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DECISION 13.140: DEFINITION OF THE TERMS "RANGE STATE" AND "VAGRANT"

(Prepared by the Joint Nature Conservation Committee, United Kingdom; submitted by the COP-appointed Councillor for Climate Change)

Summary:

The aim of this document is to supplement the discussion points in UNEP/CMS/ScC-SC5/Doc.7 to aid review/discussion of that document by the Sessional Committee of Decision 13.140: Definition of the Terms "Range State" and "Vagrant". The decision seeks practical guidance for CMS Parties, through interpretations of when the terms 'Range State' and 'vagrant' apply.

This document provides information about how vagrant and Range State are currently defined. It also discusses factors that may influence a decision on whether a species is a vagrant and includes a decision tree to aid Parties in determining if they may be a Range State for a species. The document is provided for review by the Scientific Council.

DECISION 13.140: DEFINITION OF THE TERMS "RANGE STATE" AND "VAGRANT"

Background

1. The Convention recognised a need to provide better guidance on how to establish whether or not a Party should be considered a Range State for a species at COP13 and addressed this with Decision 13.140: Definition of the Terms "Range State" and "Vagrant". The decision is as follows:

   'The Scientific Council, subject to the availability of resources, is requested to:

   a) *develop, as practical guidance for CMS Parties, interpretations for when the terms 'Range State' and 'vagrant' apply;*

   b) *report to the Conference of the Parties at its 14th meeting on the progress in implementing this Decision.'*

2. The text of the Convention provides definitions for the terms Range State and Range. These are in Article 1 h) and f), defining the terms "Range State"[1] and "Range"[2] as:

   '"Range State" in relation to a particular migratory species means any State (and where appropriate any other Party referred to under subparagraph (k) of this paragraph) that exercises jurisdiction over any part of the range of that migratory species, or a State, flag vessels of which are engaged outside national jurisdictional limits in taking that migratory species.'

   '*"Range" means all the areas of land or water that a migratory species inhabits, stays in temporarily, crosses or overflies at any time on its normal migration route.'*

   The separate definitions of Range and Range State in the Convention can cause confusion as the definition here of Range does not equate to Range State but it may be assumed to do so.

3. Resolution 13.7[3] Guidelines for preparing and assessing proposals for the amendment of the CMS Appendices, operational paragraph 6 states:

   'Adopts the guideline that when a significant proportion of a geographically separate population of a migratory species occasionally occurs in its territory, that State should be considered a Range State'.

4. The issue being tackled in this document is that, whilst some flexibility in how the terms can be interpreted is important in providing opportunity for Parties to implement the Convention according to national circumstances, more clarity is needed to help Parties decide whether they are a Range State for a species or if the species is a vagrant in their country. Given that being a Range State for a species carries obligations under the Convention, it is important that Parties understand whether they have those obligations for a particular species or not. Clear interpretations of both vagrancy and Range States are therefore needed to overcome such uncertainty and help Parties understand when they could or should be undertaking conservation action to maintain or improve the status of a species. The two terms will be mutually exclusive for a species and the difficulty is prevalent in cases where there is a fine line when distinguishing which of the terms is appropriate in a particular case.

[1] Article 1 h) https://www.cms.int/en/convention-text

[2] Article 1 f) https://www.cms.int/en/convention-text

[3] https://www.cms.int/sites/default/files/document/cms_cop13_res.13.7_guidelines-assessment-listing-proposals_e.pdf

Flagged Vessels

5. The definition of 'Range State' in Article 1 h) of the Convention includes reference both to the jurisdiction of a Party, and to 'flag vessels' of a State. The issue of how flagged vessels may affect Range State status also needs to be considered carefully in terms of their potential impact on species, and whether they are operating in waters under the jurisdiction of another country (which may or may not be a Party to the Convention), or in areas beyond national jurisdiction. One way of looking at this is that Parties would automatically be a range state if they caught a species in any areas which are part of the species range, but their responsibilities would be linked to their jurisdiction: if the area was outside of their jurisdiction then their responsibilities would be to put in place measures to limit the risk of take, whereas if the area was within their jurisdiction their responsibilities would be to limit the risk of take and to put in place conservation measures.

