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ECOLOGICAL NETWORKS: A DRAFT STRATEGIC REVIEW OF ASPECTS RELATING TO MIGRATORY SPECIES

Summary:

At COP10 Parties requested the Scientific Council to produce a strategic review on ecological networks, including recommendations, in order to better guide decision-making on this subject at COP11 (Resolution 10.3, paragraph 9). The draft document presented here has been produced by an external consultant in close consultation with the Secretariat thanks to a voluntary contribution from Norway.

The strategic review will be finalized following discussions at the 18th Meeting of the Scientific Council and be presented to Parties at COP11. A draft Resolution which is foreseen to endorse the recommendations of the strategic review can be found in document UNEP/CMS/ScC18/Doc.10.3.

ECOLOGICAL NETWORKS: A DRAFT STRATEGIC REVIEW OF ASPECTS RELATING TO MIGRATORY SPECIES

(Prepared by the Secretariat)

1. Ecological networks were one of the priority policy items considered by Parties at COP10, as outlined in UNEP/CMS/ScC18/Doc.10.3. In Resolution 10.3 on ecological networks, Parties tasked the Scientific Council to produce a strategic review in the intersessional period, in consultation with the Secretariat and other relevant organizations and key stakeholders.

2. The draft strategic review attached to this note has been prepared at the request of the Secretariat by Mr. Dave Pritchard under consultancy, thanks to financial support gratefully received from the Government of Norway, the host country of COP10. The strategic review and its recommendations, which are due to be adopted at COP11 as part of a Resolution (see UNEP/CMS/ScC18/Doc.10.3), are intended to provide Parties with a thorough review of the complex matter of policy relating to ecological networks and its implementation. Ultimately, together with the tabled case studies (UNEP/CMS/ScC18/Inf.10.3.1), the strategic review is foreseen to provide Parties with a roadmap for action on ecological networks for the 2015-2017 intersessional period.

3. At the eighteenth Meeting of the Scientific Council only a preliminary draft of the strategic review is available. Those parts which mostly require input from the Scientific Council and other relevant stakeholders are highlighted in yellow. An oral presentation will illustrate the content and highlight the outstanding parts of the review in order to facilitate the debate. In particular, the section on "further work required" (pages 36 onwards) will be discussed. This will permit the members and observers to carefully review and shape the final strategic review, which will be tabled at COP11.

Action requested:

The Scientific Council is invited to:

(a) Consider the draft strategic review, and provide guidance towards its further development and finalization as appropriate.

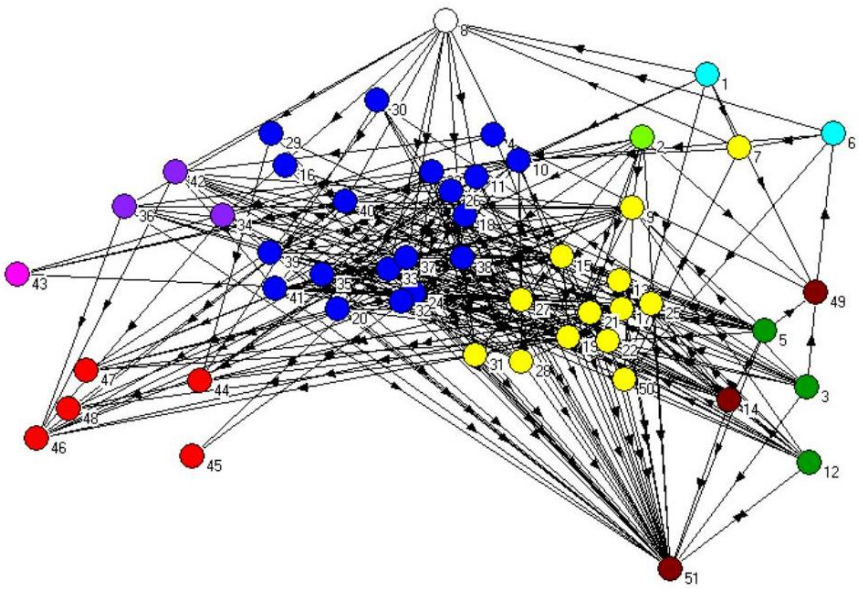
Convention on Migratory Species

Ecological networks - a strategic review of aspects relating to migratory species

CONSULTANT REPORT

Dave Pritchard

2nd Draft, 28 May 2014



Ecological networks - a strategic review of aspects relating to migratory species

Contents

Summary

[To add]

1. Background and purpose of this review

1.1 The mobile nature of migratory animals requires conservation efforts to be coordinated internationally across multiple locations. Connectedness and spatial distribution factors are crucial. This was a central theme of the 10th Meeting of the Conference of the Parties to the Convention on Migratory Species in 2011, which adopted a landmark Resolution (Res. 10.3) on "the role of ecological networks in the conservation of migratory species"[1,2].

