook on proclamation of protected game species by closed hunting season (OG RS No. 92/21). According to that, the closed hunting season for turtle doves ***Streptopelia turtur*** has been proclaimed for the period from October 1. 2021. until August 14. 2024. Duration of the hunting season for quail ***Coturnix coturnix*** has been proclaimed for the period from August 15. until September 30 of the current year; is still working on the new Law on Game and Hunting, and it is in progress (among other things) regarding the monitoring of existing data on migratory birds status that are the subject of hunting and enforcement of legislation in the sphere of hunting.

Table 12. Summary of information on threatened/consumed/declining project species (as recorded in their Red List assessment) from CMS national reports to COP14 on levels of legislation and enforcement for the species, in relation to addressing all pressures listed under question X.1 of the national report template

Levels of legislation / enforcement as listed under question X.1	Species affected	CMS listing	Overall relative severity of impact	Country	Common name
Inadequate legislation	*Streptopelia turtur* *Otis tarda* *Streptopelia turtur*	II II II	moderate moderate moderate	Armenia Armenia Serbia	Turtle Dove Great Bustard Turtle Dove
Inadequate enforcement of legislation	*Streptopelia turtur* *Otis tarda*	II II	severe severe	Armenia Armenia	Turtle Dove Great Bustard

4.2 Magnitude of take of CMS-listed avian species for consumption…….

Geographical coverage of overall take for consumption

Consumption of the 224 CMS-listed species (avian species in the AEMLAP region listed on CMS Appendices I and/or II) was recorded in a total of 84 countries and territories (68%) out of 123 countries in the AEMLAP region (only two additional countries, Republic of Congo and Sri Lanka, were recorded when all 302 project species – including potential avian taxa for listing as submitted to COP14 - were considered). This was comprised of 43 countries in the systematic literature review[35] (31 not picked up through other sources), 52 countries in the three BirdLife International regional illegal killing of birds (IKB) reviews (Brochet et al. 2016, 2017 and 2019) combined (40 not picked up through other sources) and 1 country in the WILDMEAT database (not picked up through other sources), showing very limited overlap in the geographical coverage of information collected via the different sources (Figure 3; Annex 1).

[35] This includes the data from publications retrieved from the Species Use Database.

Figure 3. Countries where take for consumption of CMS-listed species was recorded through one of the three primary data sources (the systematic literature review which incorporated data from the Species Use Database, the regional IKB reviews and the WILDMEAT database) (n = 84 countries).

Proportion of project species taken for consumption

Combining records from our systematic literature review, the Red List dataset, the three regional IKB reviews, the WILDMEAT database and the Species Use Database (SpUD), we found a total of 157 (70%) of our 224 CMS-listed project species (204 (68%) of our 302 project species) were recorded as consumed (Annex 2; Table 13). The majority of these records came from only one or two of these sources, with the maximum being recorded by four sources (for European Turtle-dove *Streptopelia turtur* only) out of the five sources of data in total. The systematic review found 69 (31%) of CMS-listed project species (83 or 27% of project species) were consumed, the Red List dataset 101 (45%) of CMS-listed project species (147 or 49% of project species), the regional IKB reviews 82 (37%) of CMS-listed project species (87 or 29% of project species), the WILDMEAT database 2 and 3 species respectively and the SpUD database 2 and 2 species respectively (less than 1% each for both categories) (Table 13).

Table 13. Summary of project species and CMS-listed project species and records recorded as consumed under each data collection method (except for Wildlife Trade Portal and CMS National Report records, which are not specific to consumption, with the latter being of intentional take).

Data source	Project species consumed* (n = 302)			CMS-listed project species consumed* (n = 224)		
	No. species	% species	No. records	No. species	% species	No. records
Systematic review	83	27%	222	69	31%	201

Red List dataset (yes/no)	147	49%	n/a	101	45%	n/a
Regional IKB reviews	87	28%	461	82	37%	450
WILDMEAT database	3	<1%	3	2	<1%	2
SpUD database	2	<1%	2	2	<1%	2
Wildlife Trade Portal (*trade only, yes/no)	52	17%	n/a	49	16%	n/a
CMS National Reports (*intentional take only)	24	8%	41	24	8%	41
TOTAL	**204**	**68%**	**827**	**157**	**70%**	**748**

The total number of records was 748 for CMS-listed project species (827 for project species), with records per species ranging from 1 to 47 (Common Quail *Coturnix coturnix*, which had multiple records from both the systematic review and regional IKB reviews, closely followed by European Turtle-dove *Streptopelia turtur*, with 40 records). The majority of species with records numbering over 20 were waterbirds (Common Pochard *Aythya farina* (36 records); Common Coot *Fulica atra* (28 records); Ferruginous Duck *Aythya nyroca* (27 records); Northern Lapwing *Vanellus vanellus* (20 records)) and one vulture (White-backed Vulture *Gyps africanus* (25 records); Annex 2).

These results are not, however, comprehensive, and likely underestimate the number and relative proportions of project species being consumed, due to geographical, thematic and taxonomic biases in the availability of data, time and capacity constraints restricting the scope of our review and data analysis, and the patchy and inconsistent nature of much of the data obtained from the systematic literature review making extrapolation difficult. See section 4.1 for a discussion on the scope and limitations of this review.

CMS-listed species taken for consumption

A large proportion of CMS-listed species were recorded as taken for consumption: 70% for species currently listed on CMS Appendix I and/or II only (and 68% of all project species). The proportion of species consumed increased for each higher level of listing, with 95% (19 species) of Appendix I only species consumed (even though there were relatively fewer records for this category) , 85% (47 species) of Appendix I/II species consumed, 61% (91 species) of Appendix II only species consumed and 60% (47 species) of potential avian species for listing consumed (Table 14). Overall, 88% of Appendix I species and 68% of Appendix II species were consumed. For CMS Appendix-listed species only, the majority of records were found for Appendix II species (702 records or 95% out of 742 total records), but this was in proportion to the number of species in this category (an average of 3.5 records of consumption per species overall for both Appendix I and Appendix II categories).

Table 14. Number of project species recorded as consumed through all sources of information combined (systematic literature review, the Red List dataset, the three regional IKB reviews, the WILDMEAT database and the Species Use Database), by CMS listing category (Appendix I only, both Appendix I and II, Appendix II only and potential avian species for listing as submitted to COP14), as absolute numbers and percentage of project species in each category.

CMS listing	Number of species in project species list	Number of species recorded consumed	% species consumed in listing category	Number of records of consumption
Appendix I only	20	19	95	40
Appendix I/II	55	47	85	217
Appendix II only	149	91	61	485
All Appendix I	75	66	88	265

All Appendix II	204	138	68	702
Potential avian species for listing	77	47	61	85
Total project species	**302**	**204**	**68**	**827**
Total Appendix I/II only	**224**	**157**	**70**	**742**

Quantity and geographical variation of overall take for consumption

While none of the means of data collection allowed for a full and systematic analysis of the scale of taking for consumption of all of the 302 project species, and detailed review and analysis of the quantitative data on take in the systematic review dataset was beyond the scope of this review, our analyses of the combined dataset from the BirdLife International regional reviews on illegal killing of birds indicates the scale and geographical variation in illegal take for consumption for food of a significant proportion of the project species.

A total of 131 project species (112 CMS-listed species) were recorded in the three regional IKB analyses (Brochet et al. 2016, 2017, 2019), of which 87 project species (66%; 461 records), including 82 CMS-listed species (73%; 450 records) were reported to be illegally taken for food (Annex 2). However, of this CMS-listed species subset, the vast majority of individual birds taken were from these 82 CMS-listed species, i.e. consumed. A mean of 3,376,269 (97%) individual birds of CMS-listed species were estimated to be killed with consumption for food as a reason per year (range 1,963,278 – 4,789,261), out of a total of 3,485,601 birds illegally taken for any reason (range 2,007,089 – 4,964,113). Figure 4 shows that the number of records is a poor indicator of the estimated numbers of birds taken, with the Middle East and north Africa showing particularly high numbers of birds being taken relative to records, predominantly for consumption. In central and northern Europe fewer birds were taken as a proportion of the number of records, and around half of these were for reasons other than consumption (with only 10% of birds taken for consumption in northern Europe).

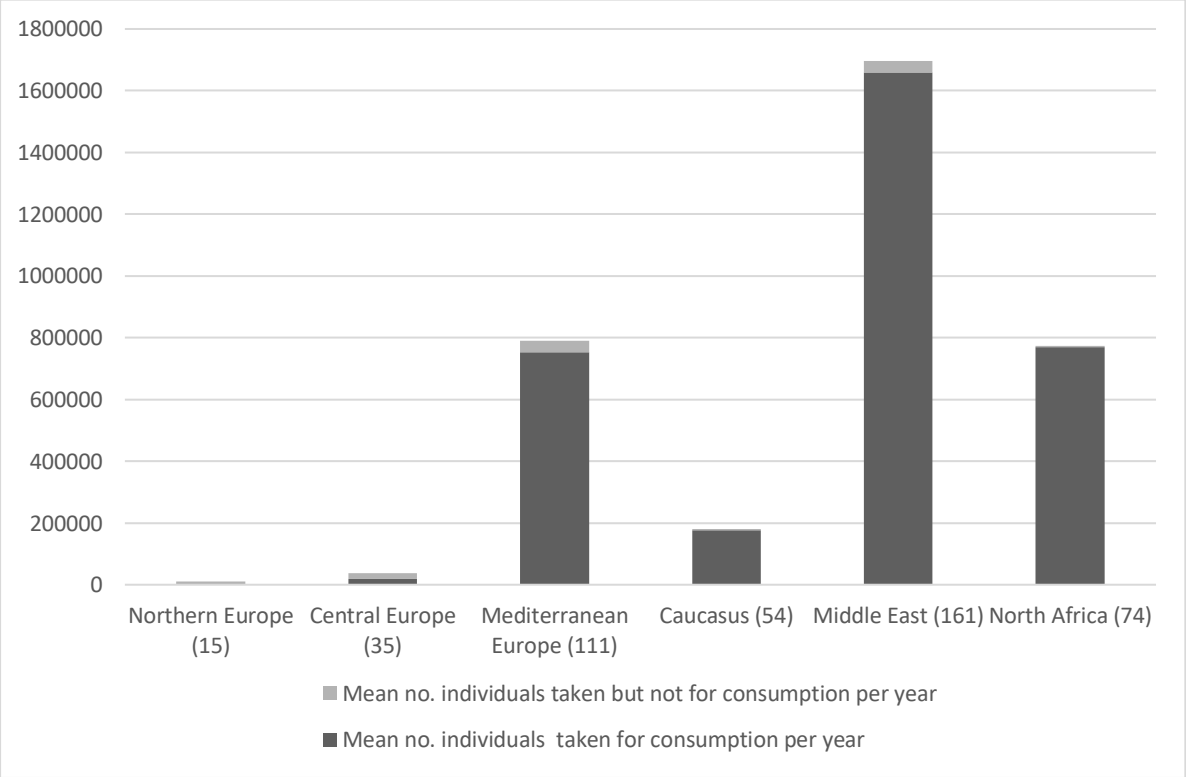


Figure 4. Number of CMS-listed species' individual birds estimated as taken for consumption out of all CMS-listed species' individual birds illegally taken per year, by subregion, calculated from the combined data from all three BirdLife International regional illegal taking of birds reviews (Brochet et al. 2016, 2017 and 2019). Number of records for each region is given in parentheses.

The number of individual birds estimated to be taken illegally for consumption per year varied significantly between countries, with Lebanon (702,783 individuals), Syrian Arab Republic (622,890), Libya (356,825) and Egypt (349,300) having the highest estimated numbers, and Slovakia (3) and Austria (8) at the other end of the scale (Figure 5).

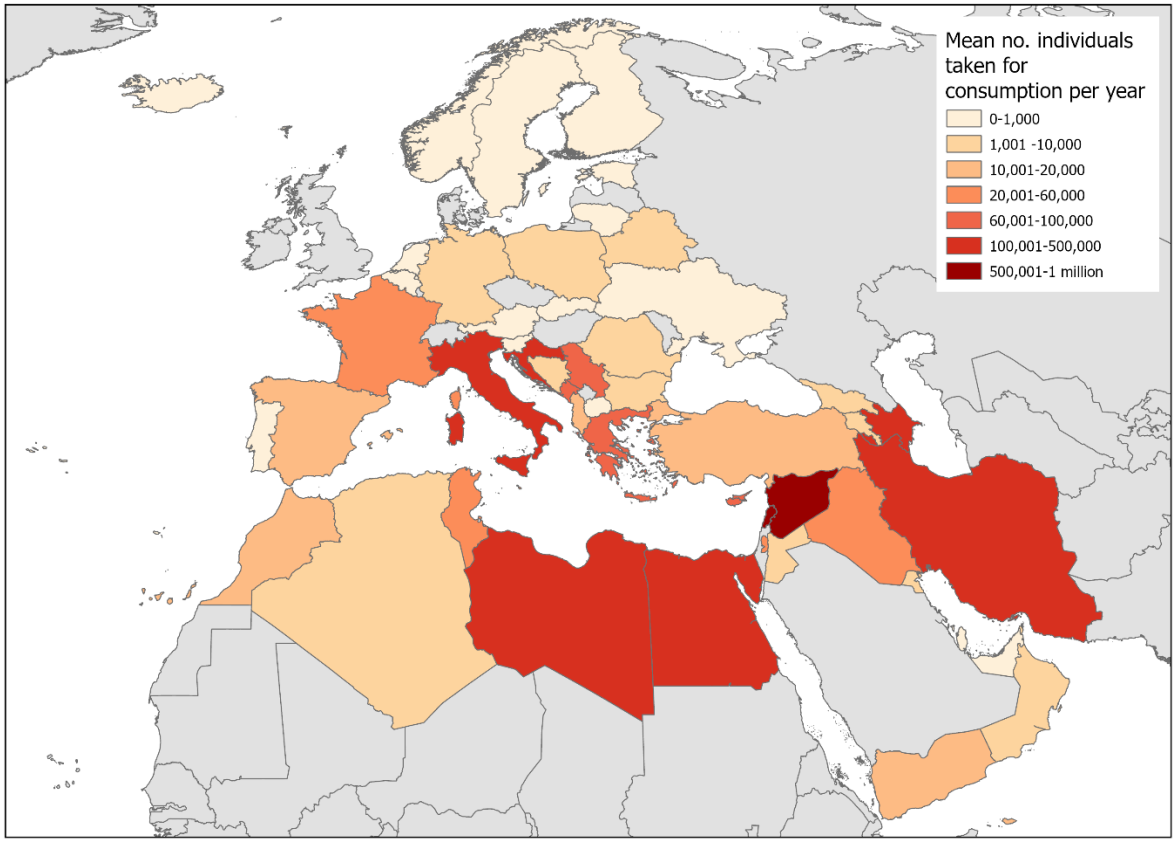


Figure 5. Approximate (categorised) number of CMS-listed individual birds estimated to be taken for consumption per year by country, calculated from the combined dataset underpinning the three BirdLife International regional illegal killing of birds reviews (Brochet et al. 2016, 2017 and 2019)

Relative proportion of CMS-listed birds taken for consumption

Our estimation of a mean of 3,376,269 (range 1,963,278 – 4,789,261) individual birds of CMS-listed species killed with consumption for food as a reason is considerably lower than the total number of birds estimated to be illegally killed per year across the three regional reviews (13-43 million birds; from Brochet et al. 2016, 2017, 2019 combined), because we have only included those birds listed at species level in the official CMS appendices. For example, of the 20 bird species with the largest estimated number of individual birds illegally killed per year in the Mediterranean (Brochet et al. 2016), only four species listed at species level (a total of 2.75 million birds; all Appendix II) have been included in our analyses, while we have excluded six species as they were listed at higher taxonomic level (a total of 5.15 million birds; also all Appendix II), with the remaining 10 species having no current or potential listing (Figure 6).

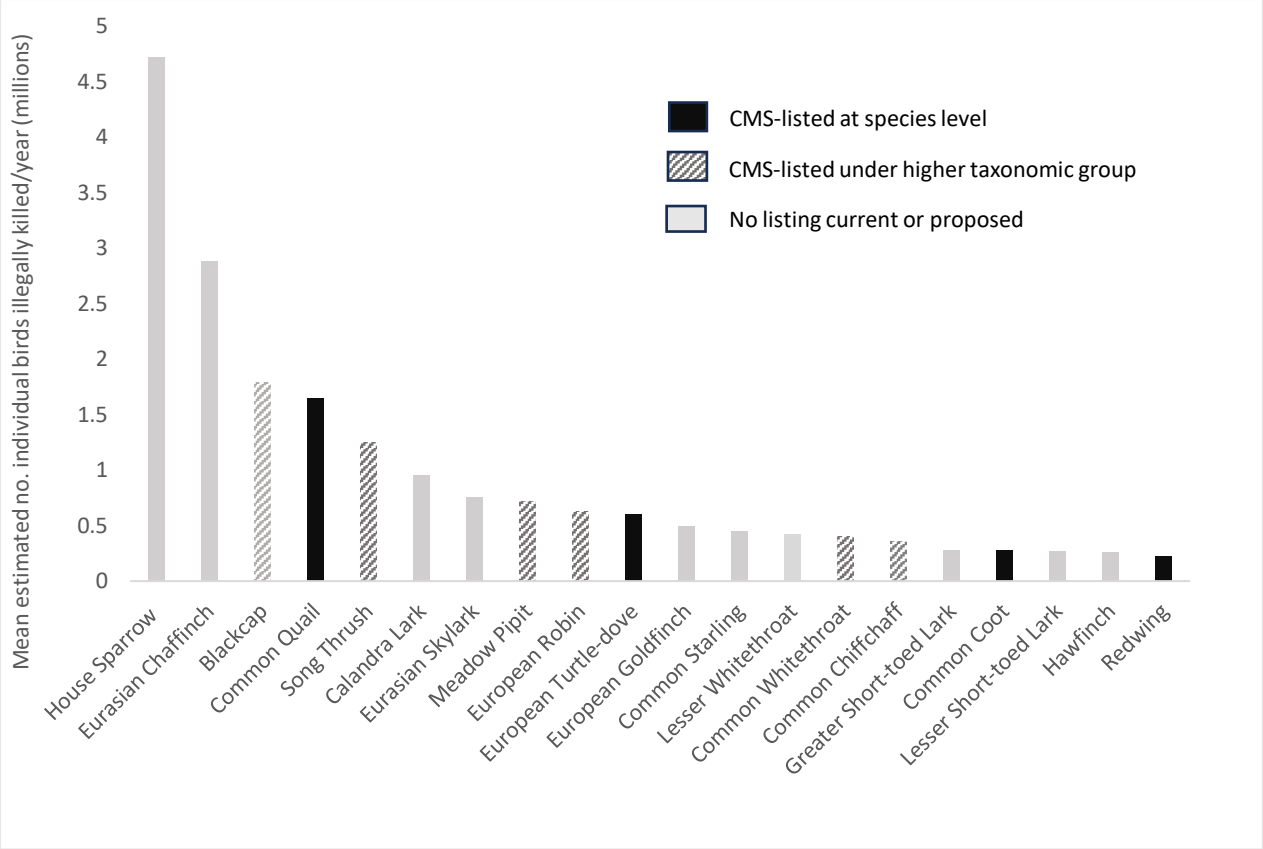


Figure 6. The 20 bird species with the largest estimated number of individual birds illegally killed/taken per year in the Mediterranean (Brochet et al., 2016, Table 3), distinguished by whether they are currently CMS-listed at species level (black bars), CMS-listed at wider taxonomic level (striped bars), or not listed/not on the list of potential species for listing (pale grey bars).

Comparison of legal to illegal take

However, while these numbers are substantial, comparison of legal to illegal take in the European Union shows that in this region legal take far outweighs illegal take (Figure 7). Our analysis of six commonly hunted species (Skylark *Alauda arvensis,* Rook *Corvus frugilegus,* Eurasian (formerly Common) Coot *Fulica atra* (Appendix II-listed), Starling *Sternus vulgaris,* Redwing *Turdus iliacus* (Appendix II-listed), Songthrush *Turdus philomelos* and Fieldfare *Turdus pilaris*) shows that the mean proportion of illegal to legal take across these species was 13% (ranging from 2% for *Corvus frugilegus* to 39% for *Fulica atra*, and 15% for the two CMS-listed species together), with records from reported bag statistics making up the majority of legal hunting, though derogations from legal protection requirements making up a considerable number in some cases. The total number of birds of these six species estimated as killed in 2016 was 16,627,127, of which 2,000,636 birds were CMS-listed species (on Appendix II). Five countries registered over one million birds killed (Cyprus, France, Greece, Italy and Spain), though data for derogations was missing for several countries and for bag statistics for six countries (Ireland, Luxembourg, Kingdom of the Netherlands, Romania, Slovenia and the United Kingdom). This suggests that the total number of birds killed in the region (legal and illegal take), is far higher than our estimations above.

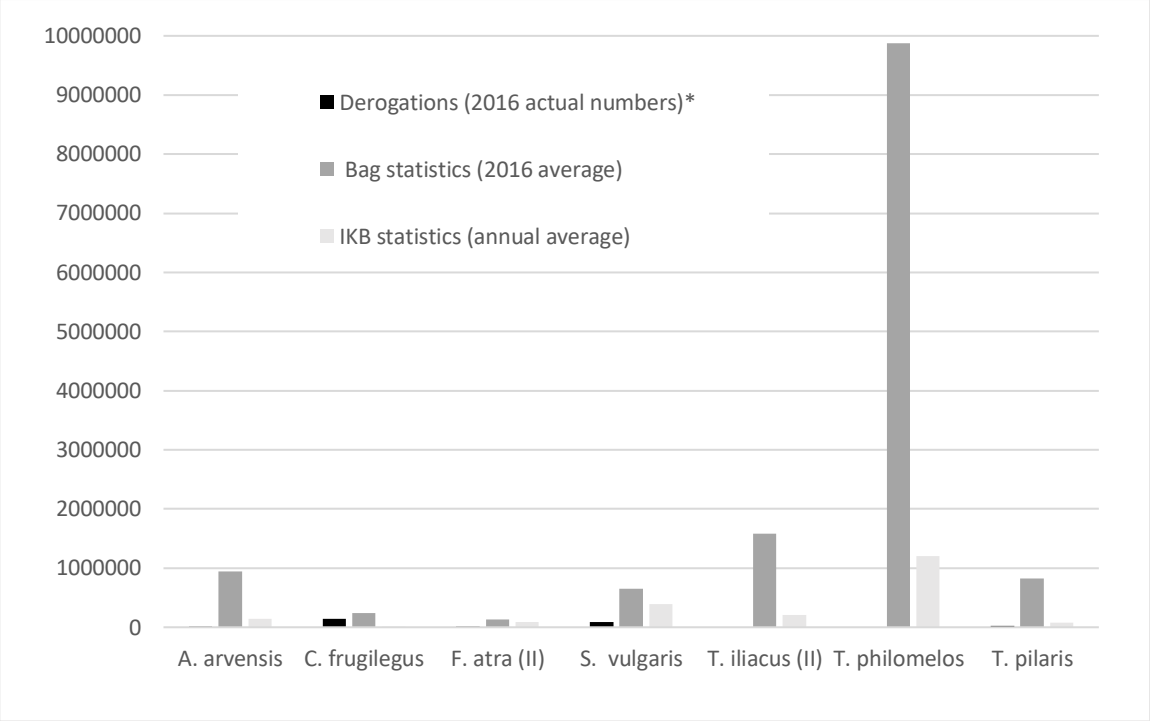


Figure 7. Comparison of numbers of birds of six species (Skylark *Alauda arvensis,* Rook *Corvus frugilegus,* Eurasian Coot *Fulica atra* (Appendix II-listed)*,* Starling *Sternus vulgaris,* Redwing *Turdus iliacus* (Appendix II-listed)*,* Songthrush *Turdus philomelos* and Fieldfare *Turdus pilaris*) estimated as illegally killed by Brochet et al. (2016, 2017; pale grey bars) with numbers officially reported as bag statistics (dark grey bars) and derogations to the EU Birds Directive (black bars) by the then 28 Member States of the EU, for 2016 (BirdLife International, unpubl. data).

Hirschfield et al. (2019) collated official hunting statistics on 82 permissible quarry species of bird (listed in Annex II of the EU Birds Directive) from 24 EU member states as well as Switzerland and Norway for 2014-2015, and reported a total annual hunting bag of at least 52 million birds. They noted that, in addition, a significant number of birds are killed, legally or illegally, in areas just beyond the study area and in European countries for which no data were available (Greece, Ireland, the Kingdom of the Netherlands and the UK). Of our CMS-listed project species, this total included conservative estimate of approximately 1.5 million European Turtle-dove (one-fifth of the EU's breeding population) and an estimated 2.9 million Common Quail. They noted at the time that "Despite a long-term decrease in the gross number of killings compared with older data, the bag figures for certain species, such as Common Pochard *Aythya ferina*, Northern Lapwing *Vanellus vanellus*, Turtle Dove *Streptopelia turtur* [all CMS-listed project species] and Skylark *Alauda arvensis*, remain high in proportion to their declining populations in Europe. Against a backdrop of declining populations of many affected species, hunting pressures may be undermining conservation efforts undertaken for these species in other countries." Action has been taken to address these concerns in relation to European Turtle-dove, and the species is now considered to be a prime example of adaptive harvest management, especially in the western flyway.

4.3 Motivations for take and trade of CMS-listed avian species for consumption.....

It should be noted that consumption for non-food purposes was not explicitly evaluated in the regional IKB reviews, and that where consumption was for medicine it may have been included either under the 'food' or 'other' category. Similarly, as human medicine was mixed up with veterinary medicine in the Red List use categories, we only analysed consumption for human food in the Red List dataset. In

the systematic literature review dataset (4.1), of the 83 project species/69 CMS-listed species consumed (27% of the 302 project species/31% of the 224 CMS-listed species), nearly all – 80/66 species respectively - were taken specifically for food, alongside 32/27 species respectively for medicinal purposes (with some taken for both reasons). The vast majority of species across all the datasets therefore are consumed for food as one motivation at least in some cases.

Consumption compared to other reasons for take

We first interrogated the regional IKB dataset to compare food consumption against other motivations for take. Experts were able to score more than one reason for IKB in the regional reviews, also scoring them as primary and secondary reasons. In terms of primary reasons, sport/recreation was the most common reason for IKB, followed by food and then taxidermy/egg collection (Figure 8). Taxidermy/egg collection was a particularly frequently cited secondary reason at species-level so scored second when primary and secondary reasons were combined, with food third. Looking at number of species gives a very similar picture to primary reasons, giving confidence in these results.

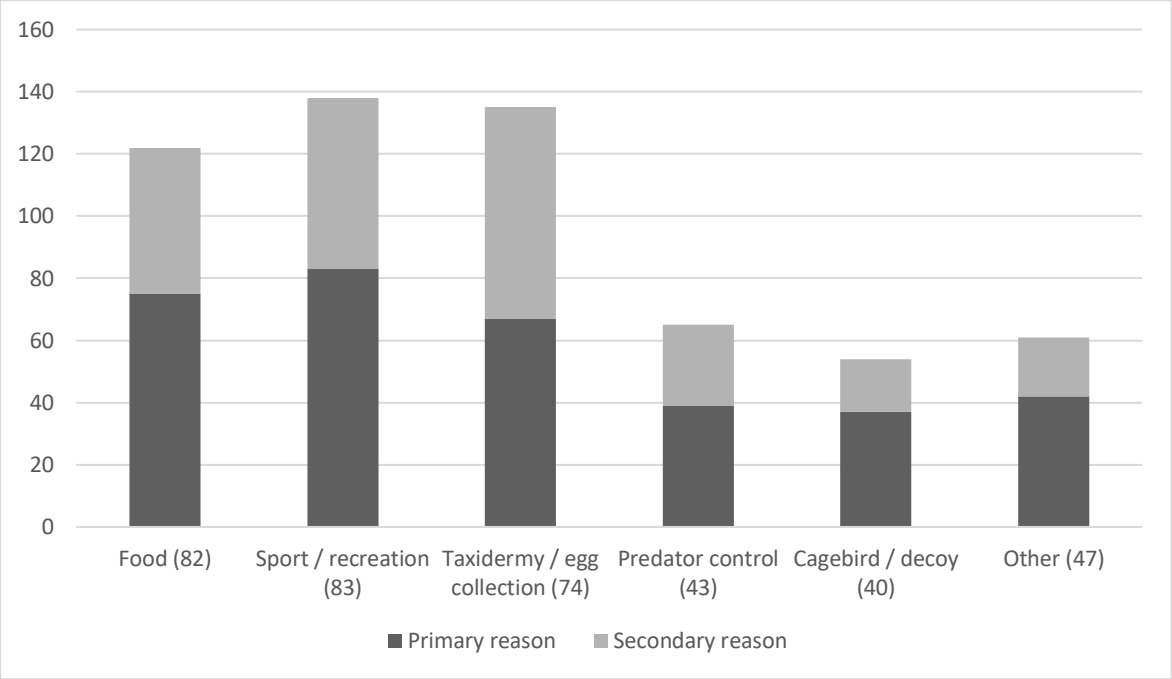


Figure 8. Primary and secondary reasons for illegal take of CMS-listed species, calculated from the combined dataset underpinning the regional IKB reviews, in terms of records (Brochet et al. 2016, 2017 and 2019). Total number of species per reason for take is in parentheses.

Combining primary and secondary reasons, there was a noticeable difference in reasons by sub-region, with food consumption being a relatively more important reason for north Africa, the Middle East and the Caucasus, offset by predator control for the three European regions where consumption was less important, with take for cagebirds/decoys notably more important for the Middle East (Figure 9). North Africa was the only sub-region where food consumption was the most common motivation for take.

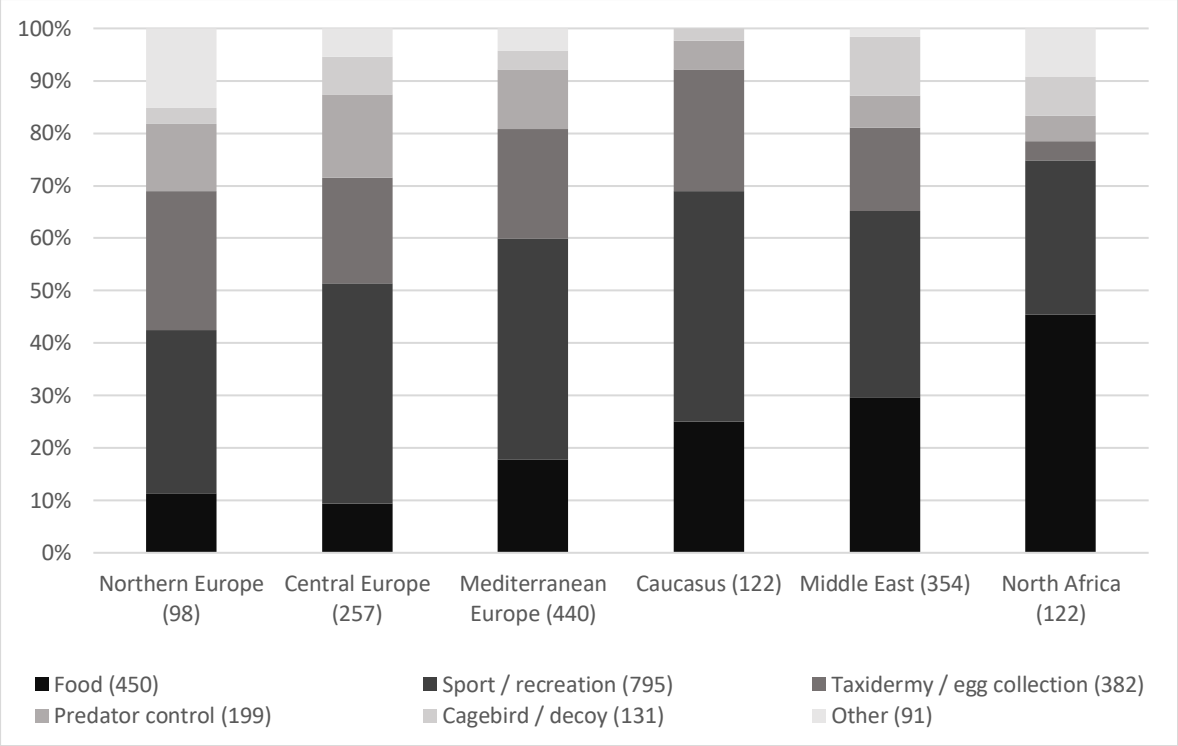


Figure 9. Reasons for illegal take of birds as a proportion of overall records per sub-region, calculated from the combined dataset underpinning the regional IKB reviews (Brochet et al. 2016, 2017 and 2019). Total number of records per sub-region is in parentheses.