6. Considering the issues in more depth, it seems that three cases may arise:

   a. Firstly, when State A catches a listed species in the waters of State B, whose definition of Range State applies? In this case, both State A and State B are Range States to the same species: State A according to the second part of the definition (flag vessel) and State B according to the first part (jurisdiction on the range). The two might however have different responsibilities in relation to the caught species: for example, if the caught species is on App. I, State A should have responsibility to put in place measures to avoid or limit the risk of taking by its flag vessels (e.g. by regulating the use of fishing gear (e.g. use of Turtle Excluder Devices, smart hooks,…), imposing the presence of observers on board, …); while State B would *also* have responsibilities in relation to regulation of fishing activities, conservation of the habitat, enforcement of regulations, etc.

   b. Secondly, when a flagged vessel catches a species in the open ocean, at what point does the boundary shift from range to vagrant if there is no Range State responsible for those waters? In this case, the point raised above on the different definition of "Range State" and "range" might come into play. According to the Convention, the range of a species is determined by its geographic distribution as per Art. 1 f), not by its Range States. The normal range of a number of CMS-listed species extend to Areas Beyond National Jurisdiction (ABNJ). However, if a flag vessel of state A catches a species in ABNJ, state A should be considered a Range State to the species, with the responsibilities that this implies in relation to taking. A limit case could be that of a flag vessel catching a species in an area outside of the species normal range, i.e. where the species would normally be considered a vagrant. Care is needed to avoid a 'get-out' clause for a non-directed take which could increase the pressures the species faces.

   c. Thirdly, where a flagged vessel from a Party to the Convention catches a listed species in the waters of a country that is *not* a Party to the Convention. In that case, the argument would depend on whether the relevant area was part of the normal range of a species or not. So, it could be equivalent to either of the first or second cases above.

Current definitions

7. "*Range State*" is defined in the Convention's text, as outlined above, yet "*vagrant*" is not currently defined in CMS documentation. An important practical aspect seems to be the distinction between: does a Party have a duty under CMS to protect the species i.e. add it to their list of species afforded legal protection, and, does a Party have sufficient part of the biogeographic population such that habitat management programmes within the Party's jurisdiction would benefit the species. Given this, it may be useful to establish a definition of vagrant to help reduce the grey area between the two terms based on existing scientific definitions. Scientific literature, field guides and international wildlife organisations often give a definition of "vagrant" that involves the use of terms like "*extralimital species*", "*recorded outside their long-term average range*" and "*outside of their recognised breeding ranges*"(Bloom *et al.*,

2011; Jayadevan, Jayapal and Pittie, 2019). The combination of these terms from multiple definitions give a more universal picture of what vagrant means, yet there is often contradiction between them, for example whether the species being outside where it breeds is included.

8. Both the IUCN and Birdlife International use the definition "*The species is/was recorded once or sporadically, but it is known not to be native to the area*". This definition, although common to two international organisations, does not give any indication of the point that a species is no longer a vagrant because it could be occurring more regularly. With the onset of climate change, a vagrant may become more established in a country if its range shifts but may not qualify for protection under a Range State if this definition were to be used for CMS.

9. Existing definitions can be further complicated by being taxon- and/or country-specific. For marine species, international working groups have also identified a need to define vagrant (Pederson *et al.*, 2008), and Howell *et al.* (2014) confirmed that there was "no precise definition for vagrant birds". The term "vagrant" is commonly used in bird field guides, where it is often synonymous with "rare visitor" (Gerbracht and Levesque, 2019).

10. Definitions for the term vagrant can be very specific within bird field guides and checklists, for the West Indies Gerbracht and Levesque (2019) define it as "*A species that occurs in extremely low densities or is a rare visitor or vagrant to the region (individuals present on average less than once every 5 years).* Similarly, Praveen *et al*. (2019) uses the definition "*An extralimital species, migratory or otherwise, that has been reliably reported fewer than ten times from India*". Ralph and Wolfe (2018) use the definition "*birds found outside their typical range*" and when applying it practically to their own capture data on warblers in California and Oregon, they defined vagrant as "*a species that was detected at least once, and with a maximum of a total of 500 records, over a 36 year period*". This shows that again specificity can be used in defining vagrancy for a particular species and geographic location. These bird-specific definitions reflect the low numbers of individuals characteristic of vagrants yet differ between countries, which may reflect the size of the country.