1.2 The Resolution noted that habitat fragmentation is one of the main threats to migratory species; and it reaffirmed both the paramount importance of conserving habitats with appropriate distribution and connectivity, and the fundamental dependence of such efforts on effective international cooperation. Ecological networks are described in terms of strategies for conceptually and functionally linking sites with each other and with wider systems. Dispersal, genetic exchange and resilience to change (including climate change)[3] are implicated in this, as well as the animals' normal cycles of migration.

1.3 Although the text of the Convention specifies several measures relating to habitat conservation for migratory species, the CMS is often perceived as primarily concerned with population management and other more species-based approaches. The development of a cogent agenda on ecological networks is helping to position the Convention more strongly in relation to the habitat and ecosystem-based strategies that were always part of its mandate but not always so prominent. This may be particularly significant in relation to cooperation with other Conventions and international processes that work routinely with systems of protected areas.

1.4 Resolution 10.3 recommended certain actions for Parties, and requested the CMS Scientific Council, in conjunction with the Secretariat and in consultation with relevant others, to conduct a strategic review to:

(i) assess the extent to which and the manner in which existing major protected area systems and initiatives aimed at promoting ecological networks address the needs of migratory species throughout their life cycles and migratory ranges, including the issue of resilience to climate change and taking into account the significant difference in ecology and behaviour between terrestrial and aquatic species;

(ii) identify among CMS Agreements and other CMS instruments the current use and potential future use of ecological network concepts and approaches;

(iii) identify opportunities for enhancing the effectiveness of and synergies between relevant initiatives and programmes on protected areas and ecological networks in respect of the conservation needs of migratory species; and

[1] Among background documents considered by the Conference were a rapid response assessment by GRID-Arendal entitled "Living Planet: Connected Planet – preventing the end of the world's wildlife migrations through ecological networks" and a COP information document Conf. 10.39/Rev.1 on "Critical sites and ecological networks for migratory species".

[2] The text of the Resolution is reproduced as Annex 1 to the present report.

[3] The same COP's Resolution 10.19 on climate change urged Parties to maximise species and habitat resilience to climate change through appropriate design of ecological networks; including ensuring that sites are sufficiently large and varied in terms of habitats and topography, and strengthening the physical and ecological connectivity between them.

(iv) report the results, including recommendations, to the Conference of the Parties at its eleventh Meeting.

1.5 The Scientific Council subsequently established an informal intersessional Working Group on connectivity and ecological networks, and the Secretariat commissioned the present report to provide the strategic review.

1.6 The terms of reference for the review emphasise (in addition to the issues above as specified in Res 10.3) the importance of a suitable working definition of ecological networks for the CMS, which foregrounds connectivity and potentially needs to differentiate between aerial, aquatic, marine and terrestrial contexts. They also call for identification of gaps in knowledge which may limit the assessment specified in (i) above.

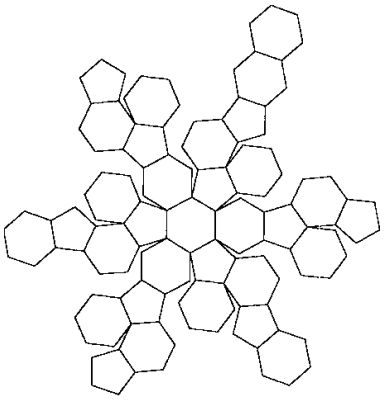
1.7 Financial support for this work has been provided by the Government of Norway (the host country of COP10); and is gratefully acknowledged.

1.8 A parallel exercise has been undertaken to compile a volume of case studies, as also requested by Res. 10.3. The findings from that work[4] have helped to inform the present report.

1.9 Item (i) above has been interpreted as asking how well-designed existing systems and initiatives are to give the best chance of achieving the intended result[5]. It has been assumed that this intends to address systems and initiatives that are international in scope; and that it mainly concerns those which overtly acknowledge some network-related aim.