Drivers of consumption

The two later regional IKB reviews by Brochet et al. (2017 and 2019) evaluated the specific reason(s) for food consumption (subsistence, delicacy or trade) of CMS-listed species (this was not evaluated by Brochet et al. 2016). For the four sub-regions studied (northern Europe, central Europe, the Caucasus and the Middle East), a similar proportion was stated as for subsistence in each (around half), with the remainder mainly as a delicacy in northern and central Europe, and for trade in the Caucasus and Middle East (Figure 10). However, the distinction between subsistence and delicacy may be subject to interpretation by the respondent, and does not necessarily indicate dependency; in northern and central Europe, hunters are largely shooting for sport and then taking the catch home, which is not fulfilling a protein need per se.

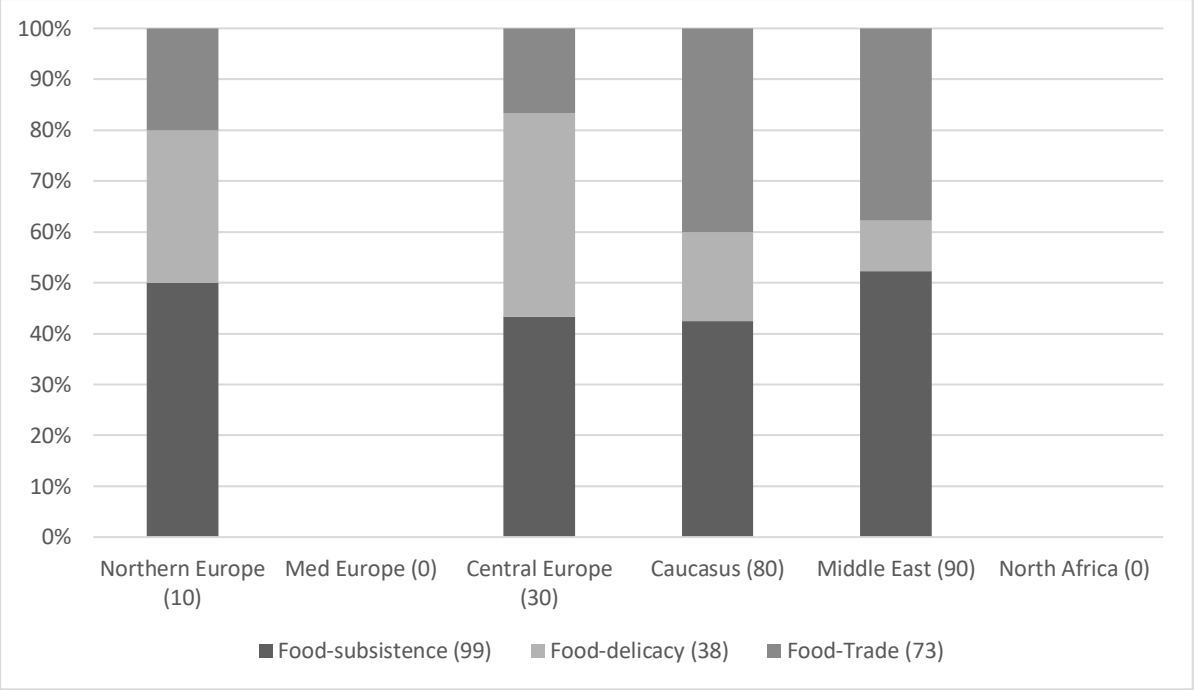


Figure 10. Proportion of records of CMS-listed project species taken illegally for food consumption by specific reason for consumption, for those subregions where these data were collected through the BirdLife International regional illegal taking of birds reviews (Brochet et al 2017 and 2019). Number of records for each category are given in parentheses.

Consumption patterns between different taxonomic groups

The majority of CMS-listed project species illegally taken for consumption registered in the regional reviews were waterbirds (59 species), followed by raptors (10), gamebirds (6) and then passerines (5). There was variation in the reasons for consumption between these taxonomic groups, with consumption for subsistence the main reason across all groups except for raptors (at 50% for waterbirds, the most consumed group), whereas trade was a more important reason for raptors and absent entirely for passerines (Figure 11).

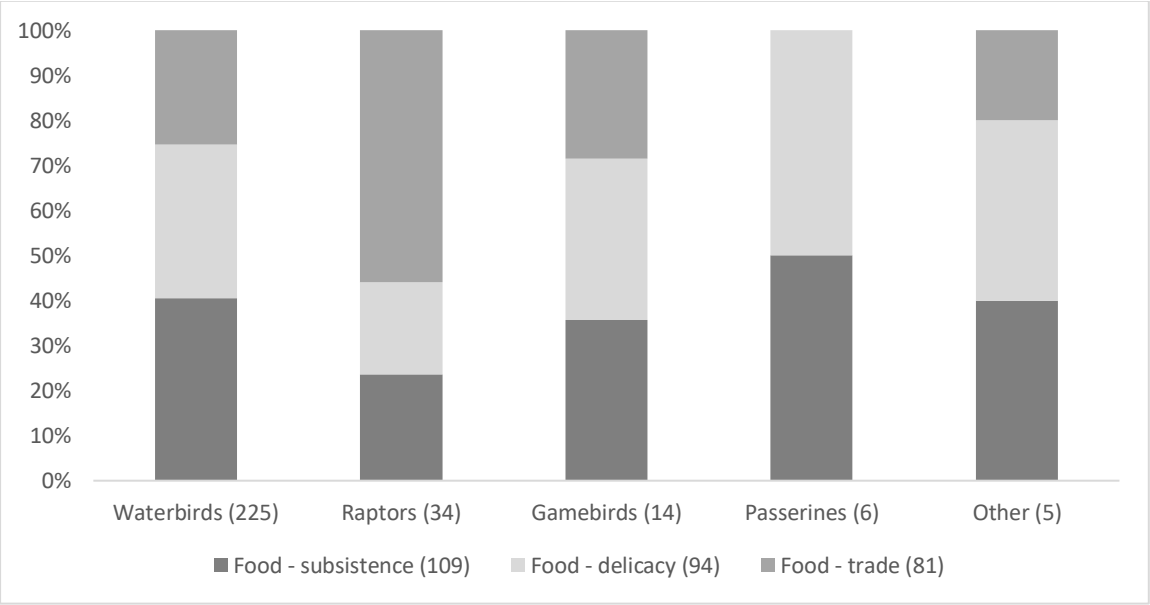
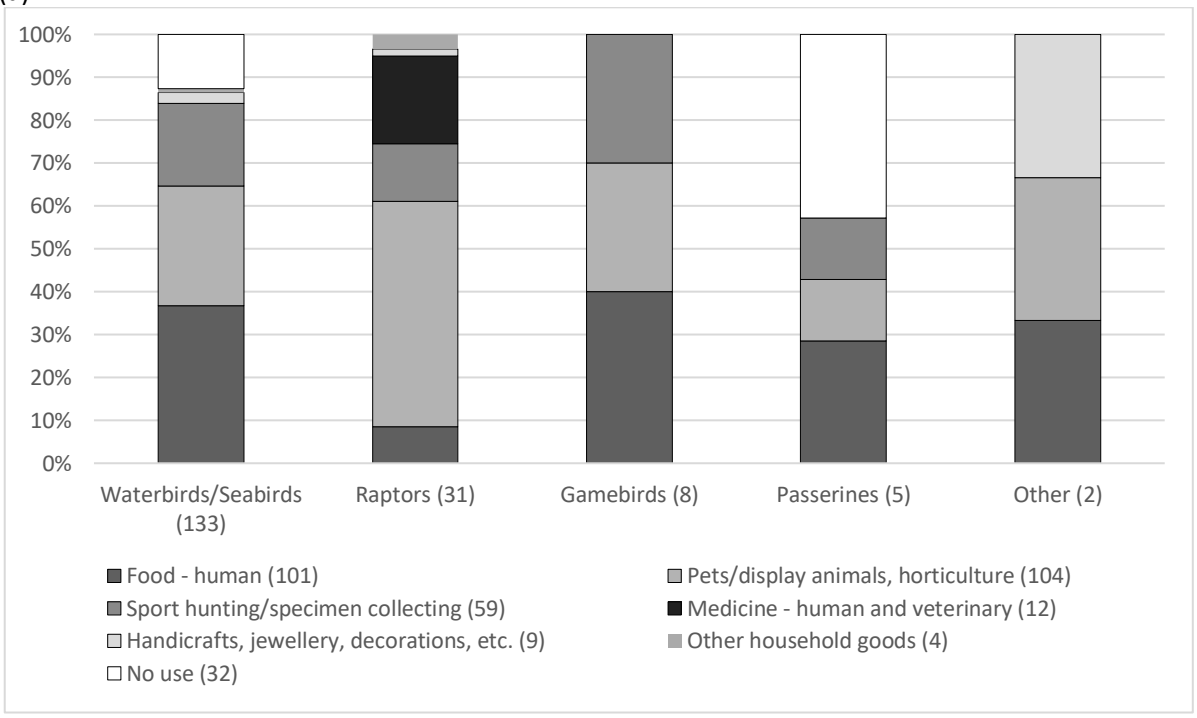


Figure 11. Proportion of records of CMS-listed project species taken illegally for food consumption by secondary reason for consumption, by taxonomic order (Brochet et al 2017 and 2019). Number of species for each family group and number of records for each food category are given in parentheses.

We then interrogated the Red List and systematic review datasets (which both cover the entire AEMLAP region and not just illegal taking) to understand variation in motivations for taking between taxonomic groups for the CMS-listed project species (Figure 12). With a much larger and more representative sample size and systematic means of evaluation, the Red List data show similar results to the regional IKB data in that food consumption is the second most prevalent reason for take (records for 101 species), just behind pets/display animals as the most important reason (records for 104 species; a category without an exact equivalent in either the IKB or systematic review datasets), with sport hunting/specimen collection coming third (records for 59 species; Figure 12a). It should be noted that pets/display animals and human/veterinary medicine are particularly important reasons for raptors (the latter only being recorded for this group). From the systematic review dataset we can see that, in addition to food, medicine is an important reason for take for all groups, though most significant for raptors, for which trade, bycatch and human-wildlife conflict are also important reasons (and as for the Red List dataset, sample sizes are very low for groups other than waterbirds and raptors; Figure 12b).

(a)



(b)

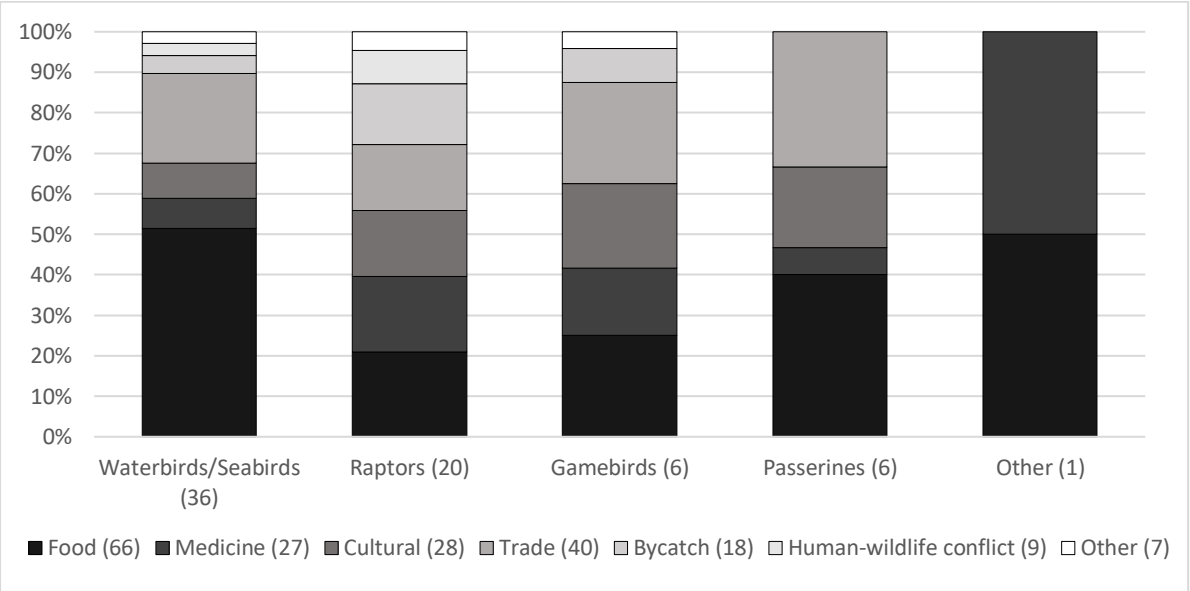
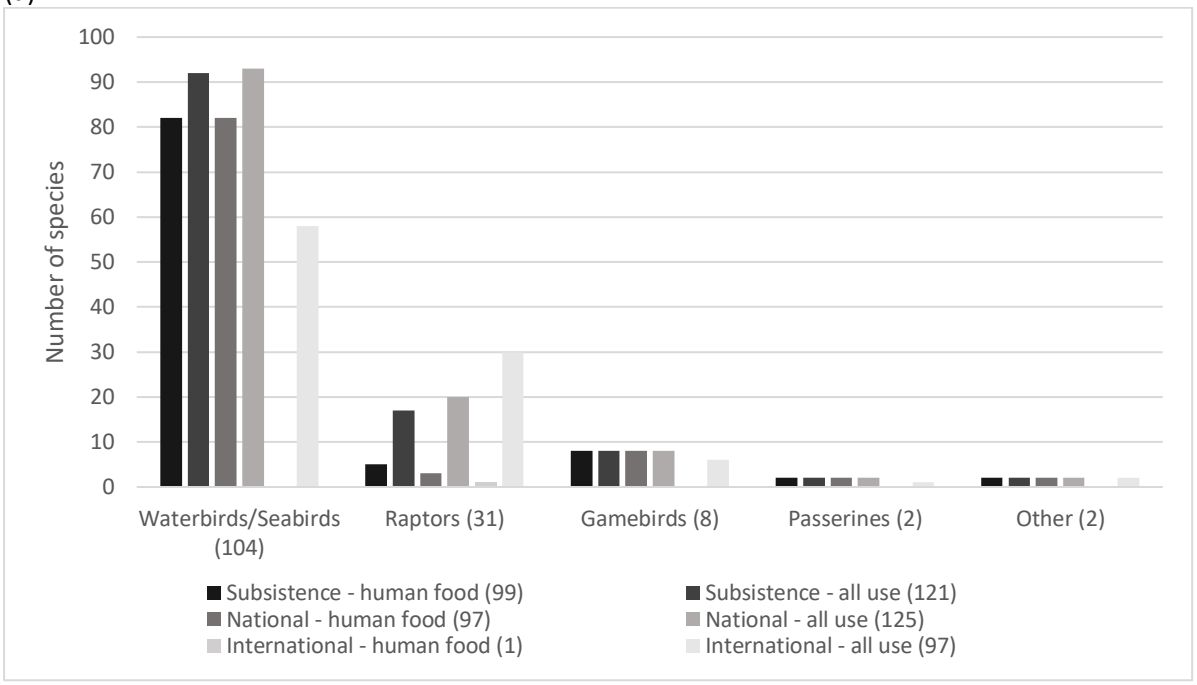


Figure 12. Proportion of CMS-listed project species in each family group taken for different purposes from (a) the Red List dataset (total 179 species) and (b) the systematic review (total 69 species), with the total number of species in parentheses after the family name and use type. More than one use could be registered for each species, though for the systematic review, records were for consumed species only (either for food or medicine).

Scale of use/trade

Analysis of the Red List dataset shows that most use/trade of the project species in general was at local or national scale, with similar scale of use for consumed species, and almost no (limited to a single species, Rüppell's Vulture *Gyps rueppelli*) international trade of consumed species (Figure 13a). In contrast, overall use/trade at international scale was most prevalent for raptors, which had relatively limited use/trade for food at any scale. The systematic review data found that the majority of consumed species were used at local scale, particularly for waterbirds, but that for raptors use/trade for consumption at national and international scale was also important (potentially linked to trade of vultures for belief-based medicine; Figure 13b).

(a)



(b)

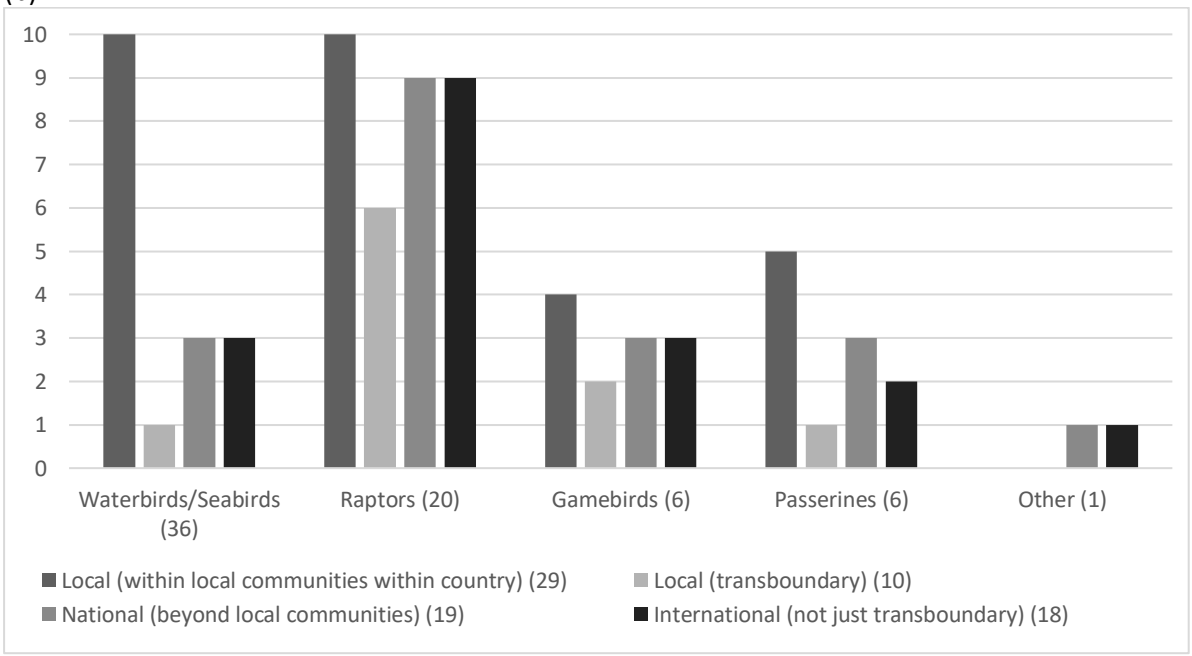


Figure 13. The scale of use of the CMS-listed project species by taxonomic group as recorded in (a) the Red List dataset (147 species; all used species compared with consumed species only) and (b) the systematic review (69 species; consumed species only). Numbers in parentheses give the overall number of species consumed in each family group and for each category.

The systematic review dataset suggests inter-regional differences in the scale of use/trade, with use being predominantly local for Africa, Central Asia and Europe, and relatively more trade at national and international scale in the Middle East (as well as Africa to a lesser extent; Figure 14).

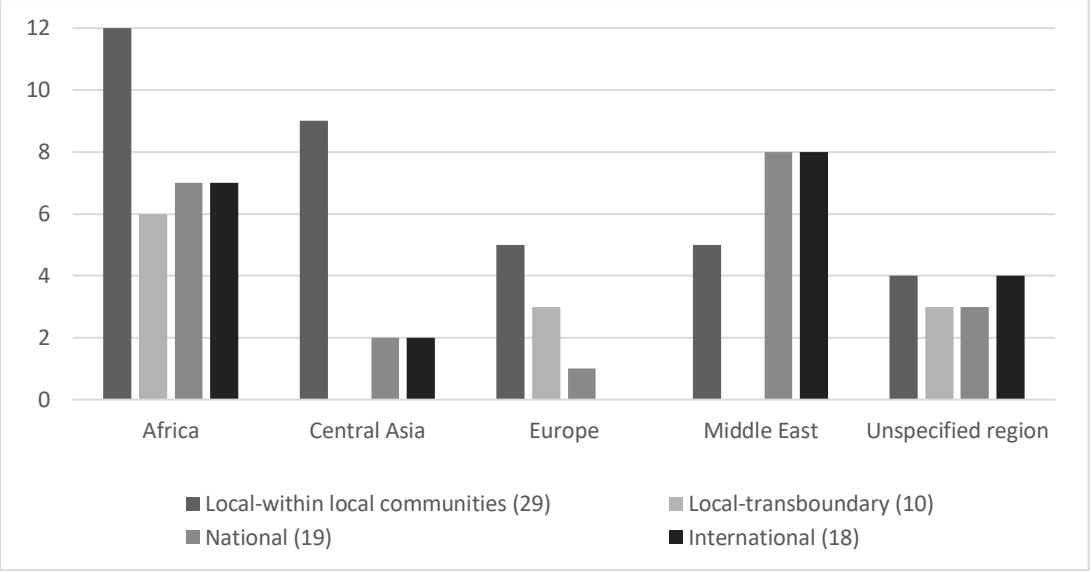


Figure 14. Scale of trade for CMS-listed project species taken for consumption by region, based on data from the systematic review. Number in parenthesis is the total number of species taken by use/trade scale.

Other motivations

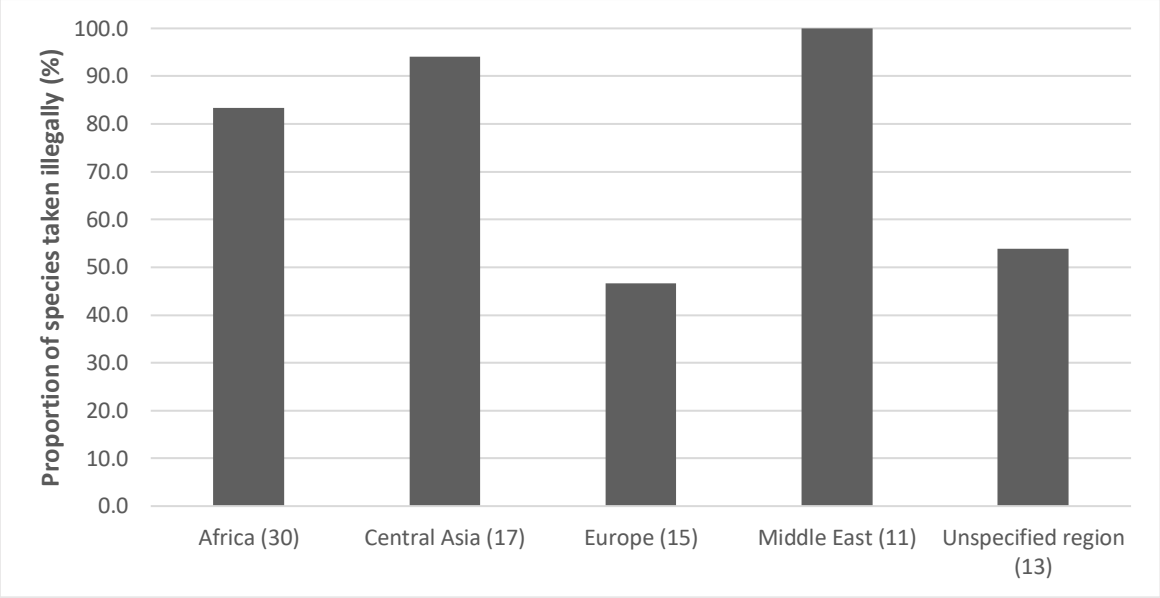
According to the Red List dataset, while the majority of species threatened by hunting were taken intentionally (143 out of 149 project species, or 100 out of 104 CMS-listed project species), 32 (21%) project species or 28 (27%) CMS-listed project species were also registered as taken unintentionally (under category 5.1.2) including as bycatch (with some species registered as being taken both intentionally and unintentionally; Annex 2). Similarly, bycatch was reported for 26% or 18 out of 69 CMS-listed project species in the systematic review (see also above and Figure 12b).

Our systematic review evaluated other motivations for taking of the 69 CMS-listed project species for consumption: take was recorded as being traditional and rural for nearly two-thirds of species (43 species or 62% for each), compared to only 7% (5 species) urban. Similarly, take was recorded as being subsistence for over two-thirds of species (47 species or 68%) compared to around a third for commercial trade (25 species or 36%; much of this was in Africa where trade and subsistence were roughly equal). A limited number of records (14 species or 20%) noted that take was due to alternative sources of protein not being available or accessible. Data on price of the species' take was noted for 13 records (19%), but in addition to this being a relatively small sample size across such a wide variety of species, locations, countries and time periods, this information was highly variable in terms of the type and quantity of take to which it referred and further quantitative evaluation was beyond the scope of this study (but see for example case studies in Boxes 4.1, 4.3 and 4.5).

Legality

Of the 69 CMS-listed project species recorded as taken for consumption in the systematic review, 55 species (80%) were reported as taken illegally. Illegal take is reported for all regions (Figure 15a), with the majority of reported take being illegal for all named regions (Africa 83% illegal, Central Asia 94% and Middle East 100%), apart from Europe, with less than half (47%) of take reported as illegal. At family level, 100% of take for consumption was recorded as illegal for gamebirds and passerines (though sample sizes were limited), and 75% for both waterbirds and raptors (Figure 15b). This result should be interpreted with caution however, as it is based on species rather than individual records, and the studies may not have looked specifically at legal vs illegal take.

(a)



(b)

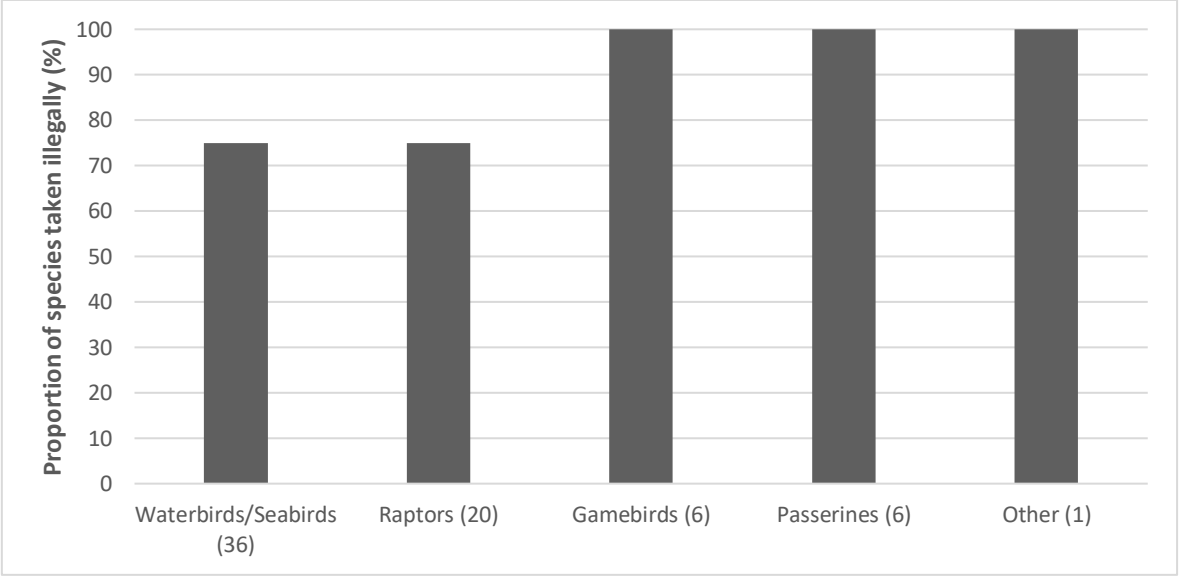


Figure 15. The proportion of CMS-listed project species taken for consumption illegally (a) by region (n = 55 species, some reported for more than one region making 66 species counts) and (b) by family group (n = 55 species), from the systematic literature review. Number in parenthesis is the total number of species reported to be taken for consumption per category.

4.4 Direct impacts of take of CMS-listed avian species for consumption.....

Information from the systematic literature review

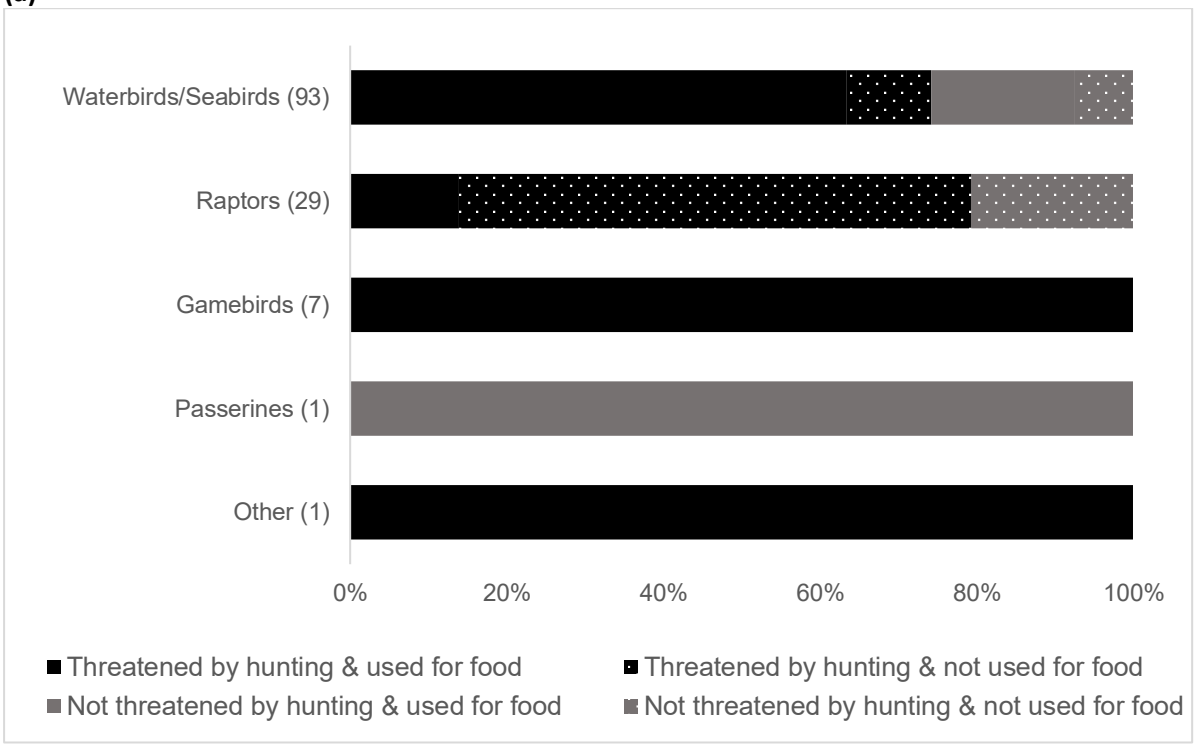
For the 69 CMS-listed project species taken for consumption (195 records), the systematic literature review found 29 species (42%; 52/195 or 27% of records) were reported by the study authors as having unsustainable levels of take, compared to 7 species (10%; 8 or 4% of records) which were reported as sustainable. A slightly higher proportion (68 or 35% of records) were reported to have declining populations or population trends. Thirty-eight percent of records (75) reported quantitative data on take in terms of quantities or volumes, but as for the price data described above, the type and quality of these data were extremely variable and further review was beyond the scope of this study.