11. Definitions of vagrant used in the context of other taxa are few and far between. However, King and Forsyth (2021) in the context of New Zealand mammals describe a vagrant as "*Includes both non-breeding colonies as well as occasional visitors*" and an IUCN report on Marine Mammals and Sea Turtles of the Mediterranean and Black Seas[4] used "*Rare and unexpected ones that do not occur annually*" for vagrant species. According to Bundone *et al*. (2019), seals are considered vagrants when "*occasional seal sightings but no births were recorded and/or the actual use of the habitat is not properly known*". These definitions again include words like "*rare*", "*occasional*" or "*unexpected*" and "*visitor*", the meanings of which are represented throughout the definitions outlined above and the seal-specific definition highlights the importance of the use of habitat in the characterisation of vagrancy.

<u>Establishing the spatial / temporal nature of species migrations</u>

12. Interpretation of Range State status and vagrancy should address the spatial and temporal characteristics of a species' migration pattern. The number of times a species cyclically and predictably occurs in a country within a (recent) specified period, as well as the proportion of the overall species population are likely to be key characteristics in distinguishing vagrancy from Range State status, but it may be difficult to assign strict numerical thresholds to a boundary between Range State status and vagrancy. Therefore, some understanding that a low number of individuals and being in a location outside its long-term average range is characteristic of a vagrant, may be sufficient to give a first indication of a species' status.

[4] https://www.iucn.org/sites/dev/files/import/downloads/iucn_med_2012_marine_mammals___sea_turtles_def.pdf

13. Putting numerical thresholds in this guidance could be problematic for several reasons, such as the variability in species migratory patterns. Species migrations can range from being regular and directed movements, known as obligate migrations, to being less predictable and nomadic (Watts *et al.*, 2018). Nomadic species can have very irregular movements and have large, temporary range expansions or contractions often driven by resource availability (Runge *et al.*, 2015).

Variability in migrations

14. Migrations are also variable between individuals of a species' population. For example, differences in annual schedules sometimes exist between geographically separate populations of the same species, as well as between sex and age groups (Newton, 2011). Partial migration has also been documented in many species, including invertebrates, birds and mammals, where individuals in a population may display both migratory and resident behaviour (Hegemann, Fudickar and Nilsson, 2019).

15. Migrations can vary considerably between taxa in how they may use space at different times of their annual cycles. This becomes relevant to Range State status when there is a need to anticipate the importance of geographic areas for different species migrations, the threats that may prevent their occurrence and the timing of their appearance. Variability between taxa may need to be considered when determining if a Party is a Range State for a particular species. These issues may also vary between ecosystems.

    a. Marine
    Marine taxa are often very wide-ranging, but also have critical habitat. For example, the pygmy right whale (*Caperea marginata*) is susceptible to shipping strikes since the increase in oceanic traffic means increased likelihood of shipping lanes being in the whale's habitat beyond the edge of continental shelves[5].

    b. Freshwater
    Spawning and nursery areas and the connectivity between the two are vital for freshwater migrants e,g. the Mekong giant catfish (*Pangasianodon gigas*) (Hogan *et al.*, 2004). Some species, such as European eel (*Anguilla anguilla*) and Atlantic salmon (*Salmo salar*), are anadromous, using both freshwater and marine habitats in different parts of their lifecycle, and need connectivity between these ecosystems and therefore Range States, to be maintained to be able to reproduce successfully.

    c. Air
    Taxa that migrate in air may have long distance migrations and to ensure their survival may coordinate their timing with the availability of their food sources along their routes. For example, Monarch butterflies' (*Danaus plexippus*) migrations track the blooming of milkweed plants and have spread throughout the Pacific where these plants grow (Oberhauser and Solensky, 2004).

    d. Terrestrial
    Terrestrial species may be wide-ranging and appear in different countries depending on resource availability. Blue wildebeest (*Connochaetes taurinus*) are largely driven in their migrations by soil fertility and rainfall gradients (Hopcraft *et al.*, 2014). Therefore, they may appear in different countries within the Serengeti Mara ecosystem at different times of the year depending on these environmental factors to best exploit resources like new forage growth (Boone, Thirgood and Hopcraft, 2006).