1.10 In summary therefore the aim of this report is:

- **to build on previous work by reviewing in further depth the contribution of ecological networks to migratory species conservation**; and
- **to offer a strategic view of the most promising action areas for CMS Parties and others in future**.



[4] CMS Secretariat (in prep). Ecological Networks - Case studies, challenges and lessons learned. UNEP-CMS report.

[5] It would be possible to interpret the question instead as calling for an assessment of the scientific evidence for the actual ecological difference made on the ground by networks, in practice; but that, while highly desirable, would be a more major empirical research project and is beyond the reach of current resources.

2. Ecological networks and migratory species conservation - key strategic issues[6]

Aims expressed in the Convention and its strategies

2.1 The main aim of the Convention is for migratory species to be maintained at or restored to favourable conservation status. The definition of this status in Article I.1(c) includes a sufficiency of habitat to maintain populations in the long term, with no reduction in migratory range. A "spatial extent" objective is therefore at the heart of the Convention from the outset.

2.2 In the case of Agreements concluded under Article IV.3, according to Article V.3(f) these should provide for "maintenance of a network of suitable habitats appropriately disposed in relation to the migration routes". The term "network" is not further interpreted in the text.

2.3 In Article III.4(c) for Appendix I species, and Art V.5 for Appendix II species in the context of Article IV.3 Agreements, the Convention also refers to elimination of obstacles that impede migration. It is arguable that adverse habitat fragmentation and other forms of unwanted ecological discontinuity could be obstacles to migration in this sense; in which case these provisions are a further mandate for habitat connectivity measures.

2.4 The CMS Strategic Plan 2006-2014 includes as Target 2.7: "The most important key habitats/sites for migratory species in each Range State are protected and connected, where appropriate, through networks of protected areas and corridors".

2.5 The draft successor Strategic Plan for Migratory Species 2015-2023 (under development in parallel with the present report) includes reference to habitat connectivity in its mission statement and in several targets, against the background of a "migratory systems" concept described in terms of "the interdependent complexes of places, routes between places, populations, ecological factors and temporal cycles involved". Draft Target 10 on "area-based conservation measures" is designed to support the global Aichi Biodiversity Target 11, which seeks the conservation of areas of particular importance through "ecologically representative and well-connected systems" of such areas.

Scope: international cooperation - essential, but not sufficient

2.6 In the sense defined by the CMS, migration is transboundary. The Convention text emphasises that conservation and effective management of migratory species requires the concerted action of all States within whose boundaries these species spend any part of their life cycle; and the Strategic

[6] For an extensive list of sources on this topic, see the reference lists given in:
Bennett, G, and Mulongoy, K J (2006). Review of experience with ecological networks, corridors and buffer zones. CBD Technical Series No. 23, Secretariat of the Convention on Biological Diversity, Montreal.
Boitani, L, Falcucci, A, Maiorano, L and Rondinini, C (2007). Ecological networks as conceptual frameworks or operational tools in conservation. Conservation Biology 21(6): 1414-1422; and in
CMS Secretariat (2011) (op. cit.) (Conf. 10.39/Rev.1);
GRID-Arendal (2011) (op. cit.); and
Lausche, B, Farrier, D, Verschuuren, J, La Viña, A G M, Trouwborst, A, Born, C-H and Aug, L (2013). The legal aspects of connectivity conservation: a concept paper. IUCN Environmental Policy and Law Paper 085, Vol. 1. IUCN, Gland.

Plan stresses that this can be achieved only through "joint international efforts in which species- and ecosystem-based approaches are linked and coordinated across the entire migratory range of a species".

2.7 This is not confined only to areas within national boundaries. The Convention also covers migration outside such boundaries, in areas beyond national jurisdiction (ABNJ)[7], where special forms of cooperation may be required for conserving marine animals at sea.

2.8 Joint efforts are necessary partly because the spatial ecology and population dynamics of the animals operate at an international level. Increasingly also many of the threats to their survival are manifest at international scales, with ever more globalised economic drivers demanding ever-smarter multilateral coordination of policy responses, and with changes in the world's climate posing perhaps the most global challenge of all.