Information from the IUCN Red List database

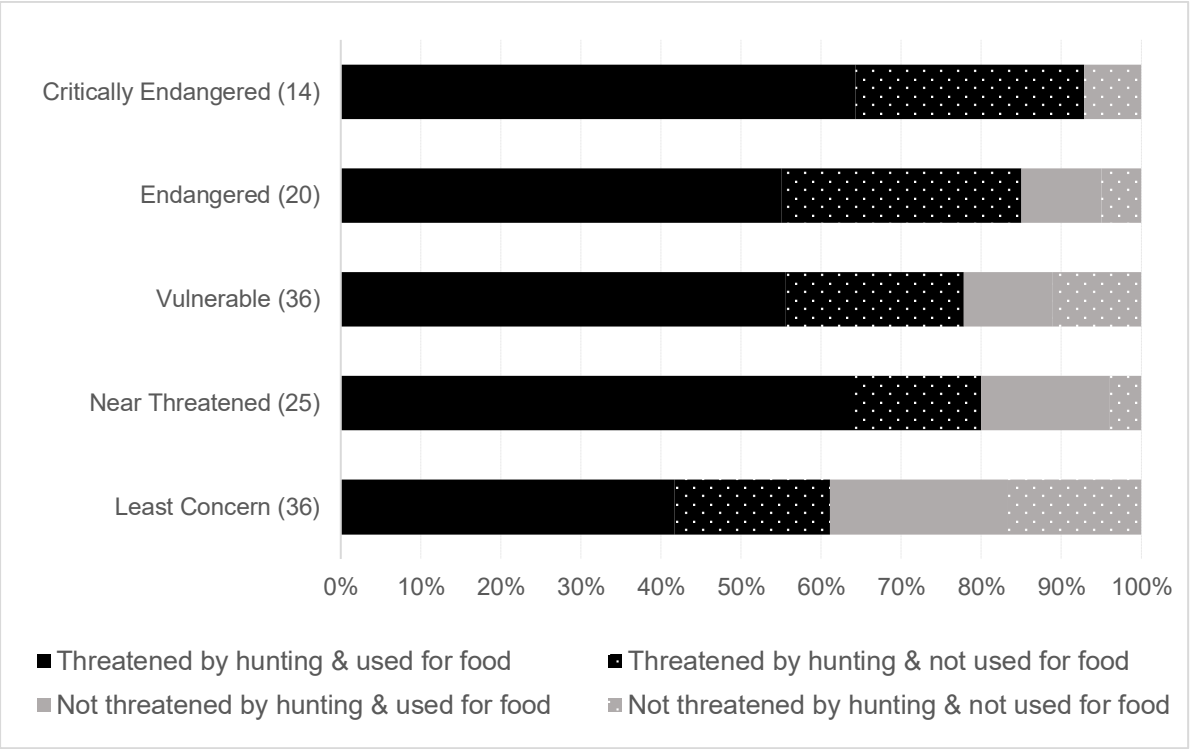
We compared whether species threatened or not threatened by intentional hunting are used for food or not, based on information on threats and use gathered as part of their IUCN Red List assessment. The majority (100 species or 76%) of the 131 CMS-listed project species with a threat assessment were threatened by hunting and recorded as used for various purposes. Of these, the majority (71 species or 71%) of the 100 species recorded as threatened by hunting were used as human food.

There were however differences in these tendencies between family groups (Figure 16a), with all 7 gamebird species threatened by hunting and used as human food, suggesting that consumption is a major driver of hunting, but the majority of raptors, whether threatened or not, not being used as human food, noting that consumption for medicine, use as pets/display animals or sport hunting are more common drivers of hunting for raptors (Figure 12a).

(a)



(b)



(c)

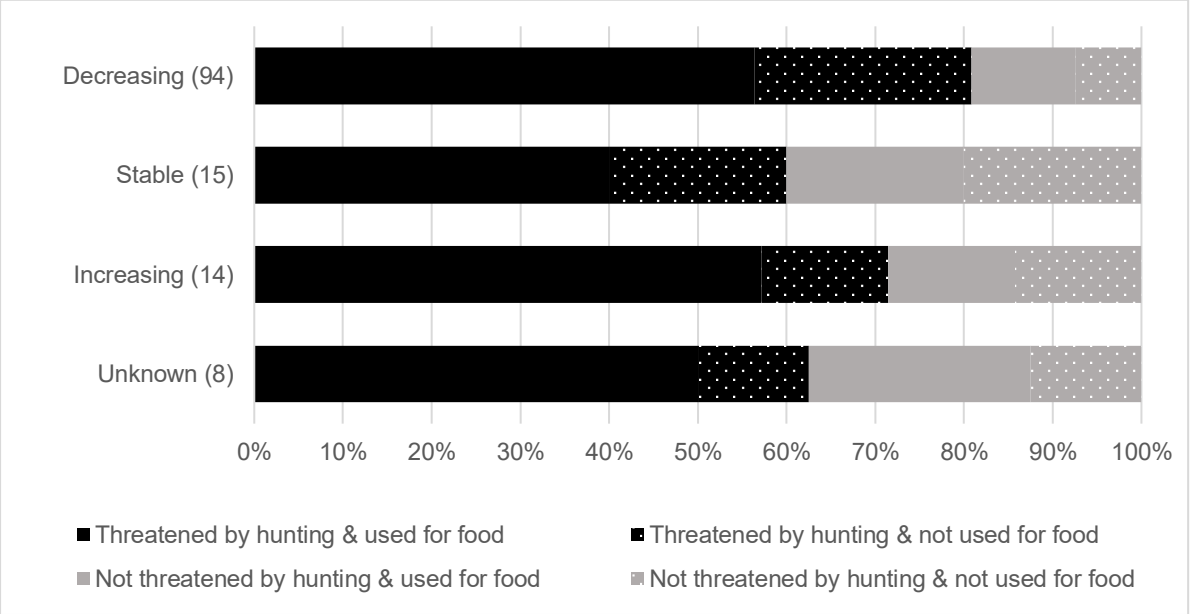


Figure 16. The proportion of the 131 CMS-listed project species with a threat assessment threatened by hunting (for intentional use – category 5.1.1), overlaid by whether they are used for human food, as registered under the IUCN Red List threats and use and trade classification schemes, (a) by family group, (b) by extinction risk category as assessed under the IUCN Red List categories and criteria, and (c) by population trend as registered in the IUCN Red List assessment. IUCN Red List data were provided by BirdLife International in December 2023. Black bars represent number of species threatened by hunting and grey bars represent number of species that are not threatened by hunting. Plain bars represent numbers used as human food and spotted bars represent numbers not

used as human food. Numbers in parentheses give the number of project species in each category with data available.

Of the 131 species, those in a higher extinction risk category tended to have a relatively higher proportion of species threatened by hunting and used as food (Figure 16b). All nine Critically Endangered CMS-listed project species used for human food are threatened by intentional hunting. While a similar proportion (around 68%) of species in each category was used as food, of the 46 globally threatened (Critically Endangered, Endangered or Vulnerable) species that are used as food, 87% (40 species) are threatened by intentional hunting, compared to 65% (15 of 23 species) in the Least Concern category.

Of the 131 CMS-listed project species, the majority (94 species, 72%) were assessed as having decreasing populations. Of those 94 species with decreasing populations, most (76 species, 81%) were threatened by hunting and over half also used as food (53 species, 56%; Figure 16c). Put another way, of the 71 CMS-listed project species threatened by intentional hunting and used for food, three-quarters (53 species) had decreasing populations. Of these 53 species with decreasing populations, 9 were CMS Appendix I only, 23 both Appendix I and II, and 21 Appendix II only. Of the 53 species, the majority (19 species) were Charadriiformes (Sandpipers, Snipes, Phalaropes, Plovers, Auks, Gulls, Terns, Skimmers), 9 species were Anseriformes (Ducks, Geese, Swans), and 6 species were Otidiformes (Bustards). It should however be noted that of the 14 CMS-listed project species assessed as having increasing populations, eight species (57%) were threatened by intentional hunting and used for food, i.e. the majority of species both with declining and increasing populations were threatened by intentional hunting and used for food.

A more in-depth review of the information gathered from different sources shows the scale, motivations and impacts of take and trade for consumption on some of our project species. Boxes 4.1 to 4.8 provide case studies of the direct impacts on a range of globally threatened project species.

Box 4.1. Illegal trade in European songbirds and other birds for food

The illegal hunting and trapping of European birds has long been an issue of conservation concern. Birds have been trapped for the pet trade and as food for hundreds of years; however, the highly effective hunting methods now developed, and in some cases additional pressures on declining populations, have created an unsustainable trade which is seriously threatening some species.

A study in 2006 found that the majority of illegal hunting occurred in south-east and central Europe, particularly Bulgaria, Romania, Serbia and Montenegro, from where the birds were exported into northern Italy (Steiner 2006). Birds were then sold for consumption as a delicacy in restaurants. Birds seized in trade were estimated to be worth EUR2–3 million per year, with the industry as a whole being estimated to be worth EUR10 million per year (N. Pierotti, Corpo Forestale Service, pers. comm. to TRAFFIC, July 2008 in TRAFFIC, WWF and Kingdom of the Netherlands Ministry of Agriculture, Nature and Food Quality (2008)). Illegal mist-netting, lime-sticking, tape-luring and automatic shotgun hunting were being used to maximise birds killed which were then concealed in cars or amongst other food products in refrigerated lorries and transported across central Europe (Rocco and Isotti 2006).

Birds traded include the Red-breasted Goose *Branta ruficollis* (CMS Appendix I/II) and Corncrake *Crex crex* (CMS Appendix II); however, the vast majority of birds traded were songbirds, including finches, pipits and larks protected under international treaties such as CMS and EU and national legislation. In 2001, the Italian Police seized a trailer containing 12 tonnes of frozen birds: 120,700 specimens comprising 83 species, including European Turtle Dove *Streptopelia turtur* (CMS Appendix II) (Rocco and Isotti 2006). Some 38,000 Common Quail *Coturnix coturnix* (CMS Appendix II) were shot in Serbia

over two months in 2004—more than the entire breeding population of Serbia - over 90% of which were estimated to have been hunted illegally using automatic shotguns and tape-lures (Simic *et al*. 2003, Simic and Tocakov 2005). These actions correspond with population declines of quails in eastern Europe including in Ukraine, Romania, Bulgaria, Albania, Serbia, Montenegro, Greece and Türkiye, whereas, elsewhere in Europe, populations are stable or increasing. BirdLife International (2008) concluded that unless further attention is given to this trade, many European birds may experience nationally and locally significant population declines as a result of over-harvesting.

Source: TRAFFIC, WWF and Netherlands Ministry of Agriculture, Nature and Food Quality (2008) The illegal trade in wild birds for food through South-east and Central Europe. Downloaded from: https://www.traffic.org/site/assets/files/3754/illegal_trade_wild_birds_for_food_europe.pdf

Box 4.2. Assessing the sustainability of harvest of the European Turtle-dove along the European western flyway: an example drawn from the Species Use Database (speciesusedatabase.com)

The European Turtle-dove *Streptopelia turtur*, a migratory bird that travels between Europe and sub-Saharan Africa, is currently facing significant challenges and is listed as Vulnerable by the IUCN. Its population has experienced a dramatic decline, estimated at around 78% since 1980. In some countries the turtle-dove population has reduced by >94%. This decline is primarily due to habitat loss from agricultural intensification, illegal hunting, and a reduction in food resources along its migratory route. In 2018, the European Commission published an Action Plan for the Conservation of the European Turtle Dove to halt and reverse the population decline (Fisher et al. 2018). The species was recorded as taken for consumption under all four of our primary sources of information in this review, with one of the highest numbers of total records (see section 4.1). A study by Lormee et al. (2020), drawn from the Species Use Database, indicates that levels of legal hunting of the species along the western flyway were at the time of the development of the Species Action Plan unsustainable and exceeded the maximum harvestable fraction under most scenarios. Spain is the European country where the most turtle doves were legally hunted, with an average of 950,000 per year between 2006 and 2017. This means that hunting for consumption was drastically impacting a population already under considerable strain on several fronts.

Even under the most conservative management objectives, the historic hunting levels were overexploiting the turtle dove population. In 2019, the European Commission launched the Turtle Dove EU Adaptive Harvest Management to answer the need to ensure sustainability of hunting as required by the EU Action Plan. In 2021, the EU Adaptive Harvest Management resulted in the implementation of a hunting moratorium in the four Member States in the Turtle Dove Western flyway (France, Spain, Portugal, and the northern part of Italy), and in the implementation of 50% harvest reductions in the Central/Eastern flyway Member States (Italy, Greece, Malta, Cyprus, Romania, Bulgaria, Austria). In the period 2022-2024 this was extended to a zero take recommendation for the Central/Eastern Flyway as well (Arroyo et al. 2025).

Box 4.3. Impacts of illegal trapping and local trade of farmland birds in Madhesh Province, Nepal

Unsustainable harvest is a critical threat to many vulnerable migratory bird species, in particular when demand increases exponentially over a short period of time – often driven by seasonal consumer demand. The issue is well illustrated by one study from Nepal where seasonally high consumption of avian wild meat targets multiple globally threatened bird species which are commonly trapped and sold to restaurants or hotels under the catch-all name of 'Bagedi' (Katuwal et al., 2023). This harvest includes the Critically Endangered and migratory Yellow-Breasted Bunting (*Emberiza aureola*), which is threatened both globally and within Nepal, and listed on CMS Appendix I.

Trappers typically use two methods - nets (used by 83% of the trappers) and catapults. The peak season is from December to February, with some trappers operating throughout the year. Trappers typically capture the birds, before either selling them directly to hotels or public houses, or to middlemen. These middlemen often provide advance money to the trappers to ensure a steady supply of birds, before they are sold to hotels. In this way, the meat of a threatened migratory bird reaches consumers, who come to the hotels specifically to eat the Bagedi.

Trappers sold Bagedi to middlemen for 20-35 NPR (USD 0.17-0.30) each, middlemen to hoteliers for 30-40 NPR (USD 0.26-0.35) each and hoteliers sold Bagedi to customers for 300-800 NPR (USD 2.60-7.00) per plate (8 pieces per plate), with an average of 520 (USD 4.50) NPR per plate. The study estimates that during the three-month peak season, 115,200 to 129,600 birds are killed, generating an estimated income of 7,488,000 to 8,424,000 NPR (USD 65,113-73,252) for the hoteliers in the study area. The trapping and trade of these threatened species is having a significant negative impact on their populations, considering the numbers of birds being harvested per annum. Many respondents to the surveys were unaware that the practice of trapping wild birds for consumption is illegal in Nepal, and despite being informed of this illegality, were unwilling to cease the practice, with more than 45% believing that bird abundance had increased.

Box 4.4. Impacts of the use for traditional medicine on vultures in KwaZulu-Natal, South Africa

Unsustainable harvest is a particularly prevalent issue for vultures across sub-Saharan Africa as they are targeted not only for their body parts for the traditional medicine trade, but are also under indirect pressure from accidental poisoning. Many vulture species are now severely threatened in part due to this unsustainable harvest, including the White-backed Vulture (*Gyps africanus*; CMS Appendix I/II) which is Critically Endangered across its range.

A study by Manqele (2022) which focused on KwaZulu-Natal found that use of vultures in traditional medicine was widespread, with traditional healers using various vulture parts, especially the head, to treat a variety of spiritual and physical ailments. The most common methods cited were poisoning (38%) and firearms (31%) with hunters typically luring vultures out of protected areas and private game reserves using livestock carcasses as bait. In poisoning cases, the carcass would be laced with a lethal substance, resulting in death after ingestion. Local people in KwaZulu-Natal had a strong awareness and appreciation of vultures, but also held beliefs that vultures possess traditional medicinal properties, which was seen as the main driver for their illegal killing.

Vultures have experienced significant population declines, with four out of seven vulture species in South Africa being Critically Endangered, and illegal and unsustainable harvesting has contributed to their threatened status. Populations of White-backed Vultures have been hit extremely hard by over-harvest as well as habitat loss, food shortages, energy infrastructure, land-use change, and climate change. Declines in vulture populations were also reported first-hand by the respondents in the study, especially by older hunters: “There used to be a lot of them [vultures] feeding on livestock carcasses in these lands [communal] but now we go years without seeing them. They spend most of their time in reserves now. Livestock die and end up being eaten by dogs and hyaenas”.

Box 4.5. Drivers and impacts of hunting of the Yellow-Casqued Hornbill and other hornbills in Cameroon

Yellow-casqued Hornbill *Ceratogymna elata* (on the CMS list of potential species for listing, Vulnerable and declining on the IUCN Red List) was the third most common hornbill species recorded in an online survey of online trade in hornbills, which recorded 25 species, of which 20 were African species and nine native to Cameroon, and found that take was predominantly for the casque or skeleton for

ornamental or medicinal purposes (Su et al. 2024). Hornbill skulls in online trade had a median price of £117, about 36 times higher than the local village price in Cameroon of £3.28 (*ibid*). While consumption as bushmeat may have been the primary reason for hunting the Yellow-casqued Hornbill in the past and continues to be the main motivation particularly in more remote villages (recorded as the reason for take by 83% of 268 village respondents, compared to 15% for traditional medicine; Mundi and Tegang 2024), trade at least of their heads and casques is also conducted (reported by 57% of respondents) and hornbills in Cameroon are increasingly being targeted to meet the growing foreign demand for hornbill parts facilitated by Asian buyers (Su et al. 2024). Even where hornbill species are fully legally protected (as for the Yellow-casqued Hornbill in Cameroon), this trade in their casques may drive severe population declines and push species to the brink of extinction; this has led to local declines within two years in Cameroon (Su et al. 2024), and the Yellow-casqued Hornbill is one of four hornbills locally extirpated from most of Ghana (Holbech et al. 2018). This is likely to cause knock-on impacts for ecosystem function given their important role in seed dispersal and in the food chain (Mundi and Tegang 2024).

Box 4.6. Population-level impacts of illegal killing of birds in the Arabian Peninsula, the Islamic Republic of Iran and Iraq

In a partial assessment of illegal killing of birds in the Arabian Peninsula, the Islamic Republic of Iran and Iraq led by BirdLife International, illegal killing was found to be widespread across the region, affecting all countries assessed, with 1.7–4.6 million birds estimated to be killed each year (Brochet et al. 2019). The highest estimated numbers were for the assessed northern part of Saudi Arabia (708 000–2 700 000), followed by the assessed provinces of the Islamic Republic of Iran (598 000–1 000 000) and Iraq (135 000–524 000). The highest estimated numbers were for warblers (693 000–2 600 000), ducks, geese and swans (381 000–641 000), rails, gallinules and coots (170 000–312 000) and pheasant, partridges and grouse (125 000–332 000). While the majority of birds were not from CMS-listed species (see section 4.2), 45 (66%) of the 68 globally threatened and Near Threatened bird species assessed in the region (Saudi Arabia was excluded as estimates made were not species-specific) were known or likely to be killed illegally each year, and nine of the ten threatened and Near Threatened species with the highest estimated numbers killed per year relative to their global population size were CMS-listed species (with the tenth species on the list of potential species for listing; Table 15).

Marbled Teal *Marmaronetta angustirostris* (Vulnerable; CMS Appendix I/II) was impacted most severely, with 5000–15,000 individuals, or potentially > 15% of its global population, estimated to be illegally killed in the region per year. Of greater concern, Sociable Lapwing (Critically Endangered; CMS Appendix I/II) had a high estimated number (0–300 birds; also known or likely to be killed illegally each year in Saudi Arabia (5–25 birds)). Four of these ten species of conservation concern, White-headed Duck (Endangered; CMS Appendix I/II), Ferruginous Duck (Near Threatened; CMS Appendix I/II), Sociable Lapwing and Marbled Teal may also have > 1% of their global population illegally killed in the Mediterranean region each year (Brochet et al. 2016). The first three are the subject of international action plans under CMS/AEWA, with a European action plan for Marbled Teal, all of which have identified illegal killing as a threat to these species and listed actions needed to reduce the impact of illegal killing on these and other species and to consider the combined effect of legal and illegal take alongside other threats such as habitat loss/degradation and climate change (Brochet et al. 2019).

Table 15. The ten globally threatened and Near Threatened bird species with the highest ratio between the estimated number killed/taken illegally per year in the Arabian Peninsula, the Islamic Republic of Iran and Iraq (except Saudi Arabia owing to absence of species-specific estimates) and their global population size, taken from Brochet et al. 2019. 2016 IUCN Red List category: NT = Near Threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered. All species are listed on

CMS Appendix I and/or II except for *Bulweria fallax* which is on the list of potential species for listing, and all are consumed for food (Annex 2).

Species (2016 IUCN Red List category)	Ratio of estimated no. of birds illegally killed/taken to the global population (min–max)	Country with the largest estimated no. of birds illegally killed/year
Marbled Teal *Marmaronetta angustirostris* (VU)	0.17 (0.08–0.27)	Iraq
Greater Spotted Eagle *Clanga clanga* (VU)	0.02 (0.01–0.08)	Quatar
Jouanin's Petrel *Bulweria fallax* (NT)	0.02 (0.01–0.08)	Yemen
Asian Houbara *Chlamydotis macqueenii* (VU)	0.02 (0.01–0.05)	Iraq
Ferruginous Duck *Aythya nyroca* (NT)	0.01 (0.004–0.03)	Iraq
Armenian Gull *Larus armenicus* (NT)	0.01 (0.01–0.02)	Iran (Islamic Republic of)
Dalmatian Pelican *Pelecanus crispus* (VU)	0.01 (0.01–0.02)	Iran (Islamic Republic of)
Eastern Imperial Eagle *Aquila heliaca* (VU)	0.01 (0.001–0.05)	Quatar
Sociable Lapwing *Vanellus gregarius* (CR)	0.008 (0.001–0.02)	Iraq
White-headed Duck *Oxyura leucocephala* (EN)	0.008 (0.004–0.01)	Iran (Islamic Republic of)

Box 4.7. CMS Appendix I birds threatened by direct use and trade; key findings from a report to CMS COP14

At CMS COP13 (Gandhinagar, 2020), Parties highlighted concerns about the direct use and trade of Appendix I taxa, particularly in the context of Article III, Paragraph 5 of the Convention, which prohibits their taking except under specific circumstances (UNEP/CMS/COP13/Doc.21). In addition, intentional biological resource use was identified as one of the most prevalent threats facing Appendix I taxa in a preliminary review of conservation status submitted to COP13 (UNEP/CMS/COP13/Doc.24). The CMS Secretariat therefore engaged the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) to assess the potential impact of direct use and trade on the conservation status of Appendix I taxa in relation to Decision 13.24 c) and in support of fulfilling Decisions 13.17 and 13.109.

The rapid assessment found that over a quarter (30%, 53 taxa) of the 180 CMS Appendix I-listed taxa (100 of which were birds) were considered 'higher risk' within a risk matrix assessing vulnerability to and likelihood of threat from use and trade (Figure 17). Among the 25 'higher risk' birds, the Accipitriformes (seven species, including three species of vulture), Pelecaniformes (five species, including three species of egrets and herons) and Otidiformes (three species, all bustards) were particularly prevalent. Of the 53 higher risk taxa, five species (9%) were classified as both very highly vulnerable (mean score ≥0.83) and likely to be very highly threatened by use and trade (mean score >0.75), including two vulture species (White-backed Vulture *Gyps africanus* and Rüppell's Vulture *G. rueppelli;* both project species), which have also been assessed by IUCN as Critically Endangered with ongoing population declines. Four of the moderate risk taxa had mean threat scores >0.75, suggesting that they may be very highly threatened by use and trade, including Lesser White-fronted Goose *Anser erythropus* and Yellow-breasted Bunting *Emberiza aureola* (both project species). Seventy percent (70 species) of birds were identified as harvested for domestic use from their IUCN Red List assessments or supplementary literature, with 77% also categorised as globally threatened, indicating that their populations may be more vulnerable to threats, including overharvesting.

Birds as a group had lower management scores compared to other taxa (Figure 17), and were more likely to be harvested for domestic rather than international use, suggesting that these at-risk birds may particularly benefit from increased efforts to address threats from domestic use, though the study authors noted that a more detailed, taxon-level review may be beneficial.

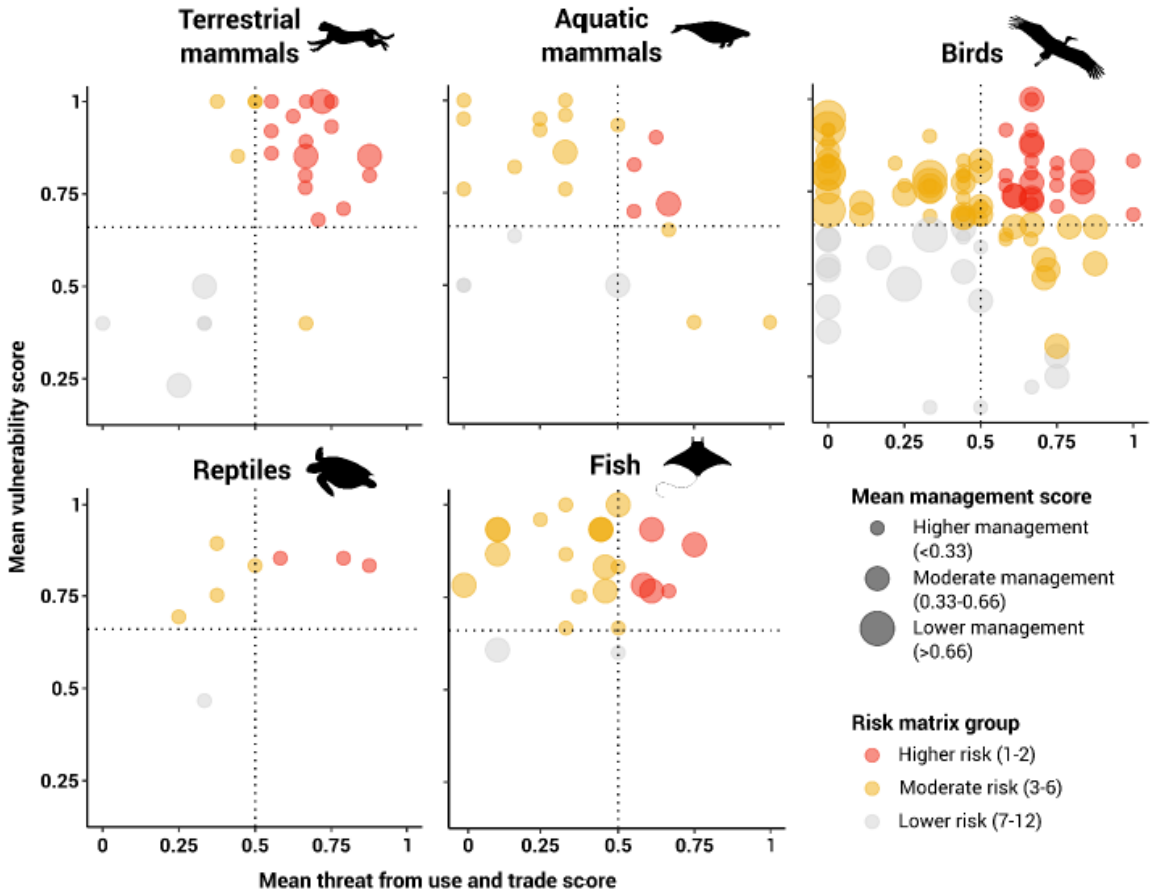


Figure 17. Distribution of taxa according to their mean unweighted scores for likelihood of threat from use and trade, vulnerability and level of management, and corresponding risk matrix group (from UNEP-WCMC 2023)

Source: UNEP-WCMC (2023) Assessment of the risk posed to CMS Appendix I-listed species by direct use and trade. UNEP-WCMC, Cambridge

Box 4.8. Extent and impacts of global migratory seabird take for consumption

Many seabirds undertake considerable journeys as part of their life cycle, and 318 of 364 species are considered migratory (Handley and Davies 2025). They are also the most threatened group of birds and have been highlighted for special conservation status under a range of mechanisms (Lascelles et al. 2016). However, they currently remain poorly represented on the CMS Appendices, with just 21 species on Appendix I and 63 species on Appendix II.

A global review of threats to seabirds found “hunting and trapping”, including egg and chick collection, to be the second greatest land-based threat (after invasive species), impacting 27% of all seabird species (97/359), many of which were coastal globally threatened species (Dias et al. 2019). Seabirds and their eggs are often harvested for food, which can have strong cultural importance. However, there are increasing concerns around sustainability, cumulative impacts, and more recently potential impacts on human health through exposure to toxins and diseases from consuming seabirds.

There is often a lack of data on the status of seabird populations and the numbers of birds or eggs harvested, and therefore the impact of consumption of seabirds on population trends remains poorly

understood. In order to implement CMS Decision 14.187 (b) on *Aquatic Wild Meat* (to "collect and present information about seabird harvests as aquatic wild meat"), a separate systematic review of available literature and existing compiled resources has been conducted by BirdLife International to synthesise available information on the species, locations, methods, reasons, and impacts of global migratory seabird take for consumption, and to provide specific policy recommendations on this issue (Handley and Davies, 2025).

4.5 Indirect impacts of take and trade of CMS-listed avian species for consumption, including in relation to zoonotic disease risk……

Through the systematic literature review we also gathered summary information and where possible key details on any indirect impacts of take for consumption of our 302 project species. Of the 195 records from 69 CMS-listed project species evaluated in our review, 25 records registered impacts in relation to ecosystem functioning or ecosystem services, 8 registered effects on other species or food webs, 17 registered impacts on human societies (for example, on food security), and 18 registered impacts in relation to disease risk.

Reductions in CMS-listed species such as White-backed Vulture *Gyps africanus*, Hooded Vulture *Necrosyrtes monachus* and Black-tailed Godwit *Limosa limosa* as a result of being taken for consumption can reduce the ecosystem services these birds provide, such as facilitating nutrient cycling through carrion removal, while also disrupting other species and food webs (e.g. as reported in South Africa, Manqele 2022; Zimbabwe, Mdhlano et al. 2018; Kenya, Odino 2011; Boxes 4.9 and 4.10). Poisoned birds can trigger cascading faunal mortality through suspected secondary and even tertiary intoxication, affecting biodiversity higher up the food chain (Odino 2011).