[5] https://www.cms.int/sites/default/files/document/I_5_II_5_Caperea_marginata_AUS.pdf

16. It is possible that a Party may be a Range State now, but due to species' declines or changes in migration patterns, may not be a Range State in the future. Conversely, a Party may not be a Range State now, but could become so in the future. These scenarios (remaining or becoming a Range State) may well require different evidence or considerations by Parties – such as the length of time between observations of a species occurrence. Changes in species ranges are increasingly likely to be driven by changes in environmental conditions caused by climate change but can also be due to land use change and therefore habitat loss. Hockey *et al*. (2011) could not attribute range changes in South African birds to either climate change or land use change and instead concluded that both may be simultaneously affecting their ranges. Whilst others have seen drastic shifts clearly owing to climate change, like Hovick *et al*. (2016), who found that within a dataset of North American breeding birds, short-distance migrants had shifted their range poleward by an average of 86 km, as a result of changes in environmental conditions caused by climate change.

17. Species can also be variable in their occurrence in a country depending on food resources, which can be triggered by harsh climatic conditions. An example of a species in which this occurs is the waxwing *(Bombycilla garrulus)*, which may migrate to Great Britain in large numbers during winter months in the northern hemisphere. Such 'irruptive migrations' will only occur in years where crops of berries are inadequate in their breeding grounds. Since appearances like these can be predicted, Parties may be able to take action to aid the migratory population's survival. Therefore, in these cases Parties can be considered Range States.

18. Given the variable nature of species migrations between taxa, populations and individuals, the difficulty in conserving migratory species and that species' migratory patterns may undergo drastic changes due to habitat loss or climate change, a Party may wish to be conservative and consider itself a Range State where these factors are at play.

Climate Change

19. Guidance on Range States should allow flexibility for anticipated changes in species' ranges with climate change. Document ScC-SC5/6.4.5 provides more information about potential range shifts due to climate change. Climate change is already causing dramatic changes to ecosystems across the world (Wassmann *et al.*, 2011; Hughes *et al.*, 2018) and changes in environmental conditions, unfavourable for many species, are projected to continue (IPCC, 2019). Some species may be able to adapt to such changes by shifting their ranges (Taylor and Figueira, 2021). However, migratory species could be particularly vulnerable as they have multiple sites important for a species' annual cycle and threats or changes to these sites can affect an entire population (Runge *et al.*, 2014). They can even experience "*multiple jeopardy*" if there is a reliance on multiple sites under threat during their cycle (Gilroy *et al.*, 2016). Studies have also found changes in migratory phenology to be associated with climate change, which could lead to mismatches between migration timings and seasonal productivity timings, threatening the survivability of migrants (Robinson *et al.*, 2009; Bauer *et al.*, 2019). Migratory species that travel long distances between feeding and breeding or that are unable to adapt quickly enough would be particularly vulnerable to these timing mismatches (Learmonth *et al.*, 2006). For example, a dramatic decline in pied flycatcher *Ficedula hypoleuca* populations has occurred due to being unable to advance their spring migrations to coincide with insect prey hatching earlier in northern latitudes (Horns and Şekercioğlu, 2018).

20. In ecology, the role of a vagrant is important in establishing subpopulations and often arises from weather disturbances (Bloom *et al.*, 2011). Vagrancy is expected to increase with the escalation of climate change (Jiguet and Barbet-Massin, 2013). These individuals are believed to be valuable for the survival of a species through expanding its range in order to adapt to changing conditions with climate change (Bloom *et al.*, 2011). Scientists are increasingly seeing vagrants as "climate refugees" and as a natural part of species' evolution (Davis and Watson, 2018). One example of vagrants establishing populations due to climate change is

four individual vagrant polar bears (*Ursus maritimus*) that have reached Iceland. They have relatively high genetic variability, although the longevity of the population will be at risk without connectivity and gene flow (Kutschera *et al.*, 2016).

Native and non-native species

21. Gilroy *et al*. (2017) highlight that the term "*native*" has also led to ambiguous wording in legislation, while "*non-native*" is often used by authorities to describe a species that, like a vagrant, is beyond their normal range. Therefore, in the past where a species has arrived in a country as a "*non-native*", authorities may automatically assume its presence may be detrimental to the local biodiversity or invasive and destroy/eradicate it before it can establish a population. However, as climate change ensues and species' ranges undergo dramatic shifts, human ideas of native and non-native biodiversity may no longer reflect the changing world. Gilroy *et al*. (2017) advocate that there should be a distinction between invasive species that may have been assisted into a country and a species that has arrived naturally or unassisted (including through anthropogenic climate change). Governments may need to consider carefully how to treat species that are climate refugees. Guidance that allows Parties to adopt Range State status under the Convention where vagrants may in future establish a population, should therefore be necessary to ensure the world's biodiversity is protected.