2.9 One important contribution is made by the creation of protected areas in border regions where, being defined by ecological parameters, they transcend geopolitical boundaries and are administered as "transboundary protected areas" (TBPAs) or "transfrontier conservation areas" (TFCAs)[8]. Some such areas, and the harmonised approach they foster, may be critical in particular to the survival of short-distance migrants in border regions.

2.10 Collective effort is therefore an obvious need - but by itself it will not produce a network. For this, extra ingredients are required. One is the picture of exactly *how* particular individual contributions add up to an intended total result. Another is the question of *consistency* of management and policy responses from one place to another, since the overall system may only be as strong as its weakest link. These aspects are discussed further below.

Scope: not only protected areas

2.11 Much of the conceptual development of ecological networks has taken place in a context of systems of designated "special sites" or protected areas. These will normally feature in some way, but they are not the whole story. The issue is a broader one of landscape-scale or migration-scale connectivity. It demands a more holistic view of how special sites, connecting corridors, the wider fabric of landscape/seascape they sit within, and the ecological processes that bind them together, all interrelate.

2.12 Migration, as understood in the CMS context (cyclical and predictable movements across national boundaries)[9] includes a wide variety of animal behaviours. The movements may be short-distance or transcontinental, seasonal or irruptive, lateral or altitudinal, east-west or north-south, dispersed or congregatory, on a broad front or narrowly funnelled, age-segregated, sex-

[7] Convention preamble, paragraph 4.

[8] For examples of some relevant initiatives see http://www.tbpa.net/index.php , http://www.peaceparks.org/story.php?pid=100&mid=19 and http://www.ramsar.org/cda/en/ramsar-documents-trss/main/ramsar/1-31-119_4000_0__

[9] Article I.1(a) of the Convention defines "migratory species" as "the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries". Further to the preambular paragraph cited above, this may also involve movements *beyond* national boundaries. Resolution 2.2 (1988) defined "cyclically" to mean relating to "a cycle of any nature, such as astronomical (circadian, annual etc.), life or climatic, and of any frequency"; and defined "predictably" to mean implying "that a phenomenon can be anticipated to recur in a given set of circumstances, though not necessarily regularly in time".

segregated or unsegregated, site-faithful or not site-faithful, and many variants of these. The "predictability" may be spatial, or temporal, or both.

2.13 Protected areas have a particularly important role in cases where behaviour is not only predictable but regular (site-faithful), concentrated and clearly bounded; and also in cases where certain key places may play a disproportionately important role for a species or population as a whole. Even here, other complementary areas may still play a critical role in connecting the "hotspots", buffering the core, providing "spare" capacity at times of ecological stress and disruption, and otherwise spreading risks across multiple locations as a way of supporting resilience to negative change.

2.14 (Note that regularity need not mean *annual* fidelity. Many migratory ungulates for example follow multi-annual climatic cycles, returning faithfully to certain sites but only on an intermittent basis; and use of less fixedly identifiable areas forms an equally important part of their pattern. Protection or management measures of a more time-limited nature may have an important role to play in such circumstances, such as the access restrictions applied in areas intermittently used by Saiga antelopes or temporary closure of certain fisheries.)

2.15 Other animals may not follow a regular or well-defined migration route at all, having a more nomadic habit or some other pattern of movement. Networks based only on protected areas may not be such a relevant conservation strategy for such species. Moreover, in the marine environment the whole notion of "sites" often has limited relevance; and spatial segregation can happen there in three dimensions rather than two.

2.16 The added value of a true network approach therefore lies with using an appropriately diverse repertoire of habitat-based measures, including but not limited to protected areas, to cater for connectivity and variability of various kinds, holistically across a migratory system.

Scope: not just a collection of sites; but functional connectivity

2.17 Much collaborative effort on area-based conservation systems historically has been devoted to agreeing schemes of importance criteria. Any such scheme may produce a consistent approach to site selection, but it does not follow that the resulting list of places automatically constitutes a network.

2.18 Most systems will go further and have at least some defined common purpose to which all the constituent sites contribute: but this of itself may not necessarily say anything about what the shape or scale of the whole system should be; and hence may also fall short of defining a network.

2.19 It could be valid, so long as it is explicit, for the purpose to be a purely *ad hoc* "safety-net" provision, used reactively in emergencies (or perhaps held in reserve and never needed) to underpin some other conservation agenda. It could be valid for it to be a targeted research or management experimentation resource, or an accolade for places demonstrating best practice, or the basis of a "people-network" for knowledge-exchange.