Only 5 records out of 18 highlighted the negative risks to human health from direct consumption of our project species, ranging from the ingestion of pesticide residues (Black-tailed Godwit, Kenya: Odino 2011; Box 4.9) to the risk of spread of zoonotic diseases (African Sacred Ibis *Threskiornis aethiopicus*, Democratic Republic of Congo: IDPE 2024; Baer's Pochard *Aythya baeri* and Common Coot *Fulica atra*, India: Choudhury 2010), and specifically the presence of the highly pathogenic avian influenza subtype H5N1 in wild vulture populations in Africa (e.g. White-backed Vulture, Nigeria: Saidu and Buij 2013). Conversely, the positive role of vultures (e.g. Hooded Vulture), in reducing disease transmission through their 'waste disposal' role in cleaning and consuming carcasses and thus controlling the spread of diseases from wildlife to domestic animals and humans, was emphasised in many more studies (e.g. Nigeria: Udoidiong & Egwali 2018; Benin: Daboné et al. 2022; Zimbabwe: Mdhlano et al. 2018; South Africa: Manqele 2022; CMS 2017), with these reports making up the majority of records mentioning disease risks (13 out of 14 records relating to vultures). Specifically, 6 vulture species were cited as providing such ecosystem services: White-backed Vulture (4 records), Hooded Vulture (3 records), Rüppell's Vulture *Gyps rueppelli* (3 records), Cape Vulture *Gyps coprotheres*, Egyptian Vulture *Neophron percnopterus* and White-headed Vulture *Trigonoceps occipitalis* (1 record each). Furthermore, declines in vultures (e.g. Rüppell's Vulture) have been linked to increases in opportunistic scavengers such as canids and rodents, which themselves are well-known reservoirs of disease (Henriques et al. 2018; Ogada et al. 2016).

Six other records discussed disease risk, but not specifically related to consumption: the disease risk relating to trade of Timneh Parrot *Psittacus timneh* (one record; Tamungang et al. 2014) and the presence of fowl pox in ex situ populations of Asian Houbara *Chlamydotis macqueenii* (3 records) and African Houbara *Chlamydotis undulata* (2 records) in Morocco, Algeria, the Islamic Republic of Iran, Pakistan and the Arab States of the Persian Gulf (Grard 2015). While there is increasing evidence of the risk of transmission of zoonotic diseases between livestock, wildlife and humans, the spillover mechanism is often poorly understood or documented, particularly in relation to wild meat

consumption (Kumpel et al. 2015). A systematic review of the links between wild meat handling and zoonotic disease transmission (1996–2022) found 51 studies reported 43 zoonotic pathogens (17 bacteria, 15 viruses, and 11 parasites) that could pose a potential risk to human health, identifying birds as the seventh most common source of pathogens out of 20 taxa (different mammalian taxa plus birds and reptiles), with bird case studies roughly equally spread between Africa, Europe, Asia and North America (Tumulty et al. 2023). However, the review did not record individual species so it is not possible to evaluate the risk and impacts in relation to our project species. Some diseases can have severe impacts on both people and birds (BirdLife International 2022). For example, highly pathogenic strains of avian influenza (HPAI) evolved in intensive poultry farms, spread to wild birds though lax biosecurity, and are now driving rapid declines in some bird populations including many of our project species (Box 4.11), though again our review did not find any clear evidence of a specific link with consumption in relation to our project species.

Box 4.9. Direct and indirect impacts on wetland birds, non-target species and ecosystem services in Kenya from deliberate pesticide poisoning: a case study of suspected carbofuran poisoning

Migratory birds traversing the Africa-Eurasia flyway rely heavily on stopover sites as critical refuges for resting and feeding. These sites are essential for replenishing energy reserves, enabling the birds to successfully continue their long-distance journeys. As such, any anthropogenic pressure on these sites could have significant implications for migrating bird species. A study by Odino (2011) focused on the deliberate poisoning of birds, particularly wetland birds, for food, in the Bunyala Rice Irrigation Scheme in Kenya using the pesticide Furadan (carbofuran). This practice has been observed in the area since the 1990s and is a threat to Kenya's rich avian biodiversity, including migratory birds that use the area as a key stopover site.

A significant proportion (36%) of birds visiting the irrigation scheme were killed by pesticide-laced baits, with the Black-tailed Godwit (*Limosa limosa*; Appendix II-listed) alongside the African Openbill, Wood Sandpipers and doves/pigeons the most frequently killed species. Chemical analysis confirmed the presence of carbofuran in the bait and in the gut samples of the dead birds. These large-scale poisoning events can also have catastrophic indirect impacts, potentially killing hundreds of secondary and tertiary animals that feed on the carcasses or drink contaminated water, and threatening human health in the process. More broadly, many migratory species are no longer seen in large numbers, reducing avian diversity and the important ecosystem services they provide.

Box 4.10. Impacts of poisoning from lead shot in the environment on birds, other wildlife and people

Lead ammunition is long known to be a poison. The use of lead shot for hunting game including wild birds can lead to toxic levels of pollution in waterbirds which ingest lead pellets, mistaking them for grit, and scavengers such as vultures which feed on shot carcasses, as well as the wider ecosystem when the lead seeps into the water system, particularly in wetlands. This can lead to direct mortality to birds but has also been found to cause indirect mortality, with chronic levels of poison in the bloodstream of vultures strongly correlating with collisions with powerlines in Israel (Botha et al 2024; Chandra et al. 2024).

Each year, an estimated 7,000 tonnes of lead are released into the UK countryside through lead ammunition and fishing gear, causing the deaths of up to 100,000 waterbirds, including swans, ducks, and wading birds. In the EU an estimated 1 million waterbirds similarly die from lead poisoning. Following decades of campaigning by conservation groups, in July 2025 a ban on toxic lead ammunition

in outdoor shooting was announced for England, Scotland, and Wales,[36] setting a powerful precedent for other countries, including the European Commission's proposal to ban lead ammunition and fishing weights across Europe (extending the ban on using lead shot ammunition in wetlands, introduced in February 2023).[37]

Box 4.11. An unprecedented global epizootic of avian influenza causing mass mortality of wild birds

Highly pathogenic strains of avian influenza (HPAI) first evolved in intensive poultry farms and have repeatedly spread to wild birds through lax biosecurity (BirdLife International 2024). The H5N1 strain of Highly Pathogenic Avian Influenza (HPAI) was first identified in domestic waterfowl in China in 1996, and has since evolved to become progressively more destructive. During the winter of 2020/2021 a new H5N1 virus started to be detected in Europe. Compared to other variants, this one is particularly well adapted to infecting wild birds, resulting in much higher levels of circulation within wild bird populations (James *et al.* 2023). There has also been a shift in the seasonality of the virus. Historically, outbreaks of HPAI have been mostly confined to the winter months, whereas the new H5N1 appears to have become endemic (present year-round) in many areas (Pohlmann *et al.* 2022, Harvey *et al.* 2023). Since its detection in Europe, the new H5N1 has spread worldwide along migratory flyways, resulting in an unprecedented epizootic that, by January 2024 had reached every continent except Oceania. This global outbreak has led to the death or destruction of c.0.5 billion poultry (Klaassen & Wille 2023) and has impacted more than 400 bird species (CMS FAO Co-convened Scientific Task Force on Avian Influenza and Wild Birds 2023), in some cases resulting in significant population declines (Figure 18).

Examples of species impacted by avian influenza during 2021–2023

Photo credits: Great Skua by Claudia/Flickr (CC BY-NC-SA 2.0); Dalmatian Pelican by anastasija26/Shutterstock; Common Crane by Piotr Krzeslak/Shutterstock; Hooded Crane by Josh More/Flickr (CC BY-NC-ND 2.0); Cape Cormorant by Alandmanson (CC BY-SA 4.0); Great White Pelican by GRID-Arendal/Flickr (CC BY-NC-SA 2.0); Brown Skua by MZPHOTO.CZ/Shutterstock; Peruvian Booby by Vladislav T. Jirousek/Shutterstock; California Condor by kojihirano/Shutterstock.

[36] https://www.birdlife.org/news/2025/08/07/major-win-for-great-britain-lead-ammunition-will-be-banned-in-outdoor-shooting/
[37] https://www.birdlife.org/news/2023/02/14/press-release-lead-ammunition-finally-banned-from-wetlands-across-the-eu/

Figure 18. Examples of species impacted by avian influenza during 2021-2023. Dalmatian Pelican, Great White Pelican, Hooded Crane and Cape Cormorant are project species. Reproduced from https://datazone.birdlife.org/articles/an-unprecedented-global-epizootic-of-avian-influenza-is-causing-mass-mortality-of-wild-birds.

Some of the first reports of mass mortality from HPAI H5N1 in wild birds came from the coastlines of Scotland, UK, with large numbers of Great Skua *Catharacta skua* dying from the end of the 2021 breeding season, followed by Barnacle Geese *Branta leucopsis* and then Northern Gannet *Morus bassanus* into the summer of 2022. Meanwhile, outbreaks were also occurring throughout the rest of Eurasia, impacting several project species. In Greece, an outbreak of HPAI in Dalmatian Pelican *Pelecanus crispus* breeding at Prespa Lake (the world's largest breeding site) during February–April 2022 wiped out c.60% of the colony (Alexandrou et al. 2022). The following winter, HPAI was detected at the congregation of 12,000 Hooded Crane *G. monacha* and White-naped Crane *G. vipio* overwintering at Izumi, Japan, resulting in the deaths of more than a thousand of the former and dozens of the latter (EAAFP 2022). Outbreaks throughout Eurasia continued into the summer, with more than 20,500 Sandwich Terns *Thalasseus sandvicensis* found dead around the coasts of northwest Europe during the 2022 breeding season, representing more than 17% of the total breeding population in this region (Knief et al. 2024).

From Europe, the virus soon spread via migratory birds to Africa (Lo et al. 2022). Data on confirmed outbreaks are sparser in this region, but there have been several reports of mass mortality. The first reports came from countries in West Africa lying along the East Atlantic Flyway. For example, in terms of project species, in Senegal 750 Great White Pelican *Pelecanus onocrotalus* were found dead at the Djoudj National Bird Sanctuary in January 2021 (Lo *et al.* 2022). Further south, extensive mortality of Cape Cormorant *Phalacrocorax capensis* was recorded during 2021–2022 in South Africa's Western Cape (>20,000 deaths recorded; CapeNature 2021) and on the west coast of Namibia (>6,500 carcasses retrieved from Bird Island; Molini et al. 2023). In early 2023, thousands of dead seabirds were recorded around the coasts of Senegal, The Gambia and Guinea-Bissau, with Caspian Tern *Hydroprogne caspia* and Royal Tern *Thalasseus maximus* among the main casualties (BirdLife International 2023). Noting significant underreporting of outbreaks in remote areas where people do not live, Klassen and Wille (2023) suggest that only a fraction of outbreaks in wildlife have been detected and appropriately reported, with the number of wild birds impacted conceivably in the millions rather than the tens of thousands that have been reported and collated.

Source: BirdLife International (2024). An unprecedented global epizootic of avian influenza is causing mass mortality of wild birds. https://datazone.birdlife.org/articles/an-unprecedented-global-epizootic-of-avian-influenza-is-causing-mass-mortality-of-wild-birds

4.6 Governance and legal protection of CMS-listed avian species……

International conventions and frameworks relevant to hunting, trade and consumption of migratory avian species

There are a number of international conventions and policy frameworks aimed at addressing illegal and unsustainable wildlife hunting, trade and consumption, including or with a specific focus on birds. The problem of illegal killing, taking and trade of birds (ITB/IKB) has been one of the principal drivers for the development of several international policy instruments (BirdLife International 2019). These include the **EU Birds Directive**[38] (Directive on the Conservation of Wild Birds; the European Union (EU) Directive 79/409/EEC (now replaced by the Directive 2009/147/EC), the **Bern Convention** on the

[38] https://environment.ec.europa.eu/topics/nature-and-biodiversity/birds-directive_en

Conservation of European Wildlife and Natural Habitats[39] (Council of Europe 1979), and the **Convention on the Conservation of Migratory Species of Wild Animals** (CMS 1979).

Coad et al. (2021), building on Coad et al. (2019), provide a detailed overview of CMS, the Convention on Biological Diversity (CBD), the Convention on International Trade in Endangered Species (CITES), the UN Declaration on the Rights of Indigenous Peoples (UNDRIP) and national governance aspects, which we summarise and build on here as relevant.

Under the **Convention on Biological Diversity (CBD)**, a number of targets of the Kunming-Montreal Global Biodiversity Framework (GBF)**,** adopted at COP15, directly or indirectly relate to sustainable use, with Targets 5 (sustainable, safe and legal harvesting and trade of wild species) and Target 9 (sustainable management of wild species to benefit people) of greatest relevance. The CBD has also adopted several Decisions regarding the sustainable use of wild meat and developed technical guidance on this issue (e.g. voluntary guidance for a sustainable wild meat sector in CBD/COP/DEC/14/7).

The **Convention on International Trade in Endangered Species (CITES or Washington Convention)** monitors and authorises the international trade among its Parties of all species listed in its Appendices. Wild meat trade impacts many CITES listed species. The CITES position on wild meat is explained in Resolution Conf. 13. 11 (Rev. CoP 18) and a resolution passed at COP16 addresses the issue of livelihoods which is relevant to achieving sustainability of use.

The UN Declaration on the Rights of Indigenous Peoples (UNDRIP) elaborates on existing human rights standards and fundamental freedoms as they apply to the specific situation of indigenous peoples. A number of its Articles are relevant to wild meat management, including Articles 8, 18, 19 and 26.

The Convention on Migratory Species (CMS) provides a global framework for the conservation of migratory species across their entire migratory range. Under Article III.5, Parties are expected to prohibit taking for Appendix I species, with limited exceptions. For Appendix II species taking is not prohibited outright, but development of international agreements for these species is encouraged. Range States to species listed in Appendix II are encouraged to conclude global or regional Agreements (e.g. the **Agreement on the Conservation of African-Eurasian Migratory Waterbirds, AEWA**[40] and the **Agreement on the Conservation of Albatrosses and Petrels, ACAP)**[41] or Memoranda of Understanding (MOUs; e.g. the **Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia, Raptors MOU**),[42] where these would benefit the species, prioritising those species with an unfavourable conservation status. CMS also provides for the development of other instruments or processes, such as Concerted Actions to improve the conservation status of selected Appendix I and II species or species groups, and Single or Multi-Species Action Plans (e.g. the **CMS Multi-species Action Plan to Conserve African-Eurasian Vultures, Vulture MsAP**[43]; the **African-Eurasian Migratory Landbirds Action Plan, AEMLAP,**[44]**)** and Special Species Initiatives (e.g. the **Initiative for Central Asian Flyway**). The aim of AEMLAP is to improve the conservation status of migratory landbird species in the African-Eurasian region through international coordination of action for these species and catalysing necessary actions at the national level. The

[39] https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/104
[40] https://www.unep-aewa.org/en
[41] https://acap.aq/
[42] https://www.cms.int/sites/default/files/publication/raptors_mou_0.pdf
[43] https://www.cms.int/sites/default/files/document/cms_cop12_doc.24.1.4_annex3_vulture-msap_e.pdf
[44] https://www.vogelwarte.ch/en/projects/conservation-of-our-migratory-birds/

overall goal is to develop an initial overarching and common strategic framework for action at the international level to protect, conserve, restore, and sustainably manage populations of migratory landbird species and their habitats in the African-Eurasian region.[45] In addressing the illegal hunting and killing of birds, the AEMLAP promotes the implementation of existing guidelines and action plans through international cooperation.

The following CMS instruments are particularly relevant to the consumption of the project species. **AEWA** is a legally binding instrument under which Article III of the Agreement text prohibits the taking of certain species (those listed in Column A of Table 1 of the Action Plan), with some exceptions under strict conditions, and requires the regulation of the taking of other species (in Column B and C), to ensure sustainability. The Action Plan contains more specific provisions related to any hunting and taking including details of hunting methods prohibited, requirements regarding hunting seasons, harvest limits and other requirements to ensure sustainability of any use. AEWA has produced detailed guidelines on sustainable harvest. **ACAP** is another binding multilateral agreement which seeks to conserve listed albatrosses, petrels and shearwaters by coordinating international activity to mitigate known threats to their populations. The **Raptors MoU** is a non-binding agreement under CMS. Its Action Plan states that Signatories ought to provide legal protection to migratory birds of prey listed in Annex 1 and ensure that relevant legislation protects all birds of prey from a) deliberate killing, b) deliberate disturbance, c) egg collection and taking of birds from the wild and d) trade, unless properly authorised and when this is sustainable and not detrimental to the conservation status of the species. The **Vulture MsAP** provides an agreed framework for priority actions to conserve the 15 Old World vulture species in Africa-Eurasia between 2018 and 2029. The **Saker Falcon Global Action Plan** and **Sooty Falcon Action Plan** provide frameworks for the conservation and sustainable use, where legally possible, of these species.

To tackle the threat of IKB specifically, the European Commission published the Roadmap towards eliminating illegal killing, trapping and trade of birds[46] (European Commission 2012), the Bern Convention produced the Tunis Action Plan for the eradication of illegal killing, trapping and trade of wild birds[47] (Council of Europe 2013) and the CMS Conference of the Parties adopted a Resolution 11.16 (Rev.COP14)[48] *The prevention of illegal killing, taking and trade of migratory birds* which urges Parties of the Convention to strengthen national laws, enhance enforcement and prosecution capabilities through specialised training and inter-agency collaboration, and conduct public awareness campaigns. Other CMS Resolutions relevant to the issue of illegal take for consumption are Resolution 11.31 (Rev.COP14) *Illegal and unsustainable taking of wildlife*, and Resolution 12.15 *Aquatic wild meat*. CMS also has a number of Task Forces to facilitate international cooperation in tackling the issue of illegal taking of migratory birds, first establishing the Intergovernmental Task Force to address illegal killing, taking and trade of migratory birds in the Mediterranean[49] (CMS MIKT; CMS 2014), whose strategic framework is the Rome Strategic Plan on Illegal Killing of Birds 2020-2030[50] and which operates jointly with the Bern Convention to cover Bern Convention countries too (CMS 2020). There is also a CMS Asia Pacific Illegal Taking of Migratory Birds Intergovernmental Task Force[51] (ITTEA) (which overlaps to some extent with the Central Asian Flyway and with the African-Eurasian flyways range with regard to the Russian Federation), and in May 2025, following endorsement by the 14th CMS

45 https://www.cms.int/sites/default/files/document/cms_cop13_res.11.17_rev.cop13_rev.1_annex_e.pdf
46 https://ec.europa.eu/environment/nature/conservation/wildbirds/docs/Roadmap illegal killing.pdf
47 https://rm.coe.int/1680746782
48 https://www.cms.int/sites/default/files/document/cms_cop12_doc.21.1.29_res_11.16_illegal-killing_e_0.pdf
49 https://www.cms.int/taskforce/mikt
50 https://rm.coe.int/tpvs-2019-03rev-draft-romestrategicplan-ikb-rev-06-12/168099315b
51 https://www.cms.int/en/taskforce/ittea

Conference of the Parties (COP14, Samarkand, Uzbekistan, February 2024) CMS launched a South-West Asia Illegal Taking of Migratory Birds Intergovernmental Task Force.[52]

National legislation relevant to hunting, trade and consumption of migratory avian species

Europe

The foundation of bird protection legislation in the European Union is the **EU Birds Directive (2009/147/EC)**, which applies to all wild bird species naturally occurring in the European Union. It prohibits deliberate killing, capture, and disturbance, and bans destruction of nests, eggs, and habitats. It permits the hunting of species listed in Annex II/A, and those indicated for particular Member States under Annex II/B. It also outlaws indiscriminate methods such as nets, lime, traps, and poisons. Limited derogations are permitted for defined species, under specific conditions, with quotas and regulated seasons. The **Environmental Crime Directive (2008/99/EC)** requires Member States to criminalise serious infractions, meaning violations of hunting rules can attract criminal penalties. Member States transpose these directives into national hunting laws: for example, **France** defines detailed lists of huntable species with strict closed seasons (Code de l'Environnement, France 2012), **Spain** regulates regional quotas and permits under autonomous community laws (Ministerio para la Transición Ecológica y el Reto Demográfico 2020), and **Italy** allows only certain species under regional hunting calendars (Legge 11 febbraio 1992, n. 157).

Outside the EU, frameworks vary but are still shaped by international treaties such as the **Bern Convention** and the **Convention on Migratory Species (CMS)** (Council of Europe 1979; UNEP/CMS 1979). **Norway** and **Switzerland**, for example, maintain national hunting laws aligned with Bern, with detailed provisions on permitted species, quotas, and methods, alongside blanket prohibitions on protected birds (Norwegian Wildlife Act 1981; Federal Law on Hunting and the Protection of Wild Mammals and Birds, Switzerland 1986). Similarly, in **Serbia**, hunting is managed through the Law on Game and Hunting, which regulates hunting grounds, permits, and species lists, while prohibiting indiscriminate methods (Law on Game and Hunting, Serbia 2010). Overall, Europe remains the most harmonised region for bird protection in legal terms, but differences persist between EU members, operating under the Birds and Environmental Crime Directives, and non-EU states, which rely more heavily on domestic hunting codes supplemented by Bern and CMS obligations.

Middle East

Hunting legislation in the Middle East varies markedly by country. **Bahrain** (CMS Party since 2022)**, Kuwait, Oman (neither CMS Parties), Saudi Arabia and Yemen** have complete bans on the hunting of all wild bird species, meaning any taking or killing of birds in these jurisdictions is unlawful (Brochet et al. 2019). For example, **Kuwait's** Environment Protection Law No. 42 of 2014 prohibits hunting of protected fauna and provides for criminal penalties (FAOLEX 2017). In the **Islamic Republic of Iran**, legislation is relatively detailed: the 1967 Hunting and Fishing Law, administered by the Department of Environment, specifies huntable species, quotas, closed seasons, licensing requirements and banned methods. These provisions clearly distinguish between legal and illegal activities (Brochet et al. 2019) but often enforcement is limited and killing often occurs in protected areas, outside the legal season, and in excess of the legal quotas (Smit et al. 2009).

In **Iraq, Qatar (not a CMS Party) and the United Arab Emirates (UAE)**, statutory hunting and trapping regulations exist but do not specify permitted species or define open seasons. Instead, hunting is authorised via special permits issued on a case-by-case basis by the relevant authorities (BirdLife International and OSME 2019). For example, In the **UAE**, federal law bans hunting of wild birds (Federal Law No. 24/1999), though falconry is licensed under regulation (UAE Ministry of Climate Change and

[52] https://www.cms.int/meeting/1st%E2%80%AFmeeting-south-west-asia-illegal-taking-migratory-birds-intergovernmental-task-force%E2%80%AF

Environment 2020), and in recent years enforcement has included prosecutions of illegal hunters (Brochet et al. 2019). As noted in the BirdLife/OSME review, this legislative uncertainty in countries such as Iraq, Qatar and UAE means some legal permitted hunting occurs, but experts consider it insignificant compared with the scale of illegal killing (BirdLife International and OSME 2019).

Since 2019, some states have tightened or clarified implementation. **Oman** has reinforced its general prohibition with a ministerial decision in 2021 banning possession or use of hunting, tracking, and simulating the sounds of birds and wild animals without a permit (Environment Authority Oman 2021). **Saudi Arabia** has operationalised its ban through executive regulations. In 2020 the Environment Legislation (Royal degree no. 165, Date: 10/7/2020) was updated to promote environmental protection. Hunting permits are now issued via the National Center for Wildlife's "Fitri" digital platform, species lists and open seasons are narrowly defined, and hunting is prohibited in protected areas, urban zones, and coastal sites. Enforcement is carried out by the Special Forces for Environmental Security, with violations attracting fines and potential imprisonment.

Africa

National legislation varies considerably across Africa due to its geographical size, inheritance of colonial-era legal frameworks and presence of regional political or economic blocks. For example, the West Africa Vulture Action Plan reports that of the 16 countries covered by the plan, all CMS Appendix I-listed species are protected in half of the countries (The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Senegal and Togo), with extensive protections for vultures under CITES, Raptors MOU or other provisions (Chandra et al. 2024). Under the **African Convention on the Conservation of Nature and Natural Resources** (ACNNR),[53] ratified by 17 African states, Chandra et al. (2024) note that species classified as Class A (which includes all vultures) shall be protected throughout the entire territory of the Contracting States, with any taking permitted only on the authorisation of the highest competent authority and if required in the national interest or for scientific purposes. We review the compliance of protection of CMS Appendix I-listed birds in six African countries in more detail below and in Annex 3.

Review of compliance of the level of protection of CMS Appendix I birds from CMS national reports

From the responses to the question regarding the level of national protection of Appendix I birds in the CMS national reports submitted to COP13, it is clear that many species do not yet have full protection, even where listing has not been recent or additional measures have been put in place under CMS or CITES (Table 16). Of the 72 Appendix I species found in the AEMLAP region, only 20 were reported to have 100% protection at national level, with protection as low as 25% for one species (Cape Vulture *Gyps coprotheres*). However, these results should be interpreted with caution, as they are based on an incomplete submission of national reports (with the sample size of responses being too low to include in the analysis for nine species), and the analysis includes non-CMS Parties within the list of Range States.

Table 16. Summary of information regarding the prohibition of taking of Appendix I species in the AEMLAP region under national or territorial legislation in accordance with CMS Article III(5), as reported by CMS Parties in national reports to COP13. Percentage represents the proportion of Range States reporting that take for that species is nationally prohibited out of those that reported. Note that the list of Range States includes non-CMS Parties which do not report to CMS. Existing measures are coded as follows: AEWA = Agreement on the Conservation of African-Eurasian Migratory Waterbirds; Raptors MOU = MOU on the Conservation of Migratory Birds of Prey in Africa and Eurasia; Vulture MsAP = Multi-species Action Plan to Conserve African-Eurasian Vultures; AEMLAP = African-Eurasian

[53] https://au.int/en/treaties/african-convention-conservation-nature-and-natural-resources-revised-version

Migratory Landbirds Action Plan; ACAP = Agreement on the Conservation of Albatrosses and Petrels (with associated action plan); CAF = Central Asian Flyway Action Plan; ISSAP = International Single Species Action Plan. Data provided by UNEP-WCMC.

Order	Scientific name (CMS)	CITES Appendix	CMS national reports - Range State responses on whether take is nationally prohibited	Year of CMS listing	Listed in CMS Appendix II	No. of Range States (inc. non-CMS)	Existing measures under CMS
Accipitriformes	*Aquila adalberti*	I	100% of 3 responding range State(s)	1997	Yes	5	Raptors MOU
Accipitriformes	*Aquila heliaca*	I	86% of 28 responding range State(s)	1997	Yes	62	Raptors MOU
Accipitriformes	*Aquila nipalensis*	II	82% of 22 responding range State(s)	2018	Yes	60	Raptors MOU
Accipitriformes	*Clanga clanga*	II	85% of 34 responding range State(s)	1997	Yes	75	Raptors MOU
Accipitriformes	*Gyps africanus*	II	56% of 18 responding range State(s)	2018	Yes	40	Raptors MOU; Zimbabwe vulture action plan
Accipitriformes	*Gyps bengalensis*	II	100% of 3 responding range State(s)	2018	Yes	14	Raptors MOU; India vulture action plan
Accipitriformes	*Gyps coprotheres*	II	25% of 4 responding range State(s)	2018	Yes	7	Raptors MOU; Zimbabwe vulture action plan
Accipitriformes	*Gyps indicus*	II	100% of 2 responding range State(s)	2018	Yes	3	Raptors MOU; India vulture action plan
Accipitriformes	*Gyps rueppelli*	II	71% of 14 responding range State(s)	2018	Yes	31	Raptors MOU
Accipitriformes	*Gyps tenuirostris*	II	100% of 2 responding range State(s)	2018	Yes	8	Raptors MOU; Vulture MsAP; India vulture action plan
Accipitriformes	*Haliaeetus albicilla*	I	90% of 30 responding range State(s)	1986	Yes	59	Raptors MOU
Accipitriformes	*Haliaeetus leucoryphus*	II	83% of 6 responding range State(s)	2002	Yes	18	Raptors MOU

Accipitriformes	*Haliaeetus pelagicus*	II	<20% range States responded	1979	Yes	5	Raptors MOU
Accipitriformes	*Necrosyrtes monachus*	II	58% of 19 responding range State(s)	2018	Yes	40	Raptors MOU; Zimbabwe vulture action plan
Accipitriformes	*Neophron percnopterus*	II	78% of 40 responding range State(s)	2009	Yes	82	Raptors MOU; Egypt vulture action plan; India vulture action plan
Accipitriformes	*Sarcogyps calvus*	II	100% of 2 responding range State(s)	2018	Yes	12	Raptors MOU; India vulture action plan
Accipitriformes	*Torgos tracheliotos*	II	59% of 22 responding range State(s)	2018	Yes	43	Raptors MOU; Zimbabwe vulture action plan
Accipitriformes	*Trigonoceps occipitalis*	II	59% of 17 responding range State(s)	2018	Yes	37	Raptors MOU
Anseriformes	*Anser cygnoid*	not listed	100% of 2 responding range State(s)	2002	Yes	8	
Anseriformes	*Anser erythropus*	not listed	91% of 32 responding range State(s)	1997	Yes	52	AEWA; CAF
Anseriformes	*Aythya baeri*	not listed	100% of 2 responding range State(s)	2009	Yes	14	ISSAP
Anseriformes	*Aythya nyroca*	not listed	82% of 45 responding range State(s)	1997	Yes	86	AEWA; CAF

Anseriformes	*Branta ruficollis*	II	82% of 22 responding range State(s)	1997	Yes	34	AEWA; CAF
Anseriformes	*Marmaronetta angustirostris*	not listed	75% of 20 responding range State(s)	1997	Yes	40	AEWA; CAF
Anseriformes	*Oxyura leucocephala*	II	90% of 20 responding range State(s)	1994	Yes	38	AEWA; CAF; ISSAP
Anseriformes	*Polysticta stelleri*	not listed	100% of 5 responding range State(s)	1997	Yes	10	AEWA
Anseriformes	*Sibirionetta formosa*	II	100% of 3 responding range State(s)	2002	Yes	11	
Charadriiformes	*Synthliboramphus wumizusume*	not listed	<20% range States responded	1989	-	3	
Charadriiformes	*Vanellus gregarius*	not listed	82% of 17 responding range State(s)	1997	Yes	35	AEWA; CAF
Charadriiformes	*Larus audouinii*	not listed	69% of 13 responding range State(s)	1979	Yes	26	AEWA
Charadriiformes	*Larus leucophthalmus*	not listed	75% of 4 responding range State(s)	1986	Yes	12	AEWA
Charadriiformes	*Larus relictus*	I	100% of 1 responding range State(s)	1979	-	5	CAF
Charadriiformes	*Saundersilarus saundersi*	not listed	<20% range States responded	1979	-	6	