Historical range and reintroductions

22. A Party may also wish to consider that if a species once had its historical range in the country and may have since become locally extinct, the Party may still have suitable habitat for recolonisation of the species and it could benefit from the provisions of the Convention. The Party will also need to consider whether a reintroduction could be detrimental to status of other established species in the country. This decision may also be further weighted by the IUCN status of the species and if the country would likely be able to provide conservation benefits to the species. For example, the saiga (*Saiga tatarica*), a critically endangered species, once had its historical range throughout north-west China, yet was extirpated in the mid-20th century (Cui *et al.*, 2017). China has since established a captive population and reintroductions are planned (Cui *et al*., 2017). Cui *et al*. 2017 evaluated areas that may be suitable for reintroduction and concluded that China had potential to provide peripheral habitats for current saiga populations.

23. Conversely, a species may have a historic range in the country but it may be unlikely that the species will return and become established without significant conservation effort and cost. It may therefore not be a viable use of resources to commit to such cases where conservation success looks unlikely. An example is the Range State status of the United Kingdom (UK) for Atlantic Sturgeon (*Acipenser sturio*). This sturgeon was once found in the seas around the UK and was widespread across European coasts (Williot *et al.*, 2002). The species is now critically endangered and according to the IUCN its global distribution is now restricted to the Garonne River in France. The JNCC in its 2019 Habitat Directives Report[6] classified this sturgeon species as a vagrant and their data was largely deficient in is occurrence in the UK, which reflects its rarity. Without expansion of the species beyond its current range, the UK is unlikely to become a Range State again.

24. Reintroductions, translocation, or re-establishment of a population pose other challenges for Range State status. Decisions on these processes need careful deliberation, as the process can be very complex and expensive. The IUCN guidelines[7] provide an important set of principles for Parties to consider. Where a species has been historically the subject of a successful reintroduction the country involved would logically now be a Range State. However, if starting anew, there are important issues to resolve on when a species reintroduction should

[6] https://jncc.gov.uk/our-work/article-17-habitats-directive-report-2019-species/#vagrant-species-vagrant-vertebrate-species-fish

[7] https://www.iucn.org/content/guidelines-reintroductions-and-other-conservation-translocations

be considered to be complete – perhaps only after a population has become self-sustaining for a period of years should the country be considered a Range State again. Note there is a distinction here between provision of legal protection of a species while it is being established, and a decision on Range State Status.

Case by case considerations

25. Guidance should reflect the flexibility needed to assess Range State or vagrancy status on a case by case basis according to species and Party circumstances.

26. Case by case flexibility may also be needed to allow for differences in species-specific ecological needs. These needs may involve a species' affinity to a certain area or its migratory range characteristics. For example, species like marine turtles that are highly mobile and traverse vast areas in search of food (Lohman, Luschi and Hays, 2008), may be more likely to end up in the jurisdiction of multiple countries in a less predictable manner. Parties that have unclear evidence for the presence of a species in their jurisdiction, may therefore still have Range State status. Similarly, a larger body mass and a carnivorous diet are indicators that species will have larger home-range sizes (Namgail *et al.*, 2014) and therefore more consideration around the Range State issue may be needed for big cats, like the jaguar and other large mammals.

27. A more precautionary stance may also be needed for a species depending whether it or its subpopulations are under threat. For example, a Critically Endangered species on the IUCN Red List could be considered to have Range State status in countries where it may only possibly be present or appear occasionally and unpredictably, but where it could benefit from conservation action. One example of this is the Asiatic cheetah *Acinonyx jubatus venaticus,* which is critically endangered with fewer than 50 individuals in Iran (Parchizadeh *et al.*, 2018). There is uncertainty around its presence in Pakistan, however the fact that it is highly vulnerable to extinction and a wide ranging mammal makes a stronger case for Pakistan to be a Range state (Farhadinia *et al.*, 2017).

28. Taxonomy should also be considered in the guidance of being a Range State. It is important to take note of the distribution and conservation status of subspecies relative to the species as a whole. For example, the black noddy (*Anous minutus*) is a species of Least Concern according to the IUCN[8]. However, the subspecies *worcesteri*, restricted to the Philippines, Malaysia and Indonesia, is classified as Endangered. Therefore, despite a large geographic area being within the range of the entire species, the countries that should be considering Range State status are only those important to the conservation of the more endangered subspecies.