2.20 The rationales above go only as far as explaining why any particular site should belong to a common collection, and perhaps what the collection is for. Where there is some idea of a conservation function being performed by the

system, as well as by any one site within it, then it may be appropriate to think of it as a "network". But none of the site lists produced by these examples will necessarily be an ecological network.

2.21 So when does a collection of sites become such a network? It may be helpful to word the question slightly differently, and think of it in terms of "the ecology of networks". The deciding factor, it is suggested here, is the element of *ecological functionality, at the network scale*.

2.22 In the migratory species context, one obvious factor to consider is the extent of coverage of the different parts of a migratory range, or what CMS Article V(3)(f) (quoted earlier above) refers to as habitats being "appropriately disposed in relation to the migration routes".

2.23 Another factor would be facilitating unhindered movement of animals from one place to another; either by providing uninterrupted contiguity of suitable areas (eg by "corridors"), or (bearing in mind Articles III(4)(c) and V(5) as also quoted above) by removing barriers to movement. (Such barriers might take the form of disturbance or discontinuities in habitat quality as well as the more obvious physical obstacles).

2.24 It may also involve thinking about temporal factors in behaviour or in the distribution of water, food, temperature, wind, sight-lines/visibility (eg though foliage, or water turbidity), predators, prey and human interference; such that (for example) factors that are critical for an animal's survival, and which distribute in the landscape according to a seasonal succession, are catered for sufficiently in the design of the network.

2.25 On some level, "connectivity" in these various forms is certain to be a central part of what "ecological functionality at the network scale" must mean. There is however a danger of adopting too readily the intuitive appeal of what may often be an anthropically biased view of this. Real connectivity-dependence, for many migratory animals, may be somewhat different from the intuited connectivity on which we base our assumptions (such as the assumed relative importance of structural factors in the landscape).

2.26 There is as yet little empirical evidence against which to test these things, and at least one salutary study came to a counterintuitive conclusion (about the role of corridors for birds)[10]. It seems there is similarly a poor evidence-base for the incremental difference made by effective networks in practice[11].

Definitions, in the CMS context

2.27 Arising from the discussion above, elements to consider in moving towards a definition of ecological networks in the CMS context could include the following:

[10] Hindmarch, C and Kirby, J (2002). Corridors for birds within a Pan-European Ecological Network. Nature and Environment: 123. Council of Europe, Strasbourg. This study concluded that "there is no evidence to suggest that [corridors] have any reality for birds except in certain 'archipelago' situations and where the 'resource' is spatially confined and temporally constant, such as in river corridors and coastlines. In all other situations, it seems doubtful whether the corridor concept has any ecological relevance, except perhaps as a means of incrementally aggregating key resources that have become fragmented".

[11] Boitani et al. (2007) (op. cit.). See also note 5 above.

- International coordination, with a common purpose and a consistent approach;
- A strategic idea of some conservation function being performed by a whole *system*, rather than just by the individual areas within it; and an idea of how individual contributions add up to the intended total result;
- A holistic view of how special sites, connecting corridors, the wider fabric of landscape/seascape they sit within, and the ecological processes that bind them together, all interrelate;
- Congruence with a "migratory systems" concept (draft Strategic Plan for Migratory Species) involving "the interdependent complexes of places, routes between places, populations, ecological factors and temporal cycles involved";
- "Ecologically representative and well-connected systems" of important areas (Aichi target 11);
- Habitat conservation measures that are spatially distributed so as to address sufficiently the needs of migratory species throughout their life cycles and migratory ranges; covering variability and resilience to change as well as normal cycles of migration;
- Connectivity in terms of ecological *functionality* at the network scale, including facilitation of unimpeded migratory movements of animals from one place to another.

2.28 There is an implication that the concept of a network must add something extra to the concept of ecological connectivity between places. This extra value is likely to lie with the dimension of strategic, migration-scale objectives for a whole system.

2.29 There is also an implication that however much ecologically functional connectivity may be demonstrated between two locations, a mere two locations might not typically be thought to add up to a "network" (even though there might be a strategic objective for this "system", and it could potentially represent the entire migratory range of a species). It would probably be unwise however to venture into trying to define "how many sites make a network", meaning that the two-site example could technically be included.