Charadriiformes	*Calidris pusilla*	not listed	85% of 13 responding range State(s)	2015	Yes	41	
Charadriiformes	*Calidris pygmaea*	not listed	100% of 2 responding range State(s)	2002	Yes	13	CAF
Charadriiformes	*Calidris subruficollis*	not listed	91% of 11 responding range State(s)	2000	Yes	33	AEMLAP
Charadriiformes	*Calidris tenuirostris*	not listed	83% of 6 responding range State(s)	2015	Yes	29	AEWA; CAF
Charadriiformes	*Numenius borealis*	I	100% of 2 responding range State(s)	1979	Yes	6	
Charadriiformes	*Numenius madagascariensis*	not listed	100% of 2 responding range State(s)	2012	Yes	24	
Charadriiformes	*Numenius tenuirostris*	I	80% of 15 responding range State(s)	1979	Yes	27	AEWA; CAF; Species MOU; ISSAP
Charadriiformes	*Tringa guttifer*	I	100% of 2 responding range State(s)	2002	Yes	17	CAF
Ciconiiformes	*Ciconia boyciana*	I	100% of 1 responding range State(s)	1979	-	9	
Coraciiformes	*Coracias garrulus*	not listed	77% of 56 responding range State(s)	2015	Yes	104	AEMLAP; ISSAP

Falconiformes	*Falco cherrug*	II	83% of 29 responding range State(s)	2012	Yes	56	Raptors MOU
Falconiformes	*Falco naumanni*	II	71% of 45 responding range State(s)	1997	Yes	99	Raptors MOU; national action plan
Falconiformes	*Falco vespertinus*	II	72% of 50 responding range State(s)	2012	Yes	87	Raptors MOU
Gruiformes	*Grus japonensis*	I	<20% range States responded	1979	Yes	6	
Gruiformes	*Grus monacha*	I	100% of 1 responding range State(s)	2002	Yes	7	
Gruiformes	*Grus nigricollis*	I	100% of 1 responding range State(s)	1979	Yes	4	CAF
Gruiformes	*Leucogeranus leucogeranus*	I	100% of 5 responding range State(s)	1979	Yes	11	AEWA; CAF; species MOU and action plan
Gruiformes	*Sarothrura ayresi*	not listed	50% of 4 responding range State(s)	1997	Yes	4	AEWA
Otidiformes	*Ardeotis nigriceps*	I	50% of 2 responding range State(s)	2020	-	2	
Otidiformes	*Chlamydotis undulata*	I	67% of 3 responding range State(s)	1979	Yes	7	
Otidiformes	*Otis tarda*	II	88% of 24 responding range State(s)	2015	Yes	42	AEMLAP; Central European population MOU and ISSAP

Otidiformes	*Tetrax tetrax*	II	71% of 14 responding range State(s)	2020	Yes	27	
Passeriformes	*Acrocephalus griseldis*	not listed	80% of 5 responding range State(s)	2006	Yes	16	AEMLAP
Passeriformes	*Acrocephalus paludicola*	not listed	86% of 22 responding range State(s)	1997	Yes	36	AEMLAP; species MOU and ISSAP
Passeriformes	*Emberiza aureola*	not listed	86% of 7 responding range State(s)	2009	-	27	AEMLAP
Passeriformes	*Serinus syriacus*	not listed	100% of 2 responding range State(s)	1979	-	5	AEMLAP
Passeriformes	*Hirundo atrocaerulea*	not listed	50% of 6 responding range State(s)	1997	Yes	11	AEMLAP
Passeriformes	*Geokichla guttata*	not listed	33% of 3 responding range State(s)	2006	Yes	8	AEMLAP
Pelecaniformes	*Ardeola idae*	not listed	64% of 11 responding range State(s)	2006	Yes	17	AEWA
Pelecaniformes	*Egretta eulophotes*	not listed	<20% range States responded	1979	-	12	
Pelecaniformes	*Gorsachius goisagi*	not listed	<20% range States responded	2002	-	5	
Pelecaniformes	*Fregata andrewsi*	I	100% of 3 responding range State(s)	2018	-	11	

Pelecaniformes	*Pelecanus crispus*	I	88% of 17 responding range State(s)	1986	Yes	34	AEWA; CAF
Pelecaniformes	*Pelecanus onocrotalus*	not listed	84% of 19 responding range State(s)	1986	Yes	58	AEWA; CAF
Pelecaniformes	*Geronticus eremita*	I	71% of 7 responding range State(s)	1979	Yes	12	AEWA; CAF
Pelecaniformes	*Platalea minor*	not listed	<20% range States responded	2002	-	9	ISSAP
Procellariiformes	*Phoebastria albatrus*	I	<20% range States responded	1979	-	7	ACAP; ACAP action plan
Procellariiformes	*Pterodroma cahow*	not listed	<20% range States responded	1979	-	2	
Procellariiformes	*Puffinus mauretanicus*	not listed	57% of 7 responding range State(s)	2006	-	16	ACAP; ACAP action plan

Compliance analysis of the level of transposition into domestic law of protection of CMS Appendix I birds and of CMS Article III.5(c) in six African countries: Congo, Democratic Republic of the Congo, Gabon, Madagascar, Zimbabwe and Zambia

We summarise here the main results from this case study analysis of six countries; the full study can be found in Annex 3, including species tables for each country for the Appendix I analysis.

Appendix I of CMS lists migratory species that have been assessed as endangered in all or a significant part of their range.[54] CMS Resolution 13.7[55] also establishes a general correspondence between the term "endangered" as defined within CMS and the criteria of the IUCN Red List (version 3.1). The categories and criteria of the IUCN Red List are also used for the evaluation of proposals for the listing of migratory species in Appendices I and II of CMS according to specific criteria and procedure.[56]

Any Range State of a migratory species listed in Appendix I has special obligations in respect of that species, including to **prohibit the taking (defined as covering 'taking, hunting, fishing, capturing, harassing, deliberate killing, or attempting to engage in any such conduct')**[57] of animals belonging to Appendix I species, with exceptions made only if: a) the taking is for scientific purposes; b) the taking is for the purpose of enhancing the propagation or survival of the affected species; c) **the taking is to accommodate the needs of traditional subsistence[58] users of such species**; or d) extraordinary circumstances so require.[59]

In this section, the status of protection provided by the country's legal framework for the migratory bird species listed in CMS Appendix I[60] is presented in analytical form for each of the six countries that were the subject of this analysis and summarised in Table 16. None of the countries examined have specific legal protections for CMS-listed species or use the exact definition of take as defined under CMS. We therefore reviewed the lists of nationally legally protected species and only considered those species listed as having 'full' or 'absolute' protection alongside appropriate provisions as outlined in their national laws as having close enough equivalence to the fully-protected status required by CMS for Appendix I species. For each national legal framework analysed, we indicate this equivalence and the number of Appendix I species covered under it. Full species tables are provided in Annex 3.

While the taking of animals belonging to migratory species listed in Appendix I of CMS is prohibited, as noted above, exceptions may be made when "the taking is to accommodate the needs of traditional subsistence users of such species."[61] The scope of this exception is limited. The exception must be precise as to its content and limited in space and time and the taking must not be detrimental to the

[54] Article I.1 (c), CMS: "'Endangered' means, for a given migratory species, that it is in danger of extinction in all or a significant part of its range".
[55] Res.13.7, OP 13 (cms_cop13_res.13.7_guidelines-assessment-listing-proposals_e.pdf)
[56] UNEP/CMS/Resolution 11.33 (Rev.COP12): Guidelines for assessing listing proposals to appendices I and II of the convention, Adopted by the Conference of the Parties at its 12th Meeting (Manila, October 2017)
https://www.cms.int/sites/default/files/document/cms_cop12_res.11.33(rev.cop12)_f.pdf.
[57] Article I (1)(j), CMS
[58] The concept of "traditional subsistence" is used in the CMS Convention without being clearly defined, which opens the door to various interpretations to clarify its meaning. Traditionally practiced by rural communities, subsistence hunting is often seen as a necessary activity to meet the basic needs of rural populations.
[59] Article III.5, CMS.
[60] Using the methodology stated in section 3.1, with Range State occurrences extracted from BirdLife International (2024) IUCN Red List for birds. Downloaded from https://datazone.birdlife.org 13/9/24.
[61] Article III.5 (c), CMS.

species concerned. We also reviewed the level of transposition into domestic law of this exception to allow for the needs of traditional subsistence users, as presented in the final column of Table 16.

Table 16. Summary of level of transposition into domestic law of legal protection of CMS Appendix I project species and CMS Article III.5 in case study countries, as assessed by this review

Country	CMS Appendix I species' equivalent national protection[62]	Notes on assessment of compliance of level of transposition into domestic law of protection of CMS Appendix I species	Notes on assessment of compliance of level of transposition into domestic law of CMS Article III.5(c) provisions
Republic of the Congo	Listed as 'fully protected' (nearly CMS equivalent): 1/4 species (25%)	Hunting is subject to the possession of a permit or a licence, with fixed seasons. Wild animals are listed as fully protected, partially protected or other.[63]	Only traditional hunting is mentioned, not the concept of the needs of traditional subsistence users; no exception to the status of fully protected or partially protected animals for the benefit of traditional hunting, though other species can be taken. [64]
Democratic Republic of the Congo	Listed as 'fully protected' (~equivalent to CMS): 1/15 species (7%) Listed as 'partially protected' (not CMS equivalent): 9/15 species (60%)	Hunting is subject to the possession of a permit or a licence, with fixed seasons, only certain gears and not in protected areas. Wild animals are listed as fully protected, partially protected or not yet protected, with fully protected essentially equivalent to CMS definition of take.[65]	The Forest Code provides for user rights for local communities, but hunting is not one of them and they must obtain a hunting licence. Derogations may be allowed for hunting in protected areas to ensure food security for populations living near these areas. However, the legal framework does not explicitly mention the concept of the needs of traditional subsistence users.[66]
Gabon	Listed as 'fully protected' (nearly CMS equivalent): 1/7 species (14%)	Hunting is subject to the possession of a permit, with fixed seasons, with the exception of the practice of	Customary rights of use in hunting are granted to members of village communities traditionally

[62] National categories such as 'Specially Protected' do not necessarily prohibit all forms of taking as defined by CMS Article I(1)(j).
[63] Article 5, Arrêté n° 6075 du 9 avril 2011 déterminant les espèces animales intégralement et partiellement protégées. The unofficial English translation is as follows "may only be slaughtered, captured, held, transported, marketed, imported or exported for exclusively scientific purposes by recognised research institutions, in accordance with the regulations in force".
[64] Article 61, paragraph 1, Loi nº 33-2020 du 8 juillet 2020 portant Code forestier
[65] Article 27, paragraph 1, Loi n°82/002 du 28 mai 1982 portant réglementation de la chasse. The unofficial English translation is as follows: "It is forbidden, except by virtue of a scientific permit issued by the Department responsible for hunting, to kill, capture, hunt, pursue, deliberately disturb or cause to escape, by any irregular means and with the aim of causing harm, the animals listed in Table I annexed to this law."
[66] Article 20, Loi n° 14/003 du 11 février 2014 relative à la conservation de la nature Loi

		user rights. Wild animals are listed as fully protected, partially protected or unprotected; only the first may not be hunted or captured, except for defence, administrative drives or for scientific purposes. [67]	living near rural forest domains in order to satisfy their personal or collective needs, for traditional fishing and hunting,[68] but only for unprotected animals outside the hunting season.[69] The concept of the needs of traditional subsistence users is not mentioned.
Madagascar	Listed as 'absolute' protection (nearly CMS equivalent): 1/1 species (100%)	Hunting on land owned by the state and local public authorities is allowed and does not require prior permission. However, hunting on private property, specifically on lands that are either clearly fenced or visibly demarcated, or where there is an ongoing agricultural harvest, requires prior authorisation from the landowner, and in certain predetermined places, such as strict nature reserves and special reserves[70]. Various hunting methods are prohibited.[71] Wild animals are listed as those under absolute protection, harmful species and game,[72] with hunting and capture of species that are under absolute protection strictly prohibited.	Subsistence hunting is not mentioned in the Malagasy legal framework currently governing hunting,[73] appearing only in a text dating from the colonial period.[74] However, management of certain renewable resources can be delegated to a local community (COBA),[75] and an agreement on customary rights can be signed.

[67] Article 216, Loi n° 16/01 du 31 décembre 2001 portant Code Forestier en République Gabonaise.
[68] Article 251, Loi n°16/01 du 31 décembre 2001 portant Code Forestier en République Gabonaise.
[69] Article 258, paragraph 2, Loi n° 16/01 du 31 décembre 2001 portant Code Forestier en République Gabonaise.
[70] Article 10, Ordonnance n°60-126 du 3 octobre 1960 fixant le régime de la chasse, de la pêche et de la protection de la faune.
[71] Article 11, Ordonnance n°60-126 du 3 octobre 1960 fixant le régime de la chasse, de la pêche et de la protection de la faune. The unofficial English translation is as follows "It is also prohibited to hunt or capture birds or other animals, either by customary means or by other means that have been prohibited, or using weapons of war or explosive projectiles, or to hunt with firearms during the night from sunset to sunrise".
[72] Article 1, paragraph 1, Ordonnance n°60-126 du 3 octobre 1960 fixant le régime de la chasse, de la pêche et de la protection de la faune.
[73] Ordonnance n°60-126 et son décret d'application.
[74] Décret n°47-2254 réglementant la chasse dans les territoires africains relevant du Ministère de la France d'Outre-Mer.
[75] Article 1, Loi n° 96-025 du 30 septembre 1996 relative à la gestion locale des ressources naturelles renouvelables.

Zambia (not a CMS Party)[76]	Listed as 'partially protected' (not CMS equivalent): 11/16 species (69%)	Hunting is subject to the possession of a permit or a licence, with fixed seasons, only certain species/sexes and gears and not in certain areas. Some endemic, threatened, or endangered wild animals are subject to enhanced protection[77] though maybe for a limited time on all or part of the national territory (at family level, e.g. "all vultures, all falcons").	Subsistence hunting does not appear as such in the hunting regulations, but the management and conservation of wildlife must take into account the "interests and needs" of local communities,[78] as long as they comply with the objectives of sustainable management, and they can exercise their traditional rights of use within parks.
Zimbabwe[79]	Listed as 'specially protected' (not CMS equivalent): 8/15 species (53%)	Hunting is subject to the possession of a permit or a licence, with fixed seasons, only certain gears and not in protected areas. Wild animals may not be hunted, possessed or sold (alive or dead) except by virtue of an ad hoc permit,[80] if specially protected (at family level), but with a wide range of exceptions.[81]	The legal framework in general, and the Parks and Wildlife Act in particular, does not provide for subsistence hunting. All types of hunting are subject to obtaining a hunting permit, and the wide range of derogations does not include the needs of traditional subsistence users.[82]
SAMPLE OVERALL (CMS Parties only)	Listed as fully protected or with absolute protection (though in most cases not exactly equating to CMS Appendix I obligations): **4/42 species (10%)** Listed as partially protected or specially protected (not adequately corresponding to CMS Appendix I obligations): **17/42 species (40%)** Listed as protected to some extent: **21/42 species (50%)**		

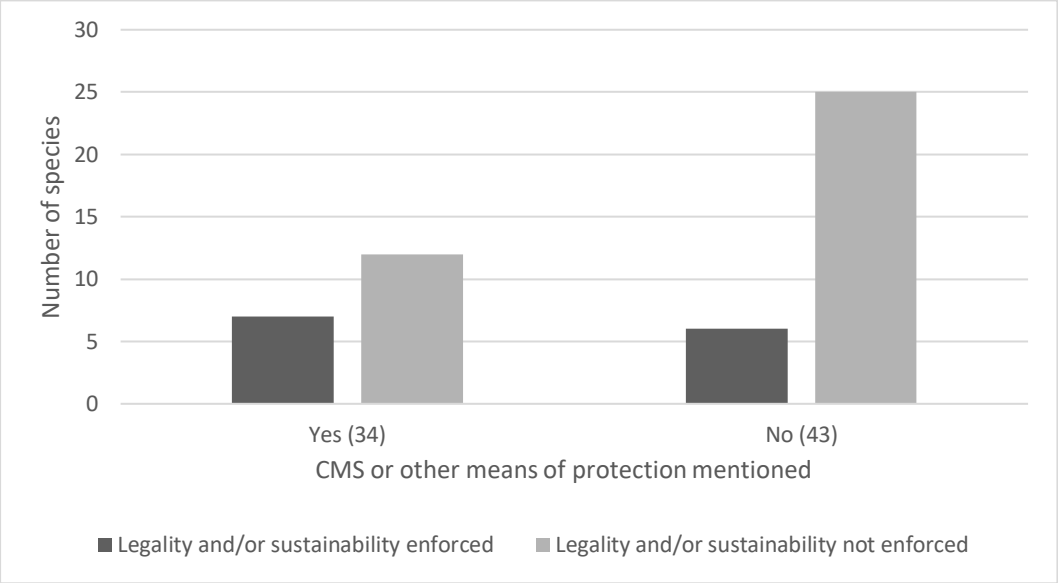
As can be seen from Table 16, the level of compliance with CMS Appendix I obligations is variable and largely not quite equivalent in terms of covering all aspects of the definition of take or explicitly referring to the needs of traditional subsistence users. Only 10% of Appendix I species across the five CMS Party countries are listed in national legislation as having full or absolute protection (though in most cases not exactly equating to Appendix I obligations) and only 50% have any level of protection. Some species are also only protected at family rather than species level. Overall, while some national frameworks provide partial or equivalent protection, significant gaps remain in meeting CMS obligations, particularly regarding exceptions and subsistence provisions.

[76] Zambia is not a CMS Party; therefore, obligations under CMS do not apply, but national law provides partial protection at family level. A comparison with CMS obligations is provided but it is therefore excluded from the summary analyses.
[77] Section 2, The Zambia Wildlife Act.
[78] Section 4, (d), The Zambia Wildlife Act.
[79] In Zimbabwe, 'Specially Protected' status does not amount to full CMS compliance, as hunting may occur under permit for reasons beyond CMS exceptions.
[80] Section 45 Parks, and Wildlife Act.
[81] According to the Parks and Wildlife Act, hunting of a "specially protected animal" is strictly prohibited (Section 45), except where a hunting permit is issued for scientific, educational, museum or zoo collection, falconry, captive breeding, export, restocking, population management, public safety, property protection or any other objective considered beneficial to the conservation of the animals (Section 46 (a,b,c,d,e,f.g)).
[82] Section 59, 77, Parks and Wildlife Act.

Insights from the systematic review on legal protection and enforcement of project species

The systematic review included questions on whether CMS or other means of legal protection were mentioned in the publication (with records for 34 species mentioning this and 43 species not), and whether or not legality or sustainability was enforced (records for 13 species mentioning that this was enforced, and 37 species that it was not, with some species with records registering both options). Our review of this information suggests that reference to CMS may slightly improve the level of enforcement (Figure 19), but it should be noted that sample sizes are very low and interpretation of the publications was down to individual researchers, with no standardised criteria for scoring legality or enforcement, so this overview analysis should be interpreted with caution.

Figure 19. Number of CMS-listed project species reporting enforcement of legality or sustainability against mention of CMS or other form of legal protection, from the systematic literature review. Numbers in parentheses are the number of species for each category.



5 Discussion.....

5.1 Limitations of our study.....

Data coverage, quality, accessibility and compatibility

As mentioned, our review likely underestimates the number, coverage and relative proportions of project species being consumed. Only limited information from the three regional IKB reviews was picked up in the systematic online literature review, given the focus was on illegal killing of birds, rather than consumption per se, and within the published papers available online, not all species taken were listed by name, or linked with consumption. This would explain the very limited duplication of information between these sources. Factors relating to the geographical coverage and taxonomic focus of the three regional IKB reviews by Brochet et al. 2016, 2017 and 2019 (excluding for example sub-Saharan Africa but focusing specifically on birds) and the WILDMEAT database (focusing on sub-Saharan Africa but with limited information on birds) are likely to have led to a bias in records relating to well-reported and better-known hunting and consumption of temperate bird species. Species with larger ranges and population sizes, covering multiple countries, are also likely to result in a greater number of distinct records, though this doesn't necessarily indicate that these potentially higher levels

of take are unsustainable. This is also a conservative estimate due to limitations in data coverage. For example, the regional IKB reviews were unable to gather information on certain countries or territories (e.g. the Russian Federation, Moldova and Greenland (Denmark), Brochet et al. 2017, or the United Arab Emirates, Brochet et al. 2019) or obtain full national coverage for other countries (e.g. Saudi Arabia and the Islamic Republic of Iran, Brochet et al. 2019).

The parameters of our systematic review were also constrained – for example due to time and capacity constraints we were only able to search for a limited number of search terms (focusing at the species level), only search via one search engine (Google Scholar) and only search in English and French. Given the large number of unique publications returned in French, this indicates that we may have gathered additional records if we had also searched in other common languages from across the AEMLAP region such as Arabic, Russian, Spanish and Portuguese, as borne out by the lack of publications picked up in the systematic review from the Russian Federation, for example. We are also aware of some papers reporting relevant information on consumption of project species that were not returned in the systematic review so excluded from our analyses (Deniau et al. (2022) recording birds taken for belief-based use, Eason et al. (2015) recording hunting of migratory birds in Egypt, and Williams et al. (2014) recording project species taken mostly for local subsistence and selling in AEWA wetland sites in Senegal, Mali, Chad, Sudan and Egypt).

Finally, the patchy and inconsistent nature of much of the data obtained from the systematic literature review (with sample sizes relatively low and interpretation of the information down to individual researchers) makes extrapolation and combination with the regional review data difficult; further work would need to be done to systematise and standardise information on aspects such as units, volumes, timeframes and trends to enable collation and combined review of these different datasets that was beyond the scope of this short review.

In terms of knowledge gaps, a comprehensive review of relevant national legislation and enforcement for all CMS project species on both Appendices and for each country across the region was beyond the scope of this review, and our case study work was challenged by the lack of clarity over the listing of species on the CMS Appendices, hindering legal interpretation and limiting our case study review to Appendix I only. A separate review focusing on links with zoonotic disease transmission was also not feasible here, but relevant information is available in a centralised database which could be reviewed with additional funding and time (D. Ingram, pers. comm.).

Challenges and implications relating to lack of clarity on which species are listed under the CMS Appendices

Our analyses – which only included species-level listings, i.e. those listed specifically under Appendix I or II by species name rather than covered under a higher taxonomic group - were originally conducted using a species list downloaded from the CMS's online species database,[83] rather than the official list as appended to the latest CMS decision. This contained some errors[84] and rendered a far greater number of species (404 project species, including 326 African-Eurasian species, *stated* as listed under CMS Appendices I and II, compared to 285 species, including 224 African-Eurasian species, *actually* listed under CMS Appendices I and II, as reviewed in this report). While not having a substantive impact on the overall trends and findings of this review, updating our project species list and repeating the

[83] https://www.cms.int/en/species

[84] At the time of research, the database available at https://www.cms.int/en/species included 22 species without an Appendix I or II listing. However, cross-checking with the Appendices (https://www.cms.int/sites/default/files/uploads/revised-appendices_cop14_e.pdf) revealed that 11 species (9 albatrosses, *Procellaria conspicillata* (Spectacled Petrel) and the seedeater *Sporophila zelichi* (now listed on CMS Appendices under *S. palustris*) are in fact listed, with only 11 owl species confirmed as not listed.

analyses did substantively reduce the number of records (by around half) and individuals of species consumed as well as exclude some species listed under CMS under higher taxonomic groups which are known to be heavily consumed. For example, in terms of records, the following ducks and geese now excluded in the updated list had previously registered over 30 records each: Mallard *Anas platyrhynchos* (46 records); Northern Pintail *Anas acuta* and Northern Shoveler *Spatula clypeata* (35 records each); Common Teal *Anas crecca* (34 records); Greylag Goose *Anser anser* and Gadwall *Mareca strepera* (33 records each); and Tufted Duck *Aythya fuligula* and Eurasian Wigeon *Mareca penelope* (31 records each).

To highlight this discrepancy, including all species listed by CMS at higher taxonomic levels, as per UNEP-WCMC's Species+ open access data portal,[85] which is now the recommended source of information on species listed under CITES and CMS, results in over 1000 species of birds apparently listed on the CMS Appendices globally, compared to the 285 species as above. This lack of clarity on which species list should be used and the considerable discrepancy in numbers of species apparently listed on the CMS Appendices depending on the source means that in some cases species that should qualify for protection and management are excluded from relevant initiatives, while in other cases common and/or non-migratory species are included.

Another implication made clear in this review is the subsequent under-representation of certain groups, in particular passerines, in our dataset, many of which make up a large proportion of the take in areas such as the Mediterranean but are only listed on the CMS appendices at higher taxonomic level. For example, Brochet et al. (2016) note that among the 561 bird species they assessed, 375 species (67%) were reported to be known or likely to be killed illegally in significant numbers each year, which included 67% of passerine species, mainly for consumption - a far greater proportion of passerines than registered through all our data collection methods.

Limitations of global databases and national reports

The IUCN Red List database provides the most comprehensive records of hunting, consumption as human food, population trends and threat status in relation to our project species. Further analysis of the individual species' Red List assessments may have rendered additional insights for this review, though very few were returned in our systematic online search, so further investigation, which was beyond the scope of this review, may be merited. Birds are comprehensively, systematically and regularly assessed for the IUCN Red List by BirdLife International, making this a consistent and reliable source of information for this group, though some assessments can be based on incomplete or out of date data. Further, as the Red List includes use as human and veterinary medicine in the same category, we were unable to evaluate medicinal use for human consumption in this review. The regional IKB assessments did not include medicinal use as a category so this particular type of consumption will have been underestimated for both these sources.

We found limitations in the utility and accessibility of information in both the TRAFFIC Wildlife Trade Portal and the CMS national reports in relation to our project species. First, records were frequently not listed at species level (only around a fifth of CMS-listed project species being mentioned in the Wildlife Trade Portal, and one-tenth in the CMS reports), meaning we could not include them, and making inferences about trends, status, sustainability and management impossible. Second, there was very limited information linked to consumption, as the motivation for trade was rarely included in the Wildlife Trade Portal and the question on consumption was rarely answered in the CMS national reports. Third, in terms of demonstrating action to address impacts in the national reports, while some useful information was provided, such as an extended closed hunting season for European Turtle-dove by Serbia in relation to inadequate legislation, in general the reports make no clear link between

[85] https://www.speciesplus.net/

intentional take, changes in conservation status and legislation/enforcement aspects at species-level as these are addressed in separate questions of the report template. Finally, as noted by Coad et al. (2021), and TRAFFIC makes clear in its description of the Wildlife Trade Portal, there is no direct correlation between seizures and the overall illegal wildlife trade, making it unwise to infer trade volumes and trends from these data, hence simply recording presence or absence of records for a species in this review.

The new databases WILDMEAT and SpUD, holding information on wildlife hunting, trade and consumption, and sustainable use respectively, have great potential to support improved understanding of wild bird consumption, but currently have limited relevant data and geographical/taxonomic coverage. For example, the data on birds, and down to species level, is limited in the WILDMEAT database; this is partly because in the regions of current focus of the database (West and Central Africa and Latin America) hunting of birds is less prevalent and less well-recorded than hunting of mammals, with wild meat researchers in these areas tending to be less able to identify and record birds to species level. That said, one of the three project species found in the WILDMEAT database (African Spoonbill *Platalea alba)* was not recorded elsewhere, and all of the records were from a country which didn't feature in the systematic review (Gabon), demonstrating the value of seeking information from multiple sources. Efforts are underway to increase the coverage of these databases, including to more regions of the world, as capacity (including funding) allows.

5.2 Scale, motivations and impacts of take and trade of CMS-listed avian species for consumption……

Scale

Migratory birds are affected by combination of threats, which interact to exacerbate one another (UNEP-WCMC 2024), but overexploitation is the greatest threat, particularly intentional take for domestic use (UNEP-WCMC 2023).

Our review found that a significant majority of African-Eurasian migratory bird species - over two-thirds (68%) of project species, and 70% of CMS-listed species – are taken for consumption. This contrasts with other estimates that only 15% of birds globally are used as food (though this does not include non-food consumption and is known to be an underestimate due to limited data: BirdLife International 2023). This is however very similar to the finding by Coad et al. (2021) that 70% of CMS-listed terrestrial mammals are consumed. The proportion being recorded as taken for consumption increased sequentially from 61% of potential species for listing and Appendix II-only-listed species to 95% or 19 out of 20 species only listed under Appendix I.

Consumption of CMS-listed project species was recorded in 84 (68%) out of 123 AEMLAP countries, with limited overlap between data sources, suggesting this is not exhaustive (and we are aware of some data missed). While an estimate of overall take for consumption across the study area was not feasible, analysis of the combined dataset from the regional IKB reviews showed that around 3.5 million individual birds of our CMS-listed project species were estimated to be illegally killed per year in Europe, North Africa, Middle East and the Caucasus, the majority (97%) of which were consumed, with considerable variety between countries and sites. The majority of the 13-43 million birds estimated as illegally taken by Brochet et al. across these regions (2016, 2017 and 2019) are not however project species (i.e. CMS-listed or with potential for listing).

Legal hunting in some areas such as the European Union is however far higher than this. Hirschfeld et al. (2019) found this accounted for 52 million birds from 82 legally huntable bird species in 26 countries in 2014/2015, registered by over 6 million hunters. However, while overall killings were decreasing, the bag figures Common Pochard *Aythya ferina*, Northern Lapwing *Vanellus vanellus* and Turtle Dove

Streptopelia turtur for (all CMS-listed project species) remained high, exerting considerable hunting pressure on declining populations. Our own analysis for 2016 found that legal hunting in this region accounted for nearly 90% of a sample of six species studied, including both hunter bag statistics and derogations. These data are not however consistently collated and published to enable calculation of a regular, quantitative estimate of total numbers of birds of all project species taken across this region, or trends over time, in terms of consumption. While EU Member States were required for the first time to report on national harvest (bag) data for the period 2013-2018 under the Birds Directive (Article 12), this dataset has not been officially or comprehensively analysed, with FACE (2022) noting issues that must be addressed in the next reporting round, including the reporting of incomplete data or which is not separated at the species level (e.g., "ducks"), and the absence of data reported for two Member States.

Motivations

The review of IKB in the Mediterranean highlights the fact that there are often multiple motivations for taking of birds and it can therefore be challenging to be sure of the relative importance of consumption. As Brochet et al. (2016) note, "Most species (62%) were reported to be killed for multiple reasons, e.g. food and sport together, when birds killed for sport are then taken home and eaten (in 62% of cases where food was listed, so was sport, in 54% of cases where sport was listed, so was food)." In areas such as tropical Africa where other larger, preferred prey species can be found, birds tend not to be targeted but are often caught as 'bycatch' where indiscriminatory traps are used or shot at the end of a hunt if preferred species have not been taken when hunting with guns (Kümpel et al. 2010).

The reasons for consumption vary slightly between regions, with the vast majority of birds being taken for consumption in most regions except central and northern Europe (where only around half and 10% of birds respectively were taken for consumption). Local-level consumption predominates, at least for consumption as food rather than medicinal or belief-based use, where trade is more prevalent. This is partly because it is more feasible to transport often smoked or dried bird products for domestic or even international trade than fresh wild meat, and prices tend to be higher, particular in urban centres. Ensuring the sustainability of take is particularly important where there may be few alternative sources of meat and income, as in areas of sub-Saharan Africa; while take of birds for consumption may be relatively low compared to larger, more desirable mammalian wild meat, as harvests diminish, birds may be increasingly targeted, with knock-on impacts on the sustainability of take for hitherto untargeted CMS-listed avian species.