Data to underpin determination of Range Status

29. A key part of a Party's decision on Range State status will be the evidence available; including how recent species observations are, how predictably a species occurs, and how reliable the records are. Decisions may need to be taken on a precautionary basis, or on balance from multiple data sources.

30. Available scientific data on a species range may be biased towards collection for particular study purpose(s), and species distribution data may be more reliable in some areas than others due to the existence of relevant monitoring or surveillance schemes. Recent distribution data may also not be available for all species or taken at sufficiently regular intervals to know how often a species occurs in an area within a given period.

[8] https://www.iucnredlist.org/species/22694799/163885644

31. Some taxa may be more difficult to survey. Monitoring of marine species is more difficult than their terrestrial counterparts due to the costly, time-consuming and often site-specific observational monitoring (Danovaro *et al.*, 2016). Technologies that may help collect more data on a larger scale in terrestrial landscapes are limited in marine, for example satellite imaging has a restricted use to shallow water habitats (Kenny *et al.*, 2003). In a report on cetaceans of the Red Sea, the dwarf sperm whale (*Koiga sima*) is suspected as a vagrant but the uncertainty is due to "*the difficulty of sighting the animals at sea, combined with a lack of expert monitoring in the area*"(Notarbartolo di Sciara *et al.*, 2017). The data deficiency and uncertainty of vagrant status for some species may be solved through developing technology and improving science.

32. Science and technology are continually developing to offer an increased understanding of species' migrations. Recent and developing monitoring techniques may be useful in detecting rare species and could help to better determine whether a species is a vagrant. A non-exhaustive list of examples of advances in species monitoring and data sharing is provided below.

    a. Remote sensing, GIS and species distribution models
    Developments in GIS technology and remotely sensed data capabilities have improved species distribution modelling and the ability to identify species from space (Parviainen *et al.*, 2013; Cubaynes *et al.*, 2019). These species distribution models could allow for better predictions on where species are currently occurring and migrating (Su *et al.*, 2018). Remotely sensed data and GIS tools are also widely employed in the consideration of changes in habitat available for use by species with specific requirements (Kushwaha and Roy, 2002).

    b. eDNA
    eDNA involves high-throughput sequencing of DNA from environmental samples (water, soil or sediment) to detect species abundances and diversity in an area (Stephenson, 2020). eDNA techniques are now being used across terrestrial, freshwater and marine habitats, with more recent studies showing that seawater samples can be effective in detecting fish (Thomsen and Willerslev, 2015). For example, Nguyen *et al*. (2020) recently used an eDNA survey to successfully identify biodiversity patterns across a tropical seascape with multiple habitats in a Caribbean bay.

    c. Acoustic technology
    Acoustic recording equipment has also greatly improved to identify the presence of vocal species such as bats through echolocation signals and are used in monitoring migration flyways for birds (Sanders and Mennill, 2014; Brown and Rainey, 2018). Brown and Rainey (2018) highlighted that if used more extensively to document species, "*the proportions that are resident, vagrant, or transient on each island can be better resolved*", which is true of each technological advancement in species monitoring and increased data sharing.