2.30 A variety of labels have been applied in other contexts to elements of the concepts listed above, including "green infrastructure", "bio-regional planning", "biological corridors" and "connectivity conservation areas". The definition suggestions given here are less concerned with the exact choice of label than with understanding the particular combination of ideas it should reflect. Alternatives could be used, but for the time being "ecological network" has the advantage of not upsetting the terminology which has already been in use in the CMS context for some years.

2.31 Boitani *et al*. (2007)[12] broadly define an ecological network as "a network of areas that are connected to enhance biodiversity conservation". The CMS COP10 information document Conf. 10.39 (2011) cites a definition by Bennett

[12] Op. cit.

(2004)[13] which has been used by IUCN and the Convention on Biological Diversity, *viz*: "a coherent system of natural and/or semi-natural landscape elements that is configured and managed with the objective of maintaining or restoring ecological functions as a means to conserve biodiversity, while also providing appropriate opportunities for the sustainable use of natural resources".

2.32 These definitions, particularly the last one which seeks to position sustainable use in network conservation agendas, all approach the network concept in terms of an anthropically created management tool. This is a valid approach to take in devising a definition for the CMS context; but it must be noted that it would be possible to approach the question instead as a purely ecological one, aiming to describe the way that particular animals distribute themselves.

2.33 It has been suggested that a typical network configuration would involve core areas, buffer zones, restoration areas and corridors; with corridors taking the form of "linear features, stepping stones, landscape patchworks or other forms of spatial connectivity"[14]. This description is perhaps more meaningful for terrestrial situations than the marine environment, and even on land it is unlikely that all four components would need to be present in every case.

2.34 A characterisation suggested by the author of the present report was included in the GRID-Arendal publication referred to above, to the effect that "Ecological networks are not just collections of sites, nor are they simply maps of migratory pathways. Instead, they represent functional relationships between places that are important in supporting the process of migration at an ecosystem level. Conservation strategies for such networks should have objectives that are ecologically meaningful in these terms"[15].

2.35 The conservation strategies concerned may need to take as many forms as the myriad types of behaviour that have come to be grouped under the heading of "animal migration"; and they may fundamentally differ according to whether the animals concerned travel over land, in water or through the air.

2.36 To date, most of the elaboration of network thinking has related to terrestrial networks and bird flyways. It is unlikely that the same models will translate directly to habitat use by inland aquatic species or to the topographically more homogenous nature of the oceans. Similarly, typical conceptions of networks to date have tended to contemplate relatively congregatory species with relatively high site fidelity; yet migratory behaviour clearly may take many other forms, as mentioned above.

2.37 Based on the discussion above, the following definitional statement is offered here for use in the CMS context:

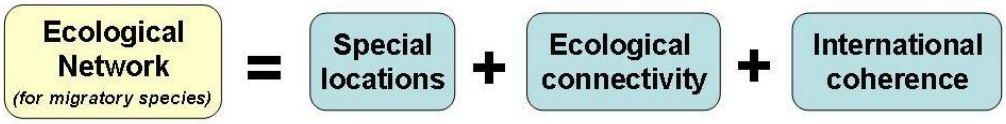
[13] Bennett, G (2004). Integrating biodiversity conservation and sustainable use - lessons learnt from ecological networks. IUCN, Gland.

[14] CMS Secretariat (in prep); op. cit.

[15] The text goes on to add: "The approach can be especially cost-effective in linking together disparate efforts into a common cause, developing synergies, and 'working with the grain' of natural systems at a macro level for the benefit of migratory species, ecosystems, and human communities worldwide".

The survival of migratory animals is dependent on the ways in which suitable habitat is distributed throughout their migratory range, and on the topographic and ecological factors allowing them to move freely from place to place. "Ecological networks" are a conservation tool designed to take a strategic approach to this, by appropriately managing relevant landscape/seascape features and a sufficiency of key areas to maintain a given migratory system, based on specific forms of functionally-defined ecological connection between them. There is no single ideal approach, since this will vary according to the needs of the animals concerned.

Key words: strategic; sufficient, functional, ecological connection.



Risks

2.38 Increasing ecological connectivity may have implications for non-target species as well as target ones, and in some cases this could give rise to unwanted negative effects. There may be potential for example to exacerbate the spread of disease organisms, problematic predators, ecological competitors or invasive species. Some kinds of increased connectivity may also exacerbate human pressures, for example by opening up new avenues of access for disturbance or poaching. These risk factors should be considered when designing new initiatives, and trade-off decisions may be required.