It is also important to distinguish use from dependency, particularly when referring to 'subsistence'. While only 20% of records in the systematic review noted that lack of alternative protein sources was a reason for consumption, this is still a significant proportion, particularly if a reduction in availability impacts more vulnerable and remote households or communities, such as in sub-Saharan Africa. In other regions, while still seen as traditional or culturally-driven, take is usually for consumption as a delicacy as affordable protein alternatives are available.

Understanding of motivations was also challenged by the use of inconsistent categories for reasons for hunting/take across the different datasets. Consumption for non-food purposes was not explicitly evaluated in the regional IKB reviews, so where consumption was for medicine it may have been included either under the 'food' category (potentially as 'food-delicacy', or 'food-trade' if it was to be traded rather than directly consumed) or 'other' category, and human and veterinary medicinal use was combined in the Red List assessments, so we had to exclude this category as we were only evaluating human consumption. However, analysis of the systematic review data and relevant publications found evidence of growing demand, and associated trade, for body parts from species

such as vultures and hornbills, for medicinal or belief-based use, particularly within Africa. This is facilitated by the online trade, increasing prices, marketability and market access.

Direct impacts

We found clear evidence of population and species declines for the CMS-listed project species as a result of unsustainable take for consumption through all our key analyses. 42% of species recorded in the systematic review were assessed as taken at unsustainable levels by the study authors. The regional reviews by Brochet et al. (2016, 2017 and 2019) found population-level impacts due to illegal take for consumption (e.g. Box 4.6, showing that 9 out of the 10 species with highest numbers killed per year relative to their global population size in the Arabian Peninsula, the Islamic Republic of Iran and Iraq were CMS-listed project species). The majority of the CMS-listed project species were assessed by the Red List as having decreasing populations (72% or 94 of 131 species), of which most (81% or 76 species) were threatened by hunting and over half also used as food (56% or 53 species). This means that 40% of our CMS-listed project species were assessed as declining with take for food as at least one threat, which compares to UNEP-WCMC (2024)'s finding that less than half of CMS-listed birds globally are threatened by overexploitation due to intentional use (not necessarily for consumption).

All nine Critically Endangered CMS-listed project species used for human food are threatened by intentional hunting, though use as food doesn't necessarily threaten a species, with a similar proportion (around 68%) of species in each Red List extinction category being used as food. However, of the 46 globally threatened (Critically Endangered, Endangered or Vulnerable) species that are used as food, 87% are threatened by intentional hunting, compared to 65% in the Least Concern category, suggesting that consumption may contribute to species declines.

A wide range of species have been impacted by take for consumption across Africa-Eurasia, driving or exacerbating serious declines of many globally threatened species CMS-listed project species. Examples include the European Turtle-dove along the European western and other flyways due to legal and illegal hunting and cross border trade combined with other drivers such as agricultural expansion and reduced food supply, the Yellow-breasted Bunting due to local trapping and trade in Nepal and across its range, the Yellow-casqued Hornbill (on the list of potential avian species for listing) and other hornbills due to increased demand for their parts from online trade at around 36 times the local village price, and vultures across Africa, in particular West Africa, from poisoning for traditional medicine use and trade as one or the most prevalent threat to their extinction.

Indirect impacts

While some publications returned in the systematic review mentioned indirect impacts as a result of consumption of some of the CMS-listed project species in relation to aspects such as the delivery of ecosystem services and impact on ecosystem function, only a handful were non-vulture species and detail was rarely included (e.g. a mention of the seed dispersal and predator/prey role of Yellow-casqued Hornbill but no primary evidence provided; Box 4.5). More evidence was provided in relation to incidental poisoning of the wider ecosystem and human and wildlife health risks as a result of deliberate carbofuran pesticide poisoning of wetland birds including Black-tailed Godwit in Kenya (Box 4.9) and poisoning of vultures in countries across Africa, and poisoning from lead shot in UK and EU is another example (Box 4.10).

While consumption of wildlife including birds is linked to risks of zoonotic disease transmission, evidence from the systematic review on direct links with the project species was limited, with more studies reporting the indirect impacts of vulture declines in terms of increased disease risk. Vultures are large scavenging birds of prey that, due to their very acid gastric fluids, can digest decomposing carcasses that are already infected with toxic bacteria that would be harmful to other scavenger

species (Ogada et al. 2012; Hill et al. 2018; DeVault et al. 2016). Whilst consuming such carcasses, vultures potentially remove dangerous bacteria from the environment, thereby providing a crucial ecosystem service to humans (Heever et al. 2021). While it has been reported that vultures can act as disease reservoirs that can increase the rates of transmission of infectious diseases, such as rabies and bubonic plague, to both humans and livestock (Ogada et al. 2012; Baldé 2016), the majority of studies have found that by disposing of animal carcasses, scavenging vultures limit the growth and spread of pathogenic bacteria (Plaza et al. 2020), thus reducing the risk of human infection, and also reduce the prevalence of dogs and rats, which themselves can transmit diseases to humans. For example, a recent study in India has shown that human mortality in areas where vultures had become extinct increased by 4%, with evidence of an increase in the feral dog population and cases of rabies and a decline in the water quality (Frank and Sudarshan 2023). When vulture populations collapse, as they have across much of India, Europe and Sub-Saharan Africa (CMS 2017), disease transmission therefore increases, and the vital ecosystem services they provide are lost (Murn and Botha 2018; Henriques et al. 2018).

5.3 Legislation, enforcement and governance……

Several multilateral environmental agreements provide legal frameworks for the protection of migratory birds, including the CBD, CITES and of course CMS, with its various daughter agreements, MOUs, actions plans, concerted actions, task forces, etc. The level of transposition of CMS provisions into national law, including protections offered to species listed on the Appendices as well as the provision for exceptions on hunting, varies by region, country and taxa.

The European Union bans all take of wild birds in its Member States except for the species listed in Annex II of the Birds Directive and for which specified Member States can open hunting seasons. In addition, the EU derogation process allows the killing of certain bird species under strict conditions. Hunting legislation in the Middle East varies markedly by country, with some countries having complete bans on the hunting of all wild bird species and others having more complex provisions. Legal frameworks vary markedly across Africa, with many stemming from the colonial era; half of the 16 countries covered under the West Africa Vulture Conservation Action Plan prohibit take of CMS Appendix I species, and most include other provisions for migratory birds under CMS frameworks such as AEWA and the Raptors MOU.

The review by UNEP-WCMC (2023) found that only 20 out of 72 Appendix I project species were reported to have 100% protection at national level, with protection as low as 25% for one species (Cape Vulture *Gyps coprotheres*; caveated by incomplete submission of reports and the inclusion of non-CMS Party Range States). The case study analysis of six African countries conducted as part of this review similarly found that only 10% of CMS Appendix I species across the five CMS Party countries are listed as fully protected under national laws (though in most cases not exactly equating to Appendix I obligations), with none of the countries having a special status for the protection of migratory or CMS-listed bird species. Only half of Appendix I species were found to have any level of protection, with some species only protected at family rather than species level, with significant gaps regarding exceptions and subsistence provisions.

With the partial exception of the Democratic Republic of the Congo, which has provided for the possibility of a generic derogation within protected areas, none of the African case study countries analysed has provided in its national body of legislation for an exception allowing the hunting of endangered animal species to meet the needs of traditional subsistence users. That said, subsistence and traditional hunting has a tendency to turn into commercial hunting, and it must be recognised that the exemption relating to subsistence needs could be used to conceal illegal take. It is therefore important for States to frame this exception within precise spatial and temporal limits, to ensure the persistence of the species concerned while respecting the rights of communities that depend on these

resources for their livelihood. The CMS National Legislative Programme[86] could assist Parties to this end.

In summary, some countries have weak legislation with gaps which doesn't reflect their international commitments, in others it is vague, contains loopholes or refers to whole taxonomic groups (e.g. ducks, vultures) rather than having species-specific lists of huntable or not huntable species, and in some cases issues lookalike species are not accounted for in legislation, opening the door for accidental take of threatened species. The system of derogations, as in the EU, for example, is open to abuse or unintended unsustainable take unless adaptive harvest management, ideally at flyway scale, is employed (Hirschfeld et al. 2019).

In addition to lacking specific legal frameworks for migratory birds, and even where species are legally protected, enforcement is often inadequate, with our systematic review finding 80% of consumption was reported as illegal. In some countries legislation is adequate on paper but is hardly enforced, or powers are lacking that would help identify criminal activity (such as being able to enter private property), or loopholes exist (e.g. certain hunting gear is banned but possession of it is not so a person would have to be caught in the act).

Finally, there is a lack of compliance among the hunting community in many countries, rather than a culture of responsible hunting supporting actions such as transparent bag reporting that would support long-term sustainability, with hunting seen either as a right or a short-term need and without sufficient accountability or responsibility. A final barrier to improved governance and management of take in some cases is low awareness and poor identification skills among the hunting communities of some countries (Matsyna et al. 2024; Newth et al. 2018).

5.4 Conservation and policy to address take and trade for consumption of migratory birds.....

There is an urgent need to better monitor and manage both legal and illegal take and trade of migratory birds. A large number of Appendix I species, including birds, are considered 'higher risk', and birds had lower management scores than other taxa, and were more likely to be harvested for domestic than international use (UNEP-WCMC 2023).

Evidence shows that targeted and enforced legislation works (Box 5.1). There is also a need to ensure local buy-in (Box 5.2). For example, The Amur Falcon, a migratory bird that roosts in Nagaland during its journey from Siberia to Africa, was once hunted in large numbers - over 100,000 annually - especially in villages like Pangti. In 2012, after global attention, fundraising and local awareness efforts by NGOs, scientists, and the government, villagers voluntarily banned hunting and began protecting the falcons. Local people were employed to patrol the area and to start eco-clubs through churches, schools and other local groups. This approach proved hugely successful, with many former hunters becoming guardians of the falcons. This led to a dramatic conservation success, with no large-scale hunting reported since 2013, and Nagaland becoming known as the 'Falcon Capital of the World.' The story is now celebrated as a model of community-led conservation combining tradition, science, and grassroots action (Kudalkar and Veríssimo 2024, CMS n.d.)

For migratory species there can be a weakest link effect where a few countries in the flyway having high levels of take can undermine the efforts of other countries. Action on wide-ranging and migratory species, particularly where this involves cross-border or international trade, therefore requires

[86] At its 12th meeting in Manila in 2017, the Conference of the Parties established, through Resolutions 12.9 and Decisions 12.6-12.9, the National Legislation Programme, which aims to provide assistance to Parties in complying with the provisions of CMS, in particular to ensure long-term compliance with certain provisions of CMS, including Article III.5.

international cooperation (Box 5.3), ideally at flyway scale (Box 5.4), where countries collaborate and collectively hold themselves to account. Ongoing monitoring, advocacy and enforcement is key to addressing entrenched behaviours and incentivising and penalising where appropriate (Box 5.5). The flyways concepts and new, large-scale initiatives such as the Regional Flyways Initiative of the East Asia-Australasia Flyway and the Americas Flyways Initiative are exciting new mechanisms which connect sites, countries and conventions through migratory birds and offer opportunities for sustainable, blended finance at scale (BirdLife International 2021).

Species-specific monitoring is a critical component of sustainability of take and must take into account biological and socio-cultural factors. Firstly, good systems for collection of hunter bag data are lacking in many countries, while in other countries where such a system has been introduced and a convenient phone app exists, a very low proportion of hunters are using it and are clearly underreporting their bag take. Addressing this requires the technology to be in place, for it to be accessible, affordable and feasible to use (less the case in the global south) and for hunters to appreciate that reporting bag take accurately is part of the responsibility that goes alongside being permitted to hunt and for it to be sustained, suggesting further awareness-raising is needed within this community. There is also currently a lack of effort to assess existing national bag data for accuracy and collate and analyse bag data at national and flyway scale, making it very difficult to understand whether current levels of taking might be sustainable or not for different species.

AEWA now requires detailed reporting from Parties on the scale of take as part of national reporting for migratory waterbirds in Africa-Eurasia, which is a very positive development. Adaptive harvest management is a good approach for bringing together all stakeholders around the evidence and should be pursued for a wider set of species. However, it is a species-by-species / population-by-population approach that takes significant investment of time and resources and can also suffer from lack of accurate bag data and lack of information on other parameters needed, such as basic monitoring of population size as well as other parameters like fecundity. Finally, information is also often lacking on the scale of illegal take and therefore the likely impact on the population of all forms of take together, and this must be better evaluated and factored in.

Box 5.1 Increased surveillance and enforcement measures in Cyprus have significantly reduced illegal bird killing

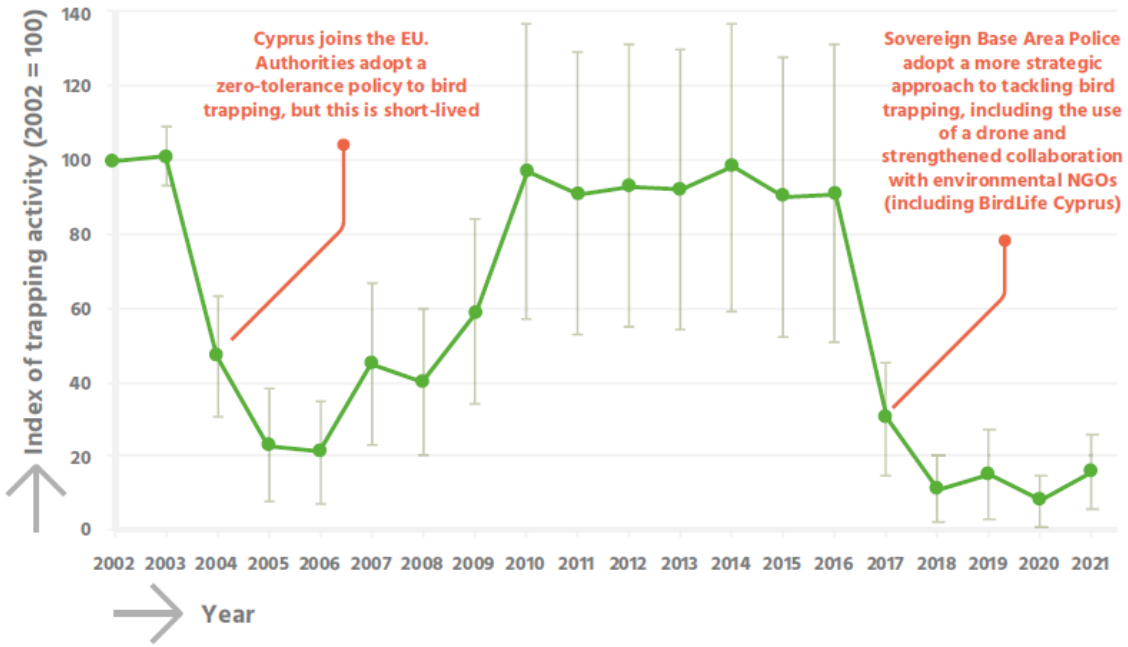


Figure 5.1. Illegal bird trapping activity in Cyprus Eastern Sovereign Base Areas, 2002-2021. Bars represent standard errors. Data from BirdLife Cyprus 2021, graphic reproduced from BirdLife International 2022.

Every year, hundreds of thousands of songbirds are illegally trapped and killed as they pass through Cyprus on migration, to be sold on the black market for the banned local dish of 'ambelopoulia'. BirdLife Cyprus, together with the UK BirdLife Partner, RSPB, have been systematically monitoring illegal bird trapping in the Republic of Cyprus and the Eastern Sovereign Base Areas for the last 20 years. This active covert surveillance has been used to inform on-the-ground action by enforcement officials, resulting in one of the most successful campaigns against illegal poaching globally. Since surveys began in 2002, mist-netting activity within the survey area has decreased by almost 90%. However, such efforts need to be sustained; subsequent relaxation of deterrent legislation, together with reduced capacity in enforcement teams, has resulted in signs that since 2020, trapping activity is no longer declining and may even be increasing slightly within the Republic of Cyprus (while remaining low in the Eastern Sovereign Base Areas; Shialis and Charalambides 2025).

Adapted from BirdLife International 2022 (original source BirdLife Cyprus 2021)

Box 5.2 Local self-regulation can be more effective at ensuring sustainable resource use than an outright ban

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

The response of BirdLife Partner the Wildlife and Environmental Society of Malawi (WESM) was not, as might have been expected, to seek a ban on bird hunting, but to find a way to give communities the responsibility and capacity to manage their resource sustainably. A revision of Malawi's Wildlife Act allowed Community Conserved Areas to be established, and under WESM's management 20 hunting clubs were created around the lake, with representatives elected to an umbrella body. WESM worked with the clubs and local government to reach an agreement on measures such as a closed season, no-hunting zones, and licensing and bag-limits, which were written into a by-law, with a framework of fines and measures for dealing with infractions. Importantly, the whole process operates at the local level—offenders are dealt with by traditional chiefs, and fines contribute to community projects like repairing boreholes and improving school buildings.

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

Adapted from BirdLife International 2011

Box 5.3. Addressing declines in vultures due to poisoning and international trade for belief-based use in West Africa: the West African Vulture Conservation Action Plan

In 2020, more than 2,000 Critically Endangered Hooded Vultures *Necrosyrtes monachus* were found dead across Guinea-Bissau (BirdLife International 2020). Investigations revealed that the vultures had been poisoned to collect their heads for belief-based use. African vulture species have experienced catastrophic population declines over the last 50 years, with the populations of all 11 African species plummeting by 80-97%, mainly due to poisoning (responsible for 61% of recorded vulture deaths across Africa), killing for belief-based use (29%), and electrocution by energy infrastructure (9%; Figure 5.2). West Africa has experienced the most significant vulture population crash across the continent (Ogada et al. 2016), with all six species (all CMS Appendix I and II-listed) now either Critically Endangered (CR) or Endangered (EN): Egyptian Vulture *Neophron percnopterus* (EN), Hooded Vulture *Necrosyrtes monachus* (CR), Lappet-faced Vulture *Torgos tracheliotos* (EN), Rüppel's Vulture *Gyps rueppeli* (CR), White-backed Vulture *Gyps africanus* (CR), and White-headed Vulture *Trigonoceps occipitalis* (CR). These declines pose significant ecological and public health risks across the subregion.

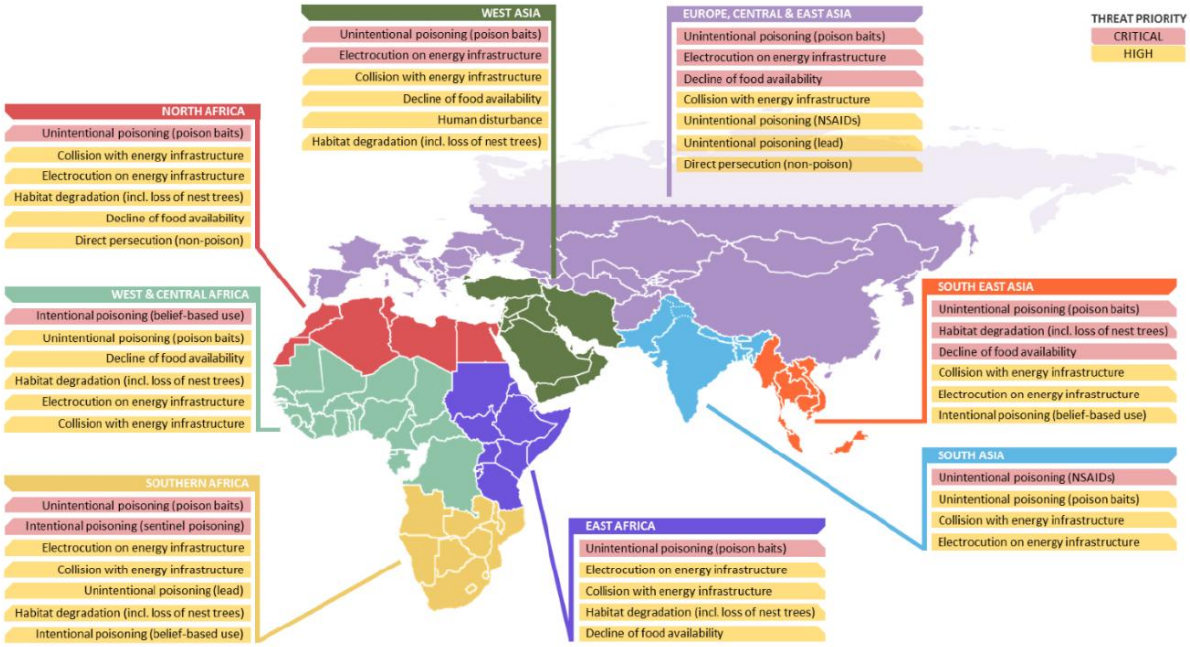


Figure 5.2. Map from the CMS Vulture MsAP (Botha et al. 2017) indicating critical and high priority threats facing African-Eurasian vultures. Intentional poisoning is the greatest threat to vultures in West and Central Africa.

The CMS Multi-species Action Plan to Conserve African-Eurasian Vultures (Vulture MsAP) highlighted that the main threat to these species was (increasing) intentional poisoning for belief-based use (Figure 5.2), where vulture body parts are traded for use in rituals, as good luck charms and for traditional medicine, purportedly (but without any known scientific basis) to treat physical or mental illnesses. Financial incentives are strong, with vulture parts selling for up to $127 in Ghana and a live vulture for up to $210 in Nigeria. There is evidence of significant cross-border trade in vulture parts (Rondeau and Thiollay 2004; Buij et al. 2016; UNEP-WCMC 2021), including from Ghana to Nigeria (Gbogbo 2016), and from Niger, Benin, Sudan, Cameroon and Chad into Nigeria (UNEP-WCMC 2021). However, CITES documented trade of wild-caught vultures from this region in the decade 2009-2018 is very limited and involves only Cameroon, Ghana and Togo (UNEP-WCMC 2021), suggesting a need for improved awareness, surveillance and control. There are currently few disincentives to trade – some countries lack specific laws to protect vultures, alternatives to vulture body parts (such as plant-based traditional medicines) are often not available or suggested, and perpetrators are rarely penalised.

The need for actions to address this imminent threat drove the development of the West African Vulture Conservation Action Plan (WAVCAP) 2023-2043, as mandated by CMS Decisions 14.152 and 14.153. Based on an extensive research and consultation process, the plan's vision is that by 2043 vulture populations across West Africa have achieved sustainable levels, are protected by effective legal frameworks, and live in a healthy environment in harmony with people. To achieve that, three thematic goals, with a short-term timeframe (2023-2029) have been identified: (1) Reduce intentional killing of vultures linked to illegal offtake, use and trade; (2) Reduce unintentional poisoning of vultures; and (3) Instate a vulture-positive public perception. Each goal has several actions which are accompanied by a measure of success, list of collaborators and a timeline. The action plan's timeframe aligns with that of the Vulture MsAP as a detailed, sub-regional plan falling under it, and all 16 Range States of the WAVCAP are called to implement it.

Sources: BirdLife International 2022; Botha et al. 2024; Chandra et al. 2024; https://www.cms.int/raptors/en/page/west-african-vulture-conservation-action-plan-2023-2043

Box 5.4. Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA): a model for population management of migratory birds?

AEWA offers a clear example within the CMS family of how international agreements can operationalise population-level management of migratory species. Through legally binding commitments, it provides Parties with structured frameworks, such as International Species Management Plans, that move beyond general conservation goals to coordinated, adaptive management of specific waterbird populations, including those subject to use. Notably, AEWA has pioneered harvest management approaches such as the International Single Species Action Plan for the Pink-footed Goose (*Anser brachyrhynchus*),[87] which sets population targets and adjusts annual hunting quotas accordingly, and collaborative efforts for Taiga Bean Geese (*Anser fabalis fabalis*),[88] where range states coordinate hunting regulations to stabilise declining populations. These examples demonstrate how conventions can provide not only legal protection but also practical tools for reconciling conservation with regulated harvest.

For such management schemes to function effectively, several factors are critical. First, reliable monitoring data on population size, distribution, and harvest levels must underpin decision-making, allowing for adaptive adjustments to management. Second, the flyway-wide nature of migratory species requires coordinated buy-in across all range states. Gaps in participation or implementation in even a few countries can undermine overall outcomes. Third, effective governance requires mechanisms to balance uneven capacities among range states; AEWA achieves this through targeted technical support and collaborative monitoring initiatives.

From a governance perspective, AEWA demonstrates how scientific assessments can be translated into enforceable management measures through international law, offering a model that could be applied more broadly across CMS-listed species. However, it also highlights persistent challenges, particularly in securing long-term funding for monitoring, ensuring compliance, and embedding adaptive harvest regulation across diverse legal and cultural contexts.

Box 5.5. Progress assessment on eradicating illegal killing of birds in the Mediterranean

[87] International Species Management Plan for the Svalbard Population of the Pink-footed Goose (TS No. 48) | AEWA
[88] International Single Species Action Plan for the Conservation of the Taiga Bean Goose (TS No. 56) | AEWA

Countries that are members of the Intergovernmental Task Force on Illegal Killing, Taking and Trade of Migratory Birds in the Mediterranean (CMS MIKT) and/or Bern Convention have all made a commitment to the Rome Strategic Plan (RSP) to eradicate the illegal killing, taking and trade of wild birds (IKB). This includes a 10-year goal to achieve at least a 50% reduction in the number of illegally killed birds by 2030, compared with 2020.

At the midpoint of the RSP, an independent NGO-led assessment by national NGOs and other experts, co-ordinated by BirdLife International and Euronatur, finds encouraging signs of progress in tackling IKB across the region, but warns that many countries will need to significantly scale up their political will, investment, or enforcement efforts to meet this target. However, this does not constitute the official CMS mid-term assessment, which is still ongoing. The NGO-led progress report notes that IKB trends have improved in some countries, demonstrating that efforts to tackle this issue are making a difference. At the midpoint of the RSP, eight countries (17%) are considered to be either on track to achieve the 50% reduction or have kept IKB at a consistently low level and 12 countries (26%) have achieved slight reductions. However, 17 countries (37%) have stable or fluctuating IKB levels and significant challenges remain, and nine countries (20%) have worsening trends in IKB. Among the 10 countries with the highest levels of IKB in 2020, where progress is most urgent, none were assessed to be on track to meet the 50% reduction by 2030, but two had a slight improvement and four had no indication of significant change. Concerningly, the remaining four countries were assessed to have a worsening IKB trend.

This report highlights areas where governments can invest further to accelerate progress and meet their RSP targets within the next five years. The MIKT/ Bern Convention process is vital in providing a forum for sharing experiences and international co-operation. Several countries have already demonstrated effective strategies in tackling IKB, providing practical models that others can follow. However, the solution to IKB cannot be achieved at a local or national level but is a flyway-wide task. The positive impact for migratory bird populations can only be achieved if other countries along the flyway also step up their efforts.

The review emphasises the need for enhanced political commitment, data transparency, and dedicated financial support to meet international targets and reduce IKB effectively or to sustain and expand the progress already made. By building on successful initiatives and addressing remaining challenges, governments have an opportunity and legal obligation to lead the way in protecting bird populations and strengthening conservation efforts across the region. With increased political will, targeted investment, strengthened collaboration and the adoption of best practices, the goal of reducing IKB by 50% by 2030 is still within reach of every country in the region.

Source: BirdLife International and EuroNatur (2025) Progress assessment on the eradication of illegal killing, taking and trade in the Mediterranean and Europe. https://www.birdlife.org/wp-content/uploads/2025/05/The-Killing-3.0-full-report.pdf

5.5 Recommendations.....

This review underscores the relevance of the recommendations for priority actions to tackle overexploitation as laid out in the recent State of the World's Migratory Species report (UNEP-WCMC 2024), which we adapt and build upon as follows:

- Ensure that national legislation fully and effectively protects CMS Appendix I-listed species from take, including by regularly reviewing and closely regulating any exceptions to the general prohibition of take. Participate in the CMS National Legislation Programme, which should provide guidance to help states frame any derogations within precise spatial and temporal limits, to ensure the persistence of the species concerned while respecting the rights

and ensuring sustainability for communities that may depend on these resources for their subsistence. Monitor implementation of the National Legislation Programme to enable it to adapt/improve as necessary.

- Strengthen penalties to ensure deterrence of illegal activity and training of prosecutors and judiciary in wildlife crime cases and improve enforcement of the law by ensuring adequate allocation of resources and personnel with appropriate training, skills and legal powers and political will with a high priority given to detecting and pursuing wildlife crime working with other stakeholders (for example within the framework of a National IKB Action Plan and committee).
- Improve and encourage the use of tools for monitoring, collecting and collating standardised data on both legal and illegal take at the national level. Efforts should also be made to improve the reliability and comprehensiveness of reporting in order to understand the scale, intensity and sustainability of national take, including through improvements to the CMS national reporting template and improved guidance to register species and standardise information on conservation status, trade volumes and threats (including from consumption). The approach being taken by AEWA provides a good model.
- Fill knowledge gaps on the main drivers and scale of illegal and/or unsustainable take of migratory species, for consumption and other reasons, including in regions where this threat has not yet been assessed, as well as legislative/policy needs, to inform the priority actions needed to tackle this issue. This should include improved monitoring of hunting, trade (including through market surveys) and illegal take, using more standardised methodology between regions to aid comparability of results, as well as research to understand the effectiveness of efforts to address it.
- Assess the cumulative impact of harvest pressure on migratory species at the flyway and population level and use this information to manage levels of take. Such adaptive harvest management requires the collation of data on both legal and illegal take at national and international scales, as well as basic monitoring of population size and other parameters like fecundity.
- Strengthen and expand collaborative international efforts to tackle illegal and unsustainable take, taking a flyway approach and focussing on the main drivers of taking and on geographical areas identified as hotspots for illegal take. Support and further develop the CMS Task Forces established to tackle the illegal killing of migratory birds. At the national level, multistakeholder action plans should be developed to agree priorities and foster collaboration to tackle this issue.
- Work with local communities to improve compliance with the law among hunters, including through awareness raising, training and consistent messaging from international and national hunting organisations, to develop alternative livelihoods opportunities where communities are reliant on subsistence consumption of wild birds, and to improve outreach and awareness-raising, particularly targeting areas with high levels of consumption of wild birds to help reduce demand.

5.6 Conclusions.....

This review highlights the substantial scale and impact of take and trade for consumption on CMS-listed avian species across Africa-Eurasia, and the actions needed to address resulting population declines. Migratory birds are particularly vulnerable to overexploitation, and many CMS-listed species are being consumed at an unsustainable level for wild meat for subsistence, as a delicacy and for income/trade, with particular taxa such as vultures being increasingly targeted for belief-based use and trade. This is a wide-ranging and complex issue, with drivers, motivations and methods varying across communities and regions, and further research is needed to fully understand all these aspects, in particular across the extent of each species' flyway.

While these CMS-listed species should have a level of protection, in many cases legislation, enforcement and awareness is inadequate. There are however examples where action to address unsustainable take for consumption has proven successful, from which we can learn. Our findings highlight the urgent need for coordinated conservation efforts, improved legal frameworks, effective enforcement and/or community buy-in, and enhanced data collection and reporting to address the unsustainable take and trade of migratory birds for consumption. By facilitating coordinated international action through relevant thematic, flyway-level and/or often multi-species Agreements, Task Forces, Action Plans and the like, with adequate resourcing and political support, CMS and its Range States can and must play a vital role in addressing the unsustainable take and trade of avian species for consumption and ensuring they, and the ecosystems and people on which they depend, continue to thrive.