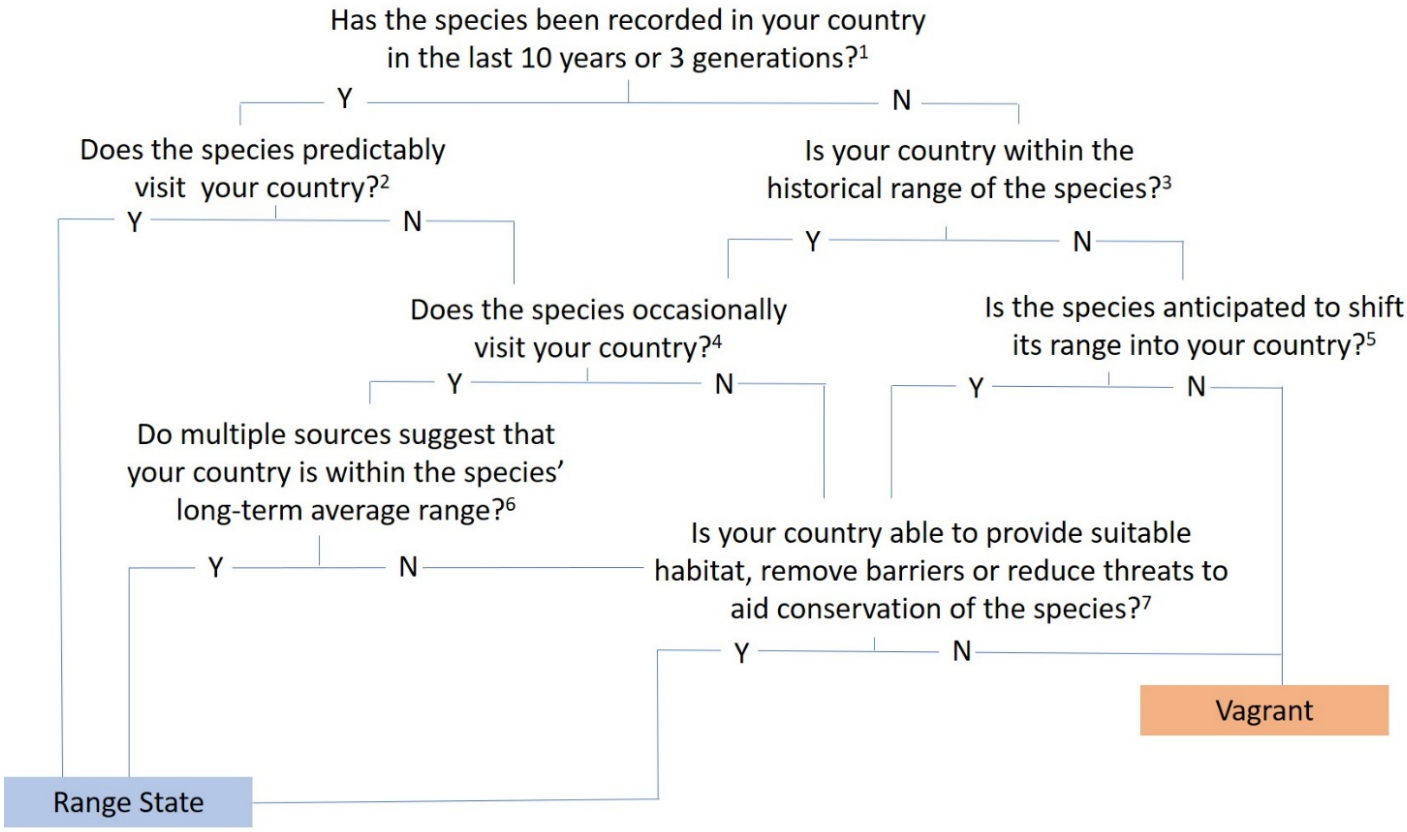
    d. Air taxa tracking technology
    Increased quantities and quality of data on species migrations are also becoming more widely available with technology such as radar that can monitor the usage of flyways (Hüppop *et al.*, 2019). Geolocators have been increasingly used to track species migrations and are less detrimental to smaller species than other tracking devices through being small and light, yet there are still concerns they may affect the animal when attached (Arlt, Low and Pärt, 2013). Further improvements to such technology and also ethical improvements for considerations of the welfare of studied animals, should allow for more data collection. This will enable a better understanding of where species are and where they spend their time relative to States that are a part of the Convention. Techniques like these can be combined with statistical models like network analyses that can reveal important sites and umbrella species, enabling targeted and efficient conservation action (Lamb *et al.*, 2019).

e. Global databases and increased data sharing

More open access online global databases and resources (see Appendix), providing access to current and historical occurrence data can facilitate analyses and easy data sharing. Databases that are maintained by experts but have data collected through citizen science are becoming more common for a range of taxa and many are commonly used in peer reviewed data papers, such as eBird (Chandler *et al.*, 2017; Johnston *et al.*, 2020). There is an increasing abundance of quality data available to verify the rarity of a species occurrence.

Decision Tree

The decision tree below is proposed as guidance for Parties when they are making decisions on whether they are a Range State for a species. This decision tree does not address issues around flag vessel status, which would require further considerations. Guidance for interpreting each stage of the tree is also provided below.



Notes on answering the questions in the Decision Tree:

[1] Recording can be any sighting that has been verified by experts.

[2] According to Resolution 13.7[9] paragraph 3 (ii) of the Guidelines for preparing and assessing proposals for the amendment of the CMS Appendices, "*Predictably*" implies:

> '*a phenomenon can be anticipated to recur in a given set of circumstances, though not necessarily regularly in time*'

[3] Historical range is difficult to define, in part because it is not clear what timescale should be considered, but could be either where a species was native or where it regularly visited.