"Critical" sites

2.39 Sites in a network will play different roles according to whether they provide breeding grounds, wintering grounds, feeding habitat, etc. They may also differ in terms of their relative importance to the population or the system overall in providing these things.

2.40 In some cases, certain individual sites may play such a pivotal or disproportionately important role for a whole migratory system that they are regarded as "critical" sites in the network. This does not necessarily imply that others are any more expendable, since the system may depend on the coherence of its totality (see below); but it reflects the way in which it may be possible to identify a "core" or a "bottleneck" or a "most vulnerable component" in the ecological processes that support a given migratory system.

2.41 This concept has received most attention in the context of bird flyways, where for example trends in certain widespread migratory shorebird populations have been attributed to ecological drivers at just a few highly productive sites in the flyways concerned[16].

[16] For example the Waddensee in Europe, Delaware Bay in North America, the Banc d'Arguin in Africa and Yellow Sea coastal sites in Asia. (Stroud, D A, Baker, A, Blanco, D E, Davidson, N C, Delany, S, Ganter, B, Gill R, González, P, Haanstra L, Morrison, R I G, Piersma, T, Scott, D A, Thorup, O, West, R, Wilson, J and Zöckler, C

"Coherence" in ecological networks

2.42 The section on definitions above suggests that some form of ecologically functional connection must exist between the areas that are included, if they are to be regarded as anything more than a list of sites sharing something in common. Satisfying this connectivity condition may produce a network, but it will not on its own ensure that the network functions coherently as a whole, or that it will be self-sustaining. The added condition of "sufficiency" ("of suitable areas to maintain a given migratory system") reflects this fact.

2.43 Some regimes, such as the Ramsar Convention[17], the OSPAR Convention[18] and the European Union nature Directives[19], move at least partly in this direction by expressing an aim of "coherence" for their respective ecological networks[20]. No universal definition of the term has been agreed for these purposes; but a typical dictionary definition would be "being well held together"; ie it is a property to be exhibited by the network as a whole.

2.44 A defined scheme of priorities, based on the goals of the network, may provide a rationale for deciding which sites should be included in it; and this will support the aim of coherence. In itself however this will not necessarily define a desired target end-state for the network. Even an "additive" aim such as "maximising diversity", while it may help to define what the system should capture and contain within it, will not help to quantify the target end-state, unless it is genuinely intended that the system will cover 100% of whatever is of interest.

2.45 Coherence, it is suggested here[21], can only be assessed in terms of "completion objectives", or in other words, the "sufficiency" condition. It is a question about when the network contains sufficient sites and/or other "ecological infrastructure" to maintain its overall functional integrity, including requisite buffers against risk and variability. Such objectives should allow "incoherence" to be identified and gaps to be filled. They might be framed in terms of:

- *Representativity* - containing enough sites of the right type to represent sufficiently the range of functions, values and attributes at stake, and to enable a contribution to be made to the conservation of each of these. In some cases the purpose may be to safeguard exceptional examples (eg the best, or the rarest); define typical reference examples; demonstrate the range of variety, or represent each defined subdivision (geographic or taxonomic) of the whole. In a migratory species context it would be likely to involve adequate representation of the migratory range of the animals

(2006). The conservation and population status of the world's waders at the turn of the millennium. In: Boere, G C, Galbraith, C A and Stroud, D A (2006) (eds). Waterbirds around the world. The Stationery Office, UK. Also Davidson, N C (2003a) Status of wader populations on the Central/South Asian flyway. Wader Study Group Bulletin 101/102: 14-15; and Davidson, N C (2003b). Declines in East Atlantic wader populations: is the Wadden Sea the problem? Wader Study Group Bulletin 101/102: 19-20).

17 The Convention on Wetlands (Ramsar, Iran, 1971).

18 The Convention for the Protection of the marine Environment of the North-East Atlantic (Paris, 1992).

19 Directive 2009/147 on the Conservation of wild birds (formerly Directive 79/409/EEC) (1979 and 2009); and Directive 92/43 on the Conservation of natural habitats and of wild fauna and flora (1992).

20 See also European Marine Board (2013). Achieving ecologically coherent MPA [Marine Protected Area] networks in Europe: science needs and priorities. EMB, Ostend, Belgium.