6. References.....

Abd Rabou, A. F. N. (2019). Ornithofauna prevailing at Al-Mawasi ecosystem of the Gaza Strip, Palestine. *Open Journal of Ecology*, *9*(9), 360–400. https://doi.org/10.4236/oje.2019.99025

Abd Rabou, A. F. N. (2021). On the hunting of the Common Quail (*Coturnix coturnix* Linnaeus, 1758) along the Mediterranean coast of the Gaza Strip – Palestine. *IUG Journal of Natural Studies*, *29*(2). https://doi.org/10.33976/iugns.29.2/2021/1

Aebischer, N. J. (2019). Fifty-year trends in UK hunting bags of birds and mammals, and calibrated estimation of national bag size, using GWCT's National Gamebag Census. *European Journal of Wildlife Research*, *65*(4). https://doi.org/10.1007/s10344-019-1299-x

Aina, F. (2016). *Education for conservation of migratory waterbirds in Ramsar site 1018* [Final Report]. https://www.africanbirdclub.org/sites/default/files/2016_Lake_Nokoue_Survey_Benin.pdf

Alexandrou, O., Malakou, M., & Catsadorakis, G. (2022) The impact of avian influenza 2022 on Dalmatian pelicans was the worst ever wildlife disaster in Greece. *Oryx 56*(6): 813

Allebone-Webb, S.M. (2009) *Evaluating dependence on wildlife products in rural Equatorial Guinea*. [Doctoral dissertation, Imperial College London and ZSL Institute of Zoology, London].

Amir, O. G. (2006). *Wildlife trade in Somalia* (IUCN/SSC/Antelope Specialist Group). https://www.nabu.de/imperia/md/content/nabude/internationalerartenschutz/10.pdf

Arkumarev, V., McGrady, M., & Angelov, I. (2020). A literature review of occurrence of Egyptian Vulture (*Neophron percnopterus*) resident in Africa. *Vulture News*, *77*(1), 1–54. https://doi.org/10.4314/vulnew.v77i1.1

Arroyo, B., Cruz-Flores, M., Rubio, B., Šilarová, E., Škorpilová, J., Guillemain, M., & Carboneras, C. (2025). *Turtle Dove Adaptive Harvest Management Mechanism Technical Update*. Document prepared in the frame of the service contract with the European Commission. (09.0201/2022/886665/SER/D.3). Instituto de Investigación en Recursos Cinegéticos (IREC, ES) Czech Society for Ornithology, Pan-European Common Bird Monitoring Scheme (CSO, CZ), Office Français de la Biodiversité (OFB, FR).

Astaras, C., Sideri-Manoka, Z. A., Vougioukalou, M., Migli, D., Vasiliadis, I., Sidiropoulos, S., Barboutis, C., Manolopoulos, A., Vafeiadis, M., & Kazantzidis, S. (2023). Acoustic monitoring confirms significant poaching pressure of European Turtle Doves (*Streptopelia turtur*) during spring migration across the Ionian Islands, Greece. *Animals*, *13*(4). https://doi.org/10.3390/ani13040687

Azafzaf, H. (2007). *Guidelines for management and monitoring threatened population of marine and coastal bird species and their important areas in the Mediterranean*.

Baldé, M.F.H. (2016). Vultures in Guinea-Bissau: establishing baseline data on distribution and abundance, assessing conservation status and launching bases for populations monitoring [Doctoral dissertation].

Bandara, A., & Ranawana, K. B. (2014). A preliminary survey on Lesser Adjutant (*Leptoptilos javanicus*) in Kumana National Park, Eastern Province Sri Lanka. *Wildlanka*, *2*, 59–63.

Barca, B., Lindon, A., & Root-Bernstein, M. (2016). Environmentalism in the crosshairs: Perspectives on migratory bird hunting and poaching conflicts in Italy. *Global Ecology and Conservation*, *6*, 189–207. https://doi.org/10.1016/j.gecco.2016.03.001

Barman, P. D., Sharma, D. K., Cockrem, J. F., Malakar, M., Kakati, B., & Melvin, T. (2020). Saving the Greater Adjutant Stork by changing perceptions and linking to Assamese traditions in India. *Ethnobiology Letters*, *11*(2), 20–29.

Barnes, K. (n.d.). *Important Bird Areas in Africa and associated islands – Lesotho*. http://datazone.birdlife.org/userfiles/file/IBAs/AfricaCntryPDFs/Lesotho.pdf

Bashari, M., Sills, E., Peterson, M. N., & Cubbage, F. (2018). Hunting in Afghanistan: Variation in motivations across species. *ORYX*, *52*(3), 526–536. https://doi.org/10.1017/S0030605316001174

Beilis, N., & Esterhuizen, J. (2005). The potential impact on Cape Griffon *Gyps coprotheres* populations due to the trade in traditional medicine in Maseru, Lesotho. *Vulture News*, *53*, 15–19. https://doi.org/10.4314/vulnew.v53i1.37630

Benchimol, C., Francour, P., Lesourd, M., & Rouen-ledra, W. De. (2009). The preservation of marine biodiversity in West Africa, the Case of Cape Verde Islands: proposal of a new biodiversity policy management. In *1st Cape Verde Congress of Regional Development* (pp. 297–318). APDR.

Berruti, A., Snow, T., & van Zijl, N. (2005). Deliberate poisoning: The biggest threat to gamebirds. *Wingshooter*, *11*, 12–15.

Bessone, M., Ingram, D.J., Abernethy, K., Abua, S., Allebone-Webb, S., Antonacci, D., Bakkegaard, R.K., Brittain, S., Cornelis, D., Detoeuf, D., Emogor, C.A., Fa, J.E., Foerster, S., Fonteyn, D., Grande Vega, M., Hodgkinson, C., Ickowitz, A., Kamogne Tagne, C.T, Kemalasari, D., Kümpel, N., Lhoest, S., Mavah, G., Mouanda Niamba, R.G., Midoko Iponga, D., Milner-Gulland, E.J., Muhindo, J., Munyuli, T., Nasi, R., Ngama, S., Nyumu, J., Ombeni, J., Poulsen, J.R., Rowland, D., Sampurna, Y., Sandrin, F., Starkey, M., Sunderland, T., Tata, C., Tieguhong, J.C., van Vliet, N., Vigneron, P., Whytock, R.C., Wieland, M., Wilkie, D., Willis, J., Wright, J., & Coad, L. (in review). Magnitude and trends of wild animal consumption across Central Africa. *Nature.*

Bhattacharya, S. (2016). Slaughter of the song birds. *Nature*, *529*(7587), 452–455. https://doi.org/10.1038/529452a

BirdLife International. (2011). Local self-regulation can be more effective at ensuring sustainable resource use than outright ban. BirdLife International, Cambridge, UK. https://datazone.birdlife.org/sowb/casestudy/local-self-regulation-can-be-more-effective-at-ensuring-sustainable-resource-use-than-outright-ban

BirdLife International. (2012). *Status of Birds and their Habitats in the Marine and Coastal Environment of Madagascar*. BirdLife International, Cambridge, UK. https://nairobiconvention.org/clearinghouse/sites/default/files/Status%20of%20Birds%20and%20their%20Habitats%20in%20the%20Marine%20and%20Coastal%20Environment%20of%20Madagascar.pdf

BirdLife International. (2016). Nearly half of all bird species are used directly by people. BirdLife International, Cambridge, UK. https://datazone.birdlife.org/sowb/casestudy/nearly-half-of-all-bird-species-are-used-directly-by-people.

BirdLife International. (2019). Spotlight on the illegal killing of birds. BirdLife International, Cambridge, UK. https://datazone.birdlife.org/sowb/spotkilling/.

BirdLife International. (2020). Investigating the mystery behind Guinea-Bissau's mass vulture deaths. BirdLife International, Cambridge, UK. https://www.birdlife.org/news/2020/05/05/investigating-the-mystery-behind-guinea-bissaus-mass-vulture-deaths/

BirdLife International. (2021). $3 billion wetland conservation project launched for birds, nature & people. BirdLife International, Cambridge, UK. https://www.birdlife.org/news/2021/10/14/3-billion-wetland-conservation-project-launched-for-birds-nature-people/.

BirdLife International. (2022). *State of the World's Birds 2022: Insights and solutions for the world's biodiversity crisis*. BirdLife International, Cambridge, UK.

BirdLife International. (2023). *IUCN Red List of Threatened Species (birds)*. BirdLife International, Cambridge, UK. [Downloaded 12 December 2023.]

BirdLife International. (2023b). *Response to the outbreak of avian flu in Senegal, Gambia, and Guinea-Bissau.* BirdLife International, Cambridge, UK. https://www.birdlife.org/news/2023/05/24/response-to-the-outbreak-of-avian-flu-in-senegal-gambia-and-guinea-bissau/

BirdLife International. (2024). An unprecedented global epizootic of avian influenza is causing mass mortality of wild birds. BirdLife International, Cambridge, UK. https://datazone.birdlife.org/articles/an-unprecedented-global-epizootic-of-avian-influenza-is-causing-mass-mortality-of-wild-birds.

BirdLife International, & EuroNatur. (2025). *Progress assessment on the eradication of illegal killing, taking and trade of wild birds in the Mediterranean and Europe*. BirdLife International, Cambridge, UK.

BirdLife International & OSME. (2019). *Review of illegal killing and taking of birds in the Arabian Peninsula, Iran and Iraq.* BirdLife International, Cambridge, UK.

Botha, A. (2015). 65 endangered vultures killed in poisoning incident. *African Geographic*.

Botha, A., Andevski, J., Bowden, C., Gudka, M., Safford, R., Tavares, J., & Williams, N. (2017). *Multi-species Action Plan to Conserve African-Eurasian Vultures* (CMS Raptors MOU Technical Publication No. 5; CMS Technical Series No. 35). CMS Raptors MOU Secretariat; CMS. https://www.cms.int/sites/default/files/publication/vulture-msap_e.pdf

Botha, A., Doherty, J., Weston, J., Andevski, J., Safford, R., Tavares, J., Bowden, C., Matsvimbo, F., Sebele, L., Al-Hasani, I., & Gallo-Orsi, U. (2024). *Report on the Mid-term Implementation Review of the Vulture Multi-species Action Plan to conserve African-Eurasian Vultures*. CMS Raptors MOU Secretariat.

Boudouresque, C.-F., Beaubrun, P.-C., Relini, G., Templado, J., Van Klaveren, M. C., Van Klaveren, P., Walmsley, J. G., & Zotier, R. (1996). Critères de sélection et liste révisée des espèces en danger et menacées (marines et saumâtres) en Méditerranée. GIS Posidonie.

Bourgeois, V. (2017). *Evolutions et enjeux de la lutte contre le braconnage en Afrique: une illustration à partir du cas du Rhinocéros blanc (Ceratotherium simum) en Afrique du Sud* [Unpublished manuscript].

Boyer, E. (2021). *Analyse territoriale critique des mesures de gestion des populations de chats sur l'île de la réunion dans le cadre de la conservation de deux espèces endémiques, le pétrel de barau (pterodroma baraui) et le pétrel noir de bourbon (pseudobulweria atterima)* [Doctoral dissertation, École Nationale Vétérinaire de Toulouse].

Brochet, A-L., van den Bossche, W., Jbour, S., Ndang'ang'a, P. K., Jones, V. R., Abdou, W. A. L. I., Al-Hmoud, A. R., Asswad, N. G., Atienza, J. C., Atrash, I., Barbara, N., Bensusan, K., Bino, T., Celada, C., Cherkaoui, S. I., Costa, J., Deceuninck, B., Etayeb, K. S., Feltrup-Azafzaf, C., Figelj, J., Gustin, M., Kmecl, P., Kocevski, V., Korbeti, M., Kotrošan, D., Laguna, J. M., Lattuada, M., Leitão, D., Lopes, P., López-Jiménez, N., Lucić, V., Micol, T., Moali, A., Perlman, Y., Piludu, N., Portolou, D., Putilin, K.,

Quaintenne, G., Ramadan-Jaradi, G., Ružić, M., Sandor, A., Sarajli, N., Saveljić, D., Sheldon, R. D., Shialis, T., Tsiopelas, N., Vargas, F., Thompson, C., Brunner, A., Grimmett, R., & Butchart, S. H. M. (2016). Preliminary assessment of the scope and scale of illegal killing and taking of birds in the Mediterranean. *Bird Conservation International*, *26*, 1–28. https://doi.org/10.1017/S0959270915000416

Brochet, A-L., van den Bossche, W., Jones, V. R., Arnardottir, H., Damoc, D., Demko, M., Driessens, G., Flensted, K., Gerber, M., Ghasabyan, M., Gradinarov, D., Hansen, J., Horvath, M., Karlonas, M., Krogulec, J., Kuzmenko, T., Lachman, L., Lehtiniemi, T., Lorgé, P., Lötberg, U., Lusby, J., Ottens, G., Paquet, J. Y., Rukhaia, A., Schmidt, M., Shimmings, P., Stipniek, A., Sultanov, E., Vermouzek, Z., Vintchevski, A., Volke, V., Willi, G., & Butchart, S. H. M. (2017). Illegal killing and taking of birds in Europe outside the Mediterranean: assessing the scope and scale of a complex issue. *Bird Conservation International*, *29*, 10–40.

Brochet, A-L., Jabour, S., Sheldon, R. D., Porter, R., Jones, V. R., Al Fazar, W., Al Saghier, O., Alkhuzai, S., Al-Obeidi, L. A., Angwin, R., Ararat, K., Pope, M., Shobrak, M. Y., Willson, M. A., Zadegan, S. S., & Butchart, S. H. M. (2019). A preliminary assessment of the scope and scale of Illegal killing and taking of wild birds in the Arabian Peninsula, Iran and Iraq. *Sandgrouse*, *41*, 154-175.

Buij, R., Nikolaus, G., Whytock, R., Ingram, D. J., & Ogada, D. (2016). Trade of threatened vultures and other raptors for fetish and bushmeat in West and Central Africa. *ORYX*, *50*(4), 606–616. https://doi.org/10.1017/S0030605315000514

Buij, R., & Croes, B. M. (2013). Raptor habitat use in the Lake Chad Basin: Insights into the effect of flood-plain transformation on Afrotropical and Palearctic raptors. *Bird Conservation International*, *23*(2), 199–213. https://doi.org/10.1017/S0959270913000014

Butchart, S. H. M. (2008). Red List Indices to measure the sustainability of species use and impacts of invasive alien species. *Bird Conservation International*, *18*(suppl.), 245–262.

CapeNature. (2021). *UPDATE: Western Cape Avian Influenza outbreak and Seal deaths.* CapeNature, 24 November. Available at: https://www.capenature.co.za/news/2021/update-western-cape-avian-influenza-outbreak-and-seal-deaths-2 [Accessed 30/01/24]

Cawthorn, D-M., & Hoffman, L.C. (2015) The bushmeat and food security nexus: A global account of the contributions, conundrums and ethical collisions. *Food Research International* 76(4): 906-925. https://doi.org/10.1016/j.foodres.2015.03.025

Cesarini, D., Boughtflower, A., & Furtado, A. (2008). A new breeding site of the Cape Verde Purple Heron *Ardea (purpurea) bournei* on Santiago, Cape Verde Islands. *Malimbus*, *30*, 145–155.

Chaber, A-L., Allebone-Webb, S., Lignereux, Y., Cunningham, A.A., & Rowcliffe, J.M. (2010). The scale of illegal meat importation from Africa to Europe via Paris. *Conservation Letters 3,* 317-323.

Chandra, S., Citegetse, G., Copsey, J., Deikumah, J. P., Gallo Orsi, U., Henriques, H., Lopes, L., & Onoja, J. (2024). *West African Vulture Conservation Action Plan 2023-2043*.

Chausson, A., Rowcliffe, J.M., Escouflaire, L., Wieland, M., & Wright, J.H. (2019). Understanding the sociocultural drivers of urban bushmeat consumption for behavior change interventions in Pointe Noire, Republic of Congo. *Human Ecology 47,* 179-191.

Choudhury, A. (2001). Some bird records from Nagaland, north-east India. *Forktail*, *17*, 91–103.

Choudhury, A. (2009). Significant recent ornithological records from Manipur, North-east India, with an annotated checklist. *Forktail*, *25*, 71–89.

Choudhury, A. (2010). Recent ornithological records from Tripura, north-eastern India, with an annotated checklist. *Indian Birds*, *6*(3), 66–74.

Cloutier-Cyr, S. (2014). *Le braconnage dans le Parc national de l'île de La Réunion* [Master's thesis, Université de Montréal]. https://papyrus.bib.umontreal.ca/xmlui/handle/1866/10676

Coad, L., Willis, J., Maisels, F., Funk, S., Doughty, H., Fa, J. E., Gomez, J., Ingram, D. J., Li, Y., Nihotte, L., Paemelaere, E., Sartoretto, E., van Vliet, N., & Nasi, R. (2021). *Impacts of taking, trade and consumption of terrestrial migratory species for wild meat*. Prepared for the Secretariat of the Convention on Migratory Species (CMS) by the Center for International Forestry Research (CIFOR).

Collar, N. J., Baral, H. S., Batbayar, N., Bhardwaj, G. S., Brahma, N., Burnside, R. J., Choudhury, A. U., Combreau, O., Dolman, P. M., Donald, P. F., Dutta, S., Gadhavi, D., Gore, K., Goroshko, O. A., Hong, C., Jathar, G. A., J. R. R. S., Jhala, Y. V., Koshkin, M. A., & Kessler, A. E. (2017). Averting the extinction of bustards in Asia. *Forktail*, *33*(33), 1–26.

Convention on Migratory Species. (2017). *Proposal for the inclusion of five vulture species occurring in sub-Saharan Africa on Appendix I of the Convention*. Available at: https://www.cms.int/sites/default/files/document/cms_cop12_doc.25.1.15_listing-proposal-five-africanvultures-kenya_e_0.pdf.

Convention on Migratory Species. (n.d). From prey to protected species: how the tide turned for the Amur Falcon. https://www.cms.int/news/prey-protected-species-how-tide-turned-amur-falcon.

Daboné, C., Adjakpa, J. B., Dansi, M. F., Thompson, L. J., Dissou, F. E., & Weesie, P. D. M. (2024). Hooded Vultures *Necrosyrtes monachus* are at risk of extinction in Benin: A result of poaching for belief-based use and decreasing food availability. *Ecology and Evolution*, *14*(4), e11184.

Daboné, C., Ouéda, A., Thompson, L. J., Adjakpa, J. B., & Weesie, P. D. M. (2022). Local perceptions and sociocultural value of Hooded Vultures *Necrosyrtes monachus* in Burkina Faso, West Africa. *Ostrich*, *93*(4), 233–247. https://doi.org/10.2989/00306525.2022.2120558

Daboné, C., Ouéda, A., Thompson, L. J., Adjakpa, J. B., & Weesie, P. D. M. (2023). Trade in vulture parts in West Africa: Burkina Faso may be one of the main sources of vulture carcasses. *Bird Conservation International*, *33*. https://doi.org/10.1017/S095927092100054X

Davies, A., D'Cruze, N., Senni, C., & Martin, R. O. (2022). Inferring patterns of wildlife trade through monitoring social media: Shifting dynamics of trade in wild-sourced African Grey parrots following major regulatory changes. *Global Ecology and Conservation*, *33*. https://doi.org/10.1016/j.gecco.2021.e01964

Deikumah, J. P. (2020). Vulture declines, threats and conservation: the attitude of the indigenous Ghanaian. *Bird Conservation International*, *30*(1), 103–116. https://doi.org/10.1017/S0959270919000261

De Merode, E., Homewood, K., & Cowlishaw, G. (2004). The value of bushmeat and other wild foods to rural households living in extreme poverty in Democratic Republic of Congo. *Biological Conservation, 118*, 583-592.

Deniau, C. P., Mathevet, R., Gautier, D., Besnard, A., Cornu, G., & Le Bel, S. (2022). Flyways to hell? An empirical assessment of Palearctic migratory waterbird harvest practices in key wetlands of Sahel-sub-Saharan Africa. *Biological Conservation*, *265*. https://doi.org/10.1016/j.biocon.2021.109419.

DeVault, T.L., Beasley, J., Olson, Z.H., Moleón, M., Carrete, M., Margalida, A., & Sánchez-Zapata, J.A. (2016). *Ecosystem services provided by avian scavengers.* USDA National Wildlife Research Center - Staff Publications. 1836.

Dey, S., Dey, S., Choudhary, S. K., Kelkar, N., Platanista, D., & Gavialis, G. (2014). An annotated bird checklist of the Vikramshila Gangetic Dolphin Sanctuary , Bhagalpur , Bihar , India , with an assessment of threats to bird conservation. *Forktail*, *30*(January), 34–40.

Dias, M. P., Martin, R., Pearmain, E. L., Burfield, I. J., Small, C., Phillips, R. A., Yates, O., Lascelles, B., Garcia Borboroglu, P., & Croxall, J. P. (2019). Threats to seabirds: a global assessment. *Biological Conservation*, *237*, 525-537. https://doi.org/10.1016/j.biocon.2019.06.033.

Dione, I. D., & Dieng, P. G. (2020). Etude des impacts écologiques et socio-économiques de la chasse amodiée dans la zone «des 3 marigots sud»(région de Saint-Louis/Sénégal). *Espace Géographique et Société Marocaine*, *33–34*.

Donald, P.F., Fernando, E., Brown, L., Busana, M., Butchart, S.H.M., Chng S., de la Colina, A., Ferreira, J.M., Jain, A., Jones, V.R., Lapido, R., Malsch, K., McDougall, A., Muccio, C., Nguyen, D., Outhwaite, W., Petrovan, S.O., Stafford, C., Sutherland, W.J., Tallowin, O., Safford, R. (2024). Assessing the global prevalence of wild birds in trade. *Conservation Biology, 38*(5): e14350. doi: 10.1111/cobi.14350. PMID: 39248745

Ducatez, M. F., Tarnagda, Z., Tahita, M. C., Sow, A., De Landtsheer, S., Londt, B. Z., Brown, I. H., Osterhaus, A. D. M. E., Fouchier, R. A. M., Ouedraogo, J. B. B., & Muller, C. P. (2007). Genetic characterization of HPAI (H5N1) viruses from poultry and wild vultures, Burkina Faso. *Emerging Infectious Diseases*, *13*(4), 611–613. https://doi.org/10.3201/eid1304.061356

Dzitse, S. (2014). *Distribution and abundance of hornbills in some selected matrices/landscapes in southern Ghana* [Master's thesis, University of Cape Coast]. http://erl.ucc.edu.gh/dspace/handle/123456789/2542

EAAFP. (2022) *Updates of HPAI recorded in East Asian – Australasian Flyway.* East Asian – Australasian Flyway Partnership, 29 December. Available at: https://www.eaaflyway.net/updates-hpai-eaaf/ [Accessed 30/01/24]

Eason, P., Rabia, B., & Attum, O. (2015). Hunting of migratory birds in North Sinai, Egypt. *Bird Conservation International*, *26*, 39-51. https://doi.org/10.1017/S0959270915000180.

East, T., Kümpel, N.F., Milner-Gulland, E.J., & Rowcliffe, J.M. (2005). Determinants of urban bushmeat consumption in Río Muni, Equatorial Guinea. *Biological Conservation 126*(2), 206-215. https://doi.org/10.1016/j.biocon.2005.05.012

Edet, D. I. (2018). Conservation of the West African Black-Crowned Crane *Balearica pavonina pavonina* (Linn 1758) in the Sudano-Sahelian Wetlands of Northern Nigeria. *International Journal of Avian & Wildlife Biology*, *3*(1). https://doi.org/10.15406/ijawb.2018.03.00045

Egwunatum, A. E., Adeyemi, M. A., Ezenwenyi, J. U., & Anaenugwu, C. J. (2022). Distribution of African Grey Parrots (*Psittacus erithacus*) Linnacus, 1758 in Okomu National Park, Nigeria. *International Journal of Agriculture, Food and Biodiversity*, *1*(1), 78–84.

Emogor, C.A., Coad, L., Balmford, B., Ingram, D.J., Detoeuf, D., Fletcher Jr, R.J., Imong, I., Dunn, A., & Balmford, A. (2024). Changes in wild meat hunting and use by rural communities during the COVID-19 socio-economic shock. *Conservation Letters 17*(5), e13042.

Estrajher, P. (2018). *Important bird areas in the southern part of West Iceland* [Master's thesis, Agricultural University of Iceland]. http://hdl.handle.net/1946/32264

Etengu, N. (2005, May 9). Migratory birds poisoned, eaten. *New Vision*. https://www.newvision.co.ug/news/1125379/migratory-birds-poisoned-eaten

FACE. (2022). *Harvest data reported under the Birds Directive: A first overview*. FACE – European Federation for Hunting and Conservation. https://www.face.eu/2023/04/harvest-data-reported-under-the-birds-directive-a-first-overview/

FAOLEX. (2017). FAOLEX Database: Environmental Protection Law No. 42 of 2014. www.fao.org/faolex/results/details/en/?details=LEX-FAOC142030. [Retrieved 21 September 2017]

Fisher, I., Ashpole, J., Scallan, D., Proud, T., & Carboneras, C. (Compilers). (2018). *International Single Species Action Plan for the conservation of the European Turtle-dove Streptopelia turtur (2018 to 2028)*. European Commission.

Frank, E., & Sudarshan, A. (2023). *The social costs of keystone species collapse: evidence from the decline of vultures in India.* University of Chicago, Becker Friedman Institute for Economics Working Paper No. 2022-165.

Garrido, J. R., Numa, C., Barrios, V., Qninba, A., Riad, A., Haitham, O., Benmammar Hasnaoui, H., Buirzayqah, S., Onrubia, A., & Fellous-Djardini, A. (2021). *The conservation status and distribution of the breeding birds of prey of North Africa*. IUCN.

Gervasoni, V. (2004). Chasse (mars 2002-novembre 2003). *Revue Juridique de l'Environnement*, *29*(4), 449–463.

Ghosh, A., Basu, S., Jabin, G., Khatri, H., Singh, S. K., Maheswaran, G., Chandra, K., & Thakur, M. (2019). Wildlife forensics in voiding false offences: A case study to deal with unidentified cooked meat. *Forensic Science International: Reports*, *1*, 100011. https://doi.org/10.1016/j.fsir.2019.100011

Gbogbo, F., Roberts, J.S., & Awotwe-Pratt, V. (2016). Some important observations on the populations of Hooded Vultures *Necrosyrtes monachus* in urban Ghana. *International Journal of Zoology 2016,* 1-6. DOI: 10.1155/2016/7946172

Grard, F. (2015). *Variole aviaire chez l'Outarde houbara (Chlamydotis undulata) : étude d'une souche d'avipoxvirus* [Doctoral dissertation, Ecole Nationale Vétérinaire de Toulouse - ENVT].

Green, A. J. (1993). Status and habitat of the White-winged Duck *Cairina scutulata*. *Bird Conservation International*, *3*(2), 119–143. https://doi.org/10.1017/S0959270900000848

Grussu, M., & Group, S. O. (2020). Evolution of the vulture population on a Mediterranean island. The Sardinian instance (Italy). *Vulture News*, *76*, 6–19. https://doi.org/10.4314/vulnew.v76i1.2

Guihal, D. (2005). Jugement du tribunal administratif de Dijon du 22 janvier 1999 enjoignant à un préfet de fixer la date de fermeture de la chasse au gibier d'eau et aux oiseaux de passage avant la fin de janvier 1999./Arrêté pris le 27 janvier 1999./Détermination de la da. *Revue Juridique de l'Environnement*, *30*(3), 299–304.

Habib, M. (2018). *Waterfowl anatidae of the wetlands of kashmir population trends habitat use and nesting success* [Doctoral dissertation, Pondicherry University].

Handal, E. N., Amr, Z. S., Basha, W. S., & Qumsiyeh, M. B. (2021). Illegal trade in wildlife vertebrate species in the West Bank, Palestine. *Journal of Asia-Pacific Biodiversity*, *14*(4), 636–639. https://doi.org/10.1016/j.japb.2021.07.004

Handley, J., & Davies, T. (2025). *Global review of direct take of seabirds.* Prepared for the Secretariat of the Convention on Migratory Species (CMS) by BirdLife International.

van den Heever, L., Thompson, L.J., Bowerman, W.W., et al. (2021). Reviewing the role of vultures at the human–wildlife–livestock disease interface: an African perspective. *Journal of Raptor Research, 55* 2021), 311-327.

Henriques, M., Granadeiro, J. P., Monteiro, H., Nuno, A., Lecoq, M., Cardoso, P., Regalla, A., & Catry, P. (2018). Not in wilderness: African vulture strongholds remain in areas with high human density. *PLoS ONE*, *13*(1), e0190594. https://doi.org/10.1371/journal.pone.0190594

Hill, J.E., DeVault, T.L., Beasley, J.C., Rhodes Jr, O.E., & Belant, J.L. (2018). Effects of vulture exclusion on carrion consumption by facultative scavengers. *Ecology and Evolution, 8*(5), 2518-2526

Hirschfeld, A., & Held, A. (2005). Mortality of migratory birds caused by hunting in Europe: bag statistics and proposals for the conservation of birds and animal welfare. *Berichte zum Vogelschutz*, *42*, 47–74.

Hirschfeld, A., Attard, G., & Scott, L. (2019). Bird hunting in Europe: an analysis of bag figures and the potential impact on the conservation of threatened species. *British Birds*, *112*, 153–166.

Hirschinger, J. (2020). *Evaluation des risques sanitaires associés à l'exposition des élevages avicoles à l'avifaune sauvage péridomestique. Exemple des élevages conservatoires d'outardes houbara aux Emirats Arabes Unis* [Doctoral dissertation].

Holbech, L. H., Annorbah, N. N. D., Phalan, B., & Arcilla, N. (2018). Uncontrolled hunting and habitat degradation decimate and extirpate forest hornbills in Ghana, West Africa. *Biological Conservation*, *223*, 104-111. https://doi.org/10.1016/j.biocon.2018.04.039.

IDPE. (2024). *Issue of protection of migratory and non-migratory birds in the Virunga landscape: case of Lake Edward*.

Ilyashenko, E., Mirande, C. M., Mirande, C. M., & Mirande, J. T. (2019). Illegal take including hunting, trapping, and poisoning. In C. M. Mirande & J. T. Harris (Eds.), *Crane Conservation Strategy* (pp. 127–134). International Crane Foundation.

Ingram, D. J (2018). *Quantifying the exploitation of terrestrial wildlife in Africa*. [Doctoral dissertation, University of Sussex].

Ingram, D. J., Coad, L., Milner-Gulland, E.J., Parry, L., Wilkie, D., Bakarr, M.I., Benítez-López, A., Bennett, E.L., Bodmer, R., Cowlishaw, G., El Bizri, H.R., Eves, H.E., Fa, J.E., Golden, C.D., Iponga, D.M., Minh, N.V., Morcatty, T.Q., Mwinyihali R., Nasi, R., Nijman, V., Ntiamoa-Baidu, Y., Pattiselanno, F., Peres, C.A., Rao, M., Robinson, J.G., Rowcliffe, J.M., Stafford, C., Supuma, M., Tarla, F.N., Van Vliet, N., Wieland, M., & Abernethy K. (2021). Wild meat is still on the menu: Progress in wild meat research, policy, and practice from 2002 to 2020. *Annual Review of Environment and Resources 46*(1), 221-254.