[4] Occasionally would mean a species is unpredictably visiting the country and / or is very rarely recorded.

[5] Climate change may make habitat in your country suitable for a species. The species could also be under threat in its normal range, making a shift to your country more likely. You should therefore

[9] https://www.cms.int/sites/default/files/document/cms_cop13_res.13.7_guidelines-assessment-listing-proposals_e.pdf

consider if there have been scientific studies predicting a shift of the species range into your country, for example within the next decade.

[6] Multiple sources could be field guides, online data collections, local sightings or knowledge, scientific literature. Long-term average range would refer to the belief of the sources for a species to occur in that geographic area over a number of decades.

[7] Would your country be able to provide any management actions needed to make a difference to the conservation of the species?

Discussion and analysis

33. Definitions for vagrancy are often country and taxon-specific; while some international organisations use the same definition, others are different. The adoption of a definition for vagrant by the convention may help in guidance for Parties being a Range State. The definition would need to work across taxa, geographic locations and be clear. Overall, in current definitions, there are common words or phrases that convey vagrants to be rare “visitors” to a country, they are outside their normal geographic range and their appearance is often irregular. These are therefore some of the key aspects that should be covered in a definition.

34. However, as outlined above, flexibility is needed for individual species on a case-by-case basis due to the variable nature of species migrations, especially during a time when climate change is expected to alter species distributions worldwide. Flexibility is also needed in regard to individual species’ and Parties’ needs.

35. Keeping informed on advances in species monitoring and data sharing is recommended to allow for more accurate estimations on the true spatial extents of species’ migrations. This will aid in making informed decisions on distinguishing vagrants from migrants.

36. The decision tree proposed above allows potential characteristics of Range State status and vagrancy to be balanced against each other in circumstances that will differ between species and in different national circumstances.

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Appendix: Online global data repositories and resources on species distributions

N.B. This list is not exhaustive but is to help in finding evidence for current information on species ranges.

Online species records

Species+

- Data portal holding information on species listed on both CITES and CMS.
- Provides information on species' taxonomy, legislation, distribution.

URL: https://speciesplus.net/species

IUCN Red List

- Recognised guide to species conservation status.
- Provides information on range, population size, habitat and ecology, use and/or trade, threats, and conservation actions that will help inform necessary conservation decisions.

URL: https://www.iucnredlist.org/

Global repositories of occurrence data

GBIF

- Global biodiversity data repository (all species).
- Species occurrence records.
- Open access data.

URL: https://www.gbif.org/

OBIS

- Marine biodiversity global data repository.
- Data is quality checked.
- Unrestricted free access to data.

URL: https://obis.org/

MICO

- Marine migratory species data.
- Contains information on geographic areas used by species, migratory cycle stage, population and network models describing the parts of a species migratory cycle.

URL: https://mico.eco/system

eBird

- Global bird occurrence data.
- Data collected through birders globally using app.
- Managed by the Cornell Lab of Ornithology and anomalies reviewed by regional experts.

URL: https://ebird.org/home

FishBase

- Data in FishBase are entered, modified, or checked by FishBase staff and collaborators.
- Contains data on distributions, descriptions and biology of the species.

URL: https://www.fishbase.se/search.php

BirdLife International

- Global bird species distribution data.
- Also provides information on taxonomy, population and red list status.

URL: http://datazone.birdlife.org/home

Global databases for camera trap data

Wildlife insights

- Global repository for camera trap data.
- Uses artificial intelligence to detect and identify species in images.
- Provides summary statics and able to export data.

URL: https://www.wildlifeinsights.org/home

eMammal

- Data repository for mammal camera trap data.
- Uses algorithm and crowd source ID.
- Experts ID and confirm species.

URL: https://emammal.si.edu/

Global databases for acoustics data

Arbimon

- Bio-acoustics analysis platform.
- Able to detect species with pattern matching and machine learning.

URL: https://arbimon.rfcx.org/

Xeno-canto

- Allows global sharing of bird sounds
- Forums to help identify species

URL: https://www.xeno-canto.org/

Macaulay Library

- Scientific archive of natural history audio, video and photographs
- As well as birds, includes amphibians, fish and mammals.

URL: https://www.macaulaylibrary.org/