Ingram, D. J., Prideaux, M., Hodgins, N. K., Frisch-Nwakanma, H., Avila, I. C., Collins, T., Cosentino, M., Keith-Diagne, L. W., Marsh, H., Shirley, M. H., Van Waerebeek, K., Djondo, M. K., Fukuda, Y., Glaus, K. B. J., Jabado, R. W., Lang, J. W., Lüber, S., Manolis, C., Webb, G. J. W., & Porter, L. (2022). Widespread Use of Migratory Megafauna for Aquatic Wild Meat in the Tropics and Subtropics. *Frontiers in Marine Science*, *9*. https://doi.org/10.3389/fmars.2022.837447.

Ingram, D.J. (2023). Wild meat in changing times. *Journal of Ethnobiology 40*(2), 117-130. https://doi.org/10.2993/0278-0771-40.2.117

Ingram, D. J., Froese, G.Z.L, Carroll, D., Bürkner, P.C, Maisels, F., Abugiche, A.S., Allebone-Webb, S., Balmford, A., Cornelis, D., Dethier, M., Dounias, E., Ekodeck, H.G., Emogor, C.A., Fa, J.E., Fonteyn, D., Ghiurghi, A., Greengrass, E., Kümpel, N.F., Lupo, K., Muhindo, J., Ngandjui, G., Ngohouani, G.D., Sandrin, F., Schleicher, J., Schmitt, D.N., Vanegas, L., Vanthomme, H.P.A., van Vliet, N.,

Willcox, A.S., Iponga, D.M., Kemalasari, D., Muchlish, U., Nasi, R., Sampurna, Y., Tarla, F.N., Willis, J., Scharlemann, J.P.W., Abernethy, K., & Coad, L. (2025). Regional patterns of wild animal hunting in African tropical forests. *Nature Sustainability* 8(2): 202-214.

Issoufou, B., Noura, S. M. M., & Ismael, A. M. (2020). Contribution à l'analyse des problématiques du braconnage dans des terroirs villageois situés à la périphérie de la Réserve Naturelle Nationale de Termit et Tin-Toumma au sud-est du Niger. *European Scientific Journal ESJ*, *16*(40). https://doi.org/10.19044/esj.2020.v16n40p119

IUCN Sustainable Use and Livelihoods Specialist Group. (n.d.-a). Species Use Database. Turtle Dove. Retrieved 2024, from https://speciesusedatabase.com/explore.

IUCN Sustainable Use and Livelihoods Specialist Group. (n.d.-b). Species Use Database. White-Backed Vulture. Retrieved 2024, from https://speciesusedatabase.com/explore.

Ives, A. M., Brenn-White, M., Buckley, J. Y., Kendall, C. J., Wilton, S., & Deem, S. L. (2022). A Global Review of Causes of Morbidity and Mortality in Free-Living Vultures. *EcoHealth*, *19*(1), 40–54. https://doi.org/10.1007/s10393-021-01573-5

Jones, I., Whytock, R., & Bunnefeld, N. (2017). *Assessing motivations for the illegal killing of Lesser White-fronted Geese at key sites in Kazakhstan*. UNEP/AEWA Secretariat. https://www.unep-aewa.org/en/publication/assessing-motivations-illegal-killing-lesser-white-fronted-geese-key-sites-kazakhstan

Jones, M. T. (2013). *Poaching as a threat to biodiversity and a barrier to sustainable development in Western Uganda: a case study of Queen Elizabeth National Park, Rwenzori Mountains National Park, Kibale National Park, and surrounding areas* [Independent Study Project (ISP) Collection]. SIT Digital Collections. https://digitalcollections.sit.edu/isp_collection/1706

Kankam, B. O., & Abukari, H. (2020). Predicting residents' intention to conserve the hooded vulture (*Necrosyrtes monachus*) in the Birem North District, Ghana. *Heliyon*, *6*(9). https://doi.org/10.1016/j.heliyon.2020.e04966

Kannan, V. (2019). Conservation of the Spot-billed Pelican *Pelecanus philippensis* in southern India. *International Journal of Zoology Studies*, *4*(6), 1–10. https://www.researchgate.net/publication/259145349

Katuwal, H. B., Sharma, H. P., Thakur, R. K., Rokka, P., Mandal, D. N., Baral, H. S., & Quan, R. C. (2023). Illegal trapping and local trade of farmland birds in Madhesh Province, Nepal. *Global Ecology and Conservation*, *42*. https://doi.org/10.1016/j.gecco.2023.e02391

Kendie, F. A., Mekuriaw, S. A., & Dagnew, M. A. (2018). Ethnozoological study of traditional medicinal appreciation of animals and their products among the indigenous people of Metema Woreda, North-Western Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, *14*(1), 37. https://doi.org/10.1186/s13002-018-0234-7

Khan, M. S. H., Ullah, S., Hamed, M. H., & Altaf, M. (2020). A study of illegal wildlife trade and seizures in Pakistan. *J. Wildl. Ecol*, *4*, 193–210.

Kibuule, M., & African Bird Club. (2016). *Population status of the critically endangered hooded vulture Necrosyrtes monachus in Uganda's major urban centres* [Report]. African Bird Club.

Knief, U., Bregnballe, T., Alfarwi, I., Ballmann, M. Z., Brenninkmeijer, A., Bzoma, S., Chabrolle, A., Dimmlich, J., Engel, E., Fijn, R., Fischer, K., Hälterlein, B., Haupt, M., Hennig, V., Herrmann, C., in 't Veld, R., Kirchhoff, E., Kristersson, M., Kühn, S., … Courtens, W. (2024). Highly pathogenic avian influenza causes mass mortality in Sandwich Tern *Thalasseus sandvicensis* breeding colonies across north-western Europe. *Bird Conservation International 34*: e6.

Korgaonkar, C., & Gokhale, Y. (2007). *Stakeholder analysis for conservation and management of Samaspur Bird Sanctuary, Uttar Pradesh*. The Energy and Resources Institute (TERI).

Kret, E., Rabeil, T., Muhammad, S. I., Shiiwua, M., Hall, P., Arkumarev, V., Dobrev, V., & Nikolov, S. C. (2018). First documented case of the killing of an Egyptian Vulture (*Neophron Percnopterus*) for belief-based practices in Western Africa. *Vie et Milieu*, *68*(1), 45–50.

Kudalkar, S., & Veríssimo, D. (2024). From media campaign to local governance transition: Lessons for community-based conservation from an Amur falcon hunting ban in Nagaland, India. *Conservation Science and Practice*, *6*. https://doi.org/10.1111/csp2.13191.

Kümpel, N. F. (2006). *Incentives for sustainable hunting of bushmeat in Rio Muni, Equatorial Guinea* [Doctoral dissertation, Imperial College London and Institute of Zoology, Zoological Society of London].

Kümpel, N.F., Milner-Gulland, E.J., Cowlishaw, G., & Rowcliffe, J.M. (2010). Assessing sustainability at multiple scales in a rotational bushmeat hunting system. *Conservation Biology 24* 3), 861-871.

Kümpel, N. F., Cunningham, A. A., Fa, J. E., Jones, J. P. G., Rowcliffe, J. M., & Milner-Gulland, E. J. (2015). Ebola and bushmeat: myth and reality. *FAO NWFP Update*, *5*, 1-5. https://www.researchgate.net/profile/Julia-Fa/publication/276937390_Ebola_and_bushmeat_myth_and_reality/links/555c65cb08ae91e75e76f42a/Ebola-and-bushmeat-myth-and-reality.pdf.

Kunac, S., & Rodik, P. (2021). *Socio-economic analysis of perception and causes of illegal killing of birds in the Neretva Delta, Croatia*. Biom. https://www.biom.hr/wp-content/uploads/2022/05/Socio-economic-analysis-of-perception-and-causes-of-illegal-killing-of-birds-in-the-Neretva-delta-Croatia.pdf

Lachi, W., & Hafiani, B. (2018). Typologie sociale des differents eleveurs d'animaux sauvages, et implications pour la conservation. http://dspace.univ-guelma.dz:8080/xmlui/handle/123456789/1001

Lamy, M. (2002). Décret du 1er août 2000 relatif aux dates de chasse aux oiseaux d'eau et au gibier de passage. Dates d'ouverture et de clôture échelonnées selon les espèces. Interprétation de l'article 7, paragraphe 4 de la directive du 2 avril 1979 donnée par la CJCE: i. *Revue Juridique de l'Environnement*, *27*(3), 425–451.

Lascelles, B., Rice, J., Sato, M., Tarzia, M., & Wanless, R. M. (2016). World Ocean Assessment I - Chapter 38: Seabirds. https://www.un.org/depts/los/global_reporting/WOA_RPROC/Chapter_38.pdf.

LIPU. (2024). LIFE Against Bird Crime: "Grive" trapping and consumption socio-economic survey.

Lo, F. T., Zecchin, B., Diallo, A. A., Racky, O., Tassoni, L., Diop, A., Diouf, M., Diouf, M., Samb, Y. N., Pastori, A., Gobbo, F., Ellero, F., Diop, M., Lo, M. M., Diouf, M. N., Fall, M., Ndiaye, A. A., Gaye, A. M., Badiane, M…Monne, I. (2022). Intercontinental spread of Eurasian highly pathogenic Avian Influenza A(H5N1) to Senegal. *Emerging Infectious Diseases, 28*(1): 234–237.

Lormée, H., Barbraud, C., Peach, W., Goutte, A., Aebischer, N. J., & Péron, C. (2020). Assessing the sustainability of harvest of the European Turtle-dove along the European western flyway. *Bird Conservation International*, *30*(4), 506-521. https://doi.org/10.1017/S0959270919000479.

Manqele, N. S. (2022). *Aspects of the use of vultures in traditional medicine in KwaZulu-Natal, South Africa, and conservation implications* [Doctoral dissertation].

Matsyna, A.I., Matsyna, E.L., Gerasimov, Y., Klokov, K.B., Syroechkovskiy, E.E., Pronkevich, V.V., Antonov, A.I., Sasin, A.A., and Zöckler, C.Z. (2024). Assessment of hunting pressure on Far Eastern Curlew

and other shorebirds in Russian Far East: summary of the fieldwork in 2019-2022. UNEP/CMS/COP14/Inf.28.5.1b. https://www.cms.int/document/assessment-hunting-pressure-far-eastern-curlew-and-other-shorebirds-russian-far-east

Mdhlano, S. F., Gandiwa, E., Muboko, N., & Mashapa, C. (2018). Local knowledge and perceptions of vulture conservation in communities living adjacent to the northern Gonarezhou National Park, Zimbabwe. *Vulture News*, *74*(1), 1. https://doi.org/10.4314/vulnew.v74i1.1

Militao, T., Dinis, H. A., Zango, L., Calabuig, P., Stefan, L. M., & Gonzalez-Solis, J. (2017). Population size, breeding biology and on-land threats of Cape Verde petrel (*Pterodroma feae*) in Fogo Island, Cape Verde. *Plos One*, *12*(4), e0174803.

Milner-Gulland, E. J., Bennett, E. L., Abernethy, K., et al. (2002). Wild meat: the bigger picture. *Trends in Ecology & Evolution*, *17*(5), 199-201. https://doi.org/10.1016/S0169-5347(03)00123-X

Molini, U., Yabe, J., Meki, I. K., Ouled Ahmed Ben Ali, H., Settypalli, T. B. K., Datta, S., Coetzee, L. M., Hamunyela, E., Khaiseb, S., Cattoli, G., Lamien, C. E. & Dundon, W. G. (2023). Highly pathogenic avian influenza H5N1 virus outbreak among Cape Cormorants (*Phalacrocorax capensis*) in Namibia, 2022. *Emerging Microbes Infectious, 12*(1): 2167610

Montrond, G. (2020). *Assessing sea turtle, seabird and shark bycatch in artisanal, semi-industrial and industrial of fisheries in the Cabo Verde Archipelago* [Master's thesis, University of Cape Town]. https://open.uct.ac.za/server/api/core/bitstreams/28f553d3-6885-486f-bef2-dbf33a761494/content

Muhammad, N. D., & Mustapha, Z. K. (2020). Collapsing towards Extinction? Trade in Birds Carcasses for Traditional Medicine and the Decline of Vulture Population in Katsina State, Nigeria. *Journal of Applied Sciences and Environmental Management*, *24*(4), 575–580. https://doi.org/10.4314/jasem.v24i4.5

Mulliken, T. A., Broad, S. R., & Thomsen, J. B. (1992). The wild bird trade—an overview. In J. B. Thomsen, S. R. Edwards, & T. A. Mulliken (Eds.), *Perceptions, conservation and management of wild birds in trade* (pp. 1-41). TRAFFIC International.

Mundi, O., & Tegang, R. (2024). Information notes from the Yellow Casqued Hornbill Project in the Ebo-Forest, Cameroon. Unpublished report.

Murn, C., & Botha, A. (2018). A clear and present danger: impacts of poisoning on a vulture population and the effect of poison response activities. *Oryx*, *52*(3), 552–558. https://doi.org/10.1017/S0030605316001137

Nasi, R., Taber A., & Van Vliet N. (2011) Empty forests, empty stomachs? Bushmeat and livelihoods in the Congo and Amazon Basins. *International Forestry Review* 13:355–368.

Newth, J.L., Wood, K.A., McDonald, R.A., Nuno, A., Semenov, I., Chistyakov, A., Mikhaylova, G., Bearhop, S., Belousova, A., Glazov, P., Cromie, R.L. & Ree, E.C. (2018). Conservation implications of misidentification and killing of protected species. Conservation Science and Practice 2019;1:e24. https://doi.org/10.1111/csp2.24

Ngure, P. W. (2012). *Patterns of wildlife exploitation in the Ugalla ecosystems of Western Tanzania* [Doctoral dissertation, University of Nottingham]. http://eprints.nottingham.ac.uk/12564/

Nielsen, M.R., Meilby, H., Smith-Hall, C., Pouliot, M., & Treue, T. (2018) The importance of wild meat in the Global South. *Ecological Economics* 146: 696-705. https://doi.org/10.1016/j.ecolecon.2017.12.018

Nikolaus, G. (2011). The fetish culture in west africa: An ancient tradition as a threat to endangered birdlife? *Bonner Zoologische Monographien*, *57*, 145–149.

Nikolaus, G. (2001). Bird exploitation for traditional medicine in Nigeria. *Malimbus*, *23*, 45–55.

Nkezabahizi, L., & Manirambona, A. (2009). *Burundi's important bird areas: status and trends 2009-July 2010*.

Nsabagasani, C., Nsengimana, S., & Hakizimana, E. (n.d.). *Biodiversity survey in Akanyaru Wetlands, unprotected important bird areas in Rwanda*. https://www.africanbirdclub.org/sites/default/files/2008_Akanyura_Wetland_Survey_Rwanda_0.pdf

Nunes, A.V., Peres, C.A., de Araujo Lima Constantino, P., Santos, B.A., & Fischer, E. (2019). Irreplaceable socioeconomic value of wild meat extraction to local food security in rural Amazonia. *Biological Conservation 236,* 171-179. https://doi.org/10.1016/j.biocon.2019.05.010

Odino, M. (2011). Measuring the conservation threat to birds in Kenya from deliberate pesticide poisoning: a case study of suspected carbofuran poisoning using Furadan in Bunyala Rice Irrigation Scheme. In N. Richards (Ed.), *Carbofuran and Wildlife Poisoning: Global Perspectives and Forensic Approaches* (pp. 53–70). John Wiley & Sons.

Ogada, D. L., & Buij, R. (2011). Large declines of the Hooded Vulture *Necrosyrtes monachus* across its African range. *Ostrich*, *82*(2), 101–113. https://doi.org/10.2989/00306525.2011.603464

Ogada, D.L., Keesing, F., & Virani, M.Z. (2012). Dropping dead: causes and consequences of vulture population declines worldwide. *Annals of the New York Academy of Sciences, 1249*(1), 57-71.

Ogada, D., Shaw, P., Beyers, R. L., Buij, R., Murn, C., Thiollay, J. M., Beale, C. M., Holdo, R. M., Pomeroy, D., Baker, N., Krüger, S. C., Botha, A., Virani, M. Z., Monadjem, A., & Sinclair, A. R. E. (2016). Another continental vulture crisis: Africa's vultures collapsing toward extinction. *Conservation Letters*, *9*(2), 89–97. https://doi.org/10.1111/conl.12182

Ogada, D., Virani, M. Z., Thiollay, J. M., Kendall, C. J., Thomsett, S., Odino, M., Kapila, S., Patel, T., Wairasho, P., Dunn, L., & Shaw, P. (2022). Evidence of widespread declines in Kenya's raptor populations over a 40-year period. *Biological Conservation*, *266*. https://doi.org/10.1016/j.biocon.2021.109361

Ogada, D. L. (2014). The power of poison: Pesticide poisoning of Africa's wildlife. *Annals of the New York Academy of Sciences*, *1322*(1), 1–20. https://doi.org/10.1111/nyas.12405

Oppel, S., Arkumarev, V., Bakari, S., Dobrev, V., Saravia-Mullin, V., Adefolu, S., Sözüer, L. A., Apeverga, P. T., Arslan, Ş., Barshep, Y., Bino, T., Bounas, A., Çetin, T., Dayyoub, M., Dobrev, D., El-Moghrabi, L., ElSafoury, H., Endris, A., … Nikolov, S. C. (2021). Major threats to a migratory raptor vary geographically along the eastern Mediterranean flyway. *Biological Conservation*, *262*. https://doi.org/10.1016/j.biocon.2021.109277

Owolabi, B. A., Odewumi, S. O., & Agbelusi, E. O. (2021a). Stratified analysis of threats pattern of hooded vulture (*Necrosytes monachus*) and palm-nut vulture (*Gypohierax angiogensis*) in South-West Nigeria. *Journal of Research in Forestry, Wildlife and Environment*, *13*(1), 75–84. http://www.ajol.info/index.php/jrfwe

Papp, D. (2008). The illegal trade in wild birds from South-East and Central Europe for food in the EU. *TRAFFIC Bulletin*, *22*(1), 11.

Parker, V. (2001). Mozambique. In L. D. C. Fishpool & M. I. Evans (Eds.), *Important Bird Areas in Africa and associated islands: Priority sites for conservation* (pp. 627–638). Pisces Publications and BirdLife International.

Petersen, S. L., Honig, M., & Nel, D. C. (2008). The impact of longline fisheries on seabirds in the Benguela Current Large Marine Ecosystem. *Collect. Vol. Sci. Pap. ICCAT*, *62*(6).

Pfeiffer, M. B., Venter, J. A., & Downs, C. T. (2015). Identifying anthropogenic threats to Cape Vultures *Gyps coprotheres* using community perceptions in communal farmland, Eastern Cape Province, South Africa. *Bird Conservation International*, *25*(3), 353–365. https://doi.org/10.1017/S0959270914000148

Pinet, P., Salamolard, M., Probst, J. M., Russell, J. C., Jaquemet, S., & le Corre, M. (2009). Barau's petrel *Pterodroma baraui*: History, biology and conservation of an endangered endemic petrel. *Marine Ornithology*, *37*(2), 107–113.

Plaza, P. I., et al. (2020). Implications of bacterial, viral and mycotic microorganisms in vultures for wildlife conservation, ecosystem services and public health. *IBIS*. *162*: 1109-1124. https://doi.org/10.1111/ibi.12865.

Pourchier, C., & Barrios, V. (2022). The story of Sa'a and other examples of the implementation of complementary conservation actions to fight against the illegal killing of vultures in Niger. *Vulture News*, *82*, 31–37. https://doi.org/10.4314/vulnew.v82i1.5

Puzović, S., Ham, I., & Tucakov, M. (2019). Glossy Ibis *Plegadis falcinellus* in Serbia and Neighbouring Balkan Countries. *SIS Conservation*, *1*, 43–49.

Raj, A. P. (2015). Status and conservation of water birds in Panamaram heronry, Kerala and implication for management. *Asian Journal of Conservation Biology*, *4*(1), 76–80.

Reed, T. (2013, December 4). Poisoning claims almost 2 000 vultures in 18 months. *Southern & East African Tourism Update*. https://www.tourismupdate.com/article/poisoning-claims-almost-2-000-vultures-in-18-months

Rocco, M., & Isotti, R. (2006). The Hunting: Italian Country Profile: National Land Pressure, International Hunting Destinations, CITES Species Subjected to Hunting. WWF-Italy Report (unpublished).

Rondeau, G., & Thiollay, J.M. (2004). West African vulture decline. *Vulture news, 51*, 13-33.

Roxburgh, L., & McDougall, R. (2012). Vulture Poisoning Incidents and the Status of Vultures in Zambia and Malawi. *Vulture News*, *62*(1). https://doi.org/10.4314/vulnew.v62i1.3

Rustamov, E. A. (2022). The Great Bustard *Otis tarda tarda* is Critically Endangered in Turkmenistan. *Great Bustard Special Issue*, *19*.

Sabo, B. B., & Mohammed, S. (2022). Population Distribution of Birds of Prey in Hadejia- Nguru Wetlands, Nigeria. *Arid-Zone Journal of Basic & Applied Research*, *1*(5), 62–79. https://doi.org/10.55639/607uoic

Sackey, H. N. K., McNamara, J., Milner-Gulland, E. J., & Ntiamoa-Baidu, Y. (2022). The bushmeat trade in northern Ghana: Market dynamics, drivers of trade and implications for conservation. *Oryx*, *57*(2), 216–227. https://doi.org/10.1017/S0030605322000096

Saidu, Y., & Buij, R. (2013). Traditional medicine trade in vulture parts in northern Nigeria. *Vulture News*, *65*, 4-14. https://doi.org/10.4314/vulnew.v65i1.1

Salamolard, M. (2008). Plan de Conservation du Pétrel de Barau. SEOR/ECOMAR.

Saley Baouna, A. (2023). *Contribution à la mise en place d'un dispositif national de lutte contre la criminalité faunique au Niger: cas des vautours du Niger* [Master's thesis, Universidad Internacional de Andalucía]. http://hdl.handle.net/10334/7924

Shaw, K. A., Waller, L. J., Crawford, R. J. M., & Oosthuizen, W. H. (2012). *Draft Biodiversity Management Plan for the African Penguin Spheniscus demersus*. Government Gazette, *566*(35607), 1–68.

Shialis, T., & Charalambides, M. (2025). *Covering the autumn 2024 findings of BirdLife Cyprus' continuing monitoring programme for illegal bird trapping in Cyprus and providing an overview of the latest developments regarding the problem.* BirdLife Cyprus. https://birdlifecyprus.org/wp-content/uploads/sites/3/2025/02/BirdLife-Cyprus_Autumn_2024_Trapping_report_Final_for-publication.pdf

Simic, D., & Tucakov, M. (2005). Pobijeno 38000 prepelica. *Dvogled*, *5–6*, 6.

Simic, D., Tucakov, M., & Dapic, D. (2003). Initiative for permanent hunting ban of Quail *Coturnix coturnix* and Tutle Dove *Streptopelia turtur* and their inclusion in the List of Natural Rarities. *Ciconia*, *12*, 25–30.

Sivaperuman, C., & Jayson, E. A. (2006). Status and conservation of bird fauna in the Vembanad-Lole Ramsar site, Kerala, India. *Proc. Nat. Conf. on Wetland Biodiversity*, 31–37.

Smit, C., Roos, M., & Rabiee, K. (2009). *Mid-winter census of waterbirds in Mazandaran Province, January 2009*. pp43–152 in: H Amini & M van Roomen (eds). Waterbirds in Iran, January 2009. Results of a mid-winter count in the provinces of Gilan, Mazanderan, Golestan, Fars, Khuzestan, Bushehr, Hormozgan & Sistan Baluchistan. Dept Environment, Islamic Republic of Iran and Foundation Working Group International Waterbird and Wetland Research, Netherlands.

Stara, K., Saravia-Mullin, V., Tsiakiris, R., Adefolu, S., Akyol, A., Akyol, R. İ., Asswad, N. G., Çetin, T., Dayyoub, M., Dushi, G., Ivande, S. T., Kordopatis, P., Kret, E., Özuslu, S., Petrovski, N., Simeonova, I., Spassova, Y., Qaneer, T. E., Pourchier, C., & Nikolov, S. C. (2022). Following the White Vulture: Ethno-ornithology along the Flyway of the Egyptian Vulture (*Neophron percnopterus*). *Human Ecology*, *50*(4), 725–738. https://doi.org/10.1007/s10745-022-00340-6

Steiner, A. (2006). *Illegal hunting and trade in birds in Central Eastern Europe*. WWF.

Su, S., Guetse, F., & Arcilla, N. (2024). A price on their heads? Assessing foreign demand as a driver of hornbill hunting in Cameroon. *Global Ecology and Conservation*, *51*, e02905. https://doi.org/10.1016/j.gecco.2024.e02905

Tamungang, S. A., Cheke, R. A., Mofor, G. Z., Tamungang, R. N., & Oben, F. T. (2014). Conservation concern for the deteriorating geographical range of the grey parrot in Cameroon. *International Journal of Ecology*, *2014*. https://doi.org/10.1155/2014/753294

TRAFFIC, WWF, & Netherlands Ministry of Agriculture, Nature and Food Quality. (2008). The illegal trade in wild birds for food through South-east and Central Europe. https://www.traffic.org/site/assets/files/3754/illegal_trade_wild_birds_for_food_europe.pdf

TRAFFIC. (2021). Bird Incident Data 2005-2019, Incident dataset. *Wildlife Trade Information System*.

Tumulty, L., Fa, J.E., Coad, L., Friant, S., Mbane, J., Thibaut Kamogne, C., Yengo Tata, C., & Ickowitz, A. (2023). A systematic mapping review of links between handling wild meat and zoonotic diseases. *One Health 17,* 100637. https://doi.org/10.1016/j.onehlt.2023.100637

Udoidiong, O. M., & Egwali, E. C. (2018). Life on edge: Environmental disordering and the decline of some avian species in Akwa Ibom State, Nigeria. In *Proceedings of 6th NSCB Biodiversity Conference* (pp. 377–383). Uniuyo.

UN (2019). World Urbanization Prospects 2018: Highlights (ST/ESA/SER.A/421). United Nations, Department of Economic and Social Affairs, Population Division.

UNEP-WCMC. (2021). *West African vultures: a review of trade and sentinel poisoning*. https://cites.org/sites/default/files/eng/com/ac/31/Inf/E-AC31-Inf-10.pdf.

UNEP-WCMC. (2023). *Assessment of the risk posed to CMS Appendix I-listed species by direct use and trade*. UNEP-WCMC. https://www.cms.int/en/document/assessment-risk-posed-cms-appendix-i-listed-species-direct-use-and-trade.

UNEP-WCMC. (2024). *State of the world's migratory species*. UNEP-WCMC. https://www.cms.int/sites/default/files/publication/State%20of%20the%20Worlds%20Migratory%20Species%20report_E.pdf

Waterland, S., Vaughan, J., Lyman, P. E., & Jurisic, D. I. (2015). *Illegal Wildlife Trade Review, Malawi.* Department of National Parks and Wildlife Malawi

Weber, J.-L. (1982). Les comptes de la chasse et de la faune sauvage. *Economie et Statistique*, *147*(1), 75–81. https://doi.org/10.3406/estat.1982.4666

Wildlife Act. (2019, December 31). Vulture Poisoning Dampens Festive Cheer. https://www.wildlifeact.com/blog/vulture-poisoning-dampens-festive-cheer

Williams, E. T. C., Beilfuss, R. D., & Dodman, T. (2003). *Status survey and conservation action plan for the Black Crowned Crane Balearica pavonina*. Wetlands International.

Williams, V. L., Cunningham, A. B., Kemp, A. C., & Bruyns, R. K. (2014). Risks to birds traded for African traditional medicine: a quantitative assessment. *PLoS ONE*, *9*(8), e105397. https://doi.org/10.1371/journal.pone.0105397.

Yong, D.L., Jain, A., Jones, V.R, & Chowdhury, S.U. (2024). *Bird hunting in mainland Southeast Asia: situation analyses and recommendations for conservation action*. BirdLife International, UK.

Zadegan, S. S. (2018). Bujagh National Park (Islamic Republic of Iran). In *The Wetland Book* (pp. 1625–1633). Springer Netherlands. https://doi.org/10.1007/978-94-007-4001-3_234

Zakeyo, P., Makenzi, P., & Chikuni, M. (2018). The status, drivers, and impacts of poaching in Lake Chilwa Biosphere Reserve. http://dx.doi.org/10.25316/IR-14918

7. Annexes.....

Annex 1. Number of project species recorded per country and in total, by data source……

Annex 2. Summary of key information and analyses in relation to the 302 project species from the IUCN Red List, systematic literature review, BirdLife International regional illegal killing of birds reviews, WILDMEAT database, Species Use Database, Wildlife Trade Portal and CMS national reports.....

Annex 3. Compliance analysis of the implementation of protection of CMS Appendix I birds in six African countries: Republic of Congo, Democratic Republic of Congo, Gabon, Madagascar, Zambia and Zimbabwe (full report)…….

Annex 4. Systematic online review search results for each species including associated search terms (Excel spreadsheet)……

Annex 5. Datasets for each source of data for project species (systematic review - with associated data on hunting type, offtake, impacts and drivers, Red List assessments, regional IKB review combined dataset, TRAFFIC Wildlife Trade Portal and CMS reports to COP13 and COP14) (Excel spreadsheet)…….

Annex 6. Mendeley data file of references collated in the systematic review (Mendeley file)……..

Annex 1. Number of project species recorded per country and in total, by data source. Countries highlighted yellow are unique to that data source.

Data source:	Systematic review (including SpUD) record(s)	Regional IKB reviews record(s)	WILDMEAT database record(s)
Countries recording consumption of project species:	Afghanistan	Albania	Gabon
	Algeria	Algeria	
	Angola	Armenia	
	Benin	Austria	
	Burkina Faso	Azerbaijan	
	Burundi	Bahrain	
	Cabo Verde	Belarus	
	Cameroon	Belgium	
	Chad	Bosnia and Herzegovina	
	Croatia	Bulgaria	
	Cyprus	Croatia	
	DR Congo	Cyprus	
	Ethiopia	Egypt	
	France	Estonia	
	Ghana	Faroe Islands	
	Greece	Finland	
	Guinea-Bissau	France	
	Iceland	Georgia	
	India	Germany	
	Iran (Islamic Republic of)	Greece	
	Iraq	Iceland	
	Italy	Iran (Islamic Republic of)	
	Kazakhstan	Iraq	
	Kenya	Italy	
	Lesotho	Jordan	
	Madagascar	Kuwait	
	Morocco	Lebanon	
	Mozambique	Libya	
	Nepal	Lithuania	
	Niger	Malta	
	Nigeria	Montenegro	
	Pakistan	Morocco	
	Palestine (State of)	Netherlands (Kingdom of the)	
	Rwanda	North Macedonia	
	Senegal	Norway	
	Somalia	Oman	
	South Africa	Palestine (State of)	
	Tanzania	Poland	
	Uganda	Portugal	
	UK	Qatar	
	United Arab Emirates	Romania	

	Zambia Zimbabwe	Serbia Slovakia Slovenia Spain Sweden Syrian Arab Republic Tunisia Türkiye Ukraine United Arab Emirates Yemen	
No. countries per data source:	43	52	1
*No. unique countries:	31	40	1
Total no. countries from all data sources:	84		