21 Much of the thinking in this section derives from Pritchard, D E (2004). Towards Coherence in Site Networks. Proceedings of the Waterbirds Around the World Conference, Edinburgh, UK, 3-8 April 2004. Published by the UK Stationery Office.

concerned. (Each of these aims requires a different strategy, and they are not all necessarily compatible with each other).

- *Viability* - containing a sustainable minimum of the resource in question (for example a self-sustaining animal population) for it to be conserved within the network; judged perhaps according to a hypothetical worst-case scenario of its being lost from everywhere outside the network. For migratory animals this might be a question of encompassing enough of the different geographical, climatic and other factors which play different roles at different times, and combine together to support a given population. It might also need to give particular attention to including sites that are "critical" for viability (see above).
- *Distribution (spreading)* - minimising vulnerability and risk, by choosing sites so that the variety of values at stake is spread across a large number of disparate sites. This insures against the total loss of a resource from localised impacts such as fire, flooding, disease, food-source collapse or inappropriate land-use decisions; and it aids recovery by offering a spread of gene-pools for potential recolonisation. Networks may also need sufficient spread to provide for occasional temporary redistribution of animals for example through disturbance or exceptional weather conditions. Spreading sites across several geopolitical jurisdictions may also help to guard against the effects of political support for conservation fluctuating from time to time and from place to place.
- *Distribution (concentrating)* - if there is an aim of minimising cost per unit benefit, this would suggest that the maximum variety and abundance of values should be concentrated in the smallest possible number of sites. This could also support an aim of complementarity, i.e. each site being as different from the others as possible.
- *Distribution (accessibility)* - maximising accessibility of sites to people. This might be important if the aims of the system include human enjoyment of natural areas for eco-tourism, or provision of amenity "greenspace".

2.46 Clearly there may be trade-offs to make in choosing the appropriate strategy for achieving coherence; for example between risk-spreading (suggesting a network of numerous small sites) and cost-effectiveness (suggesting a network of fewer but larger sites). Ecologically speaking, the two areas of representativity and viability are probably where the main benefits lie in moving from a site-by-site approach to an ecological network approach.

2.47 As guidance under OSPAR points out, it is much easier to develop tests that indicate when ecological coherence has *not* been achieved (i.e. something is missing) than when it *has* been achieved: full achievement is unlikely to be demonstrable, and it will probably need to be stated instead as a *likelihood*[22].

2.48 It is possible that the most important aspects of functional coherence of a network may operate at the level of genomes, or trophic processes, or climate risk-envelopes; hence often going far wider than "sites". Judging the matter in terms of more visible aspects of the ecosystem, such as species and habitats, might be no more than a proxy for the real issues at stake. At present the

[22] OSPAR Commission (2007). Background document to support the assessment of whether the OSPAR Network of Marine Protected Areas is ecologically coherent. Publication No. 320/2007.

visible indicators are the ones that are practical to use; but this caveat should be borne in mind.

2.49 Coherence may also be considered in terms of policy and management responses. A network that is ecologically coherent may yet fail if actions taken in different parts of it unintentionally counteract each other, or if inadequate conservation standards in one place undermine good efforts made elsewhere. Some responses may need to be applied at a network-wide international scale through coordination of available national-level mechanisms, such as synchronisation of hunting seasons or planning of habitat compensation measures.

Static tools in a changing environment

2.50 In relying typically on systems of land and sea areas that are statutorily designated for special attention, ecological networks are vulnerable to the risk, shared by all such systems, that they are too statically delineated for the natural systems they seek to protect.

2.51 In part, this is a result of our incomplete knowledge about longer-term patterns of natural variation in the environment, set against the need to make urgent decisions with whatever knowledge we do have. In part it may also arise from new environmental variations, whether connected with the natural propensity of ecosystems to evolve in dynamic ways[23], or with macro-scale anthropogenic effects such as food-chain disruption or climate change, which are posing new questions for the resilience of area-based conservation systems in general.

2.52 Networks may consequently become "locked in" to a spatially mis-targeted response to the true needs of the animals concerned. There is a general case for a new understanding of natural resource management which better embraces the realities of ecological dynamism. In the meantime however most available legal and policy response mechanisms are not well equipped to accommodate this.

2.53 In particular there is (as yet) very poor machinery, in most protected area regimes, for distinguishing genuine irreversible change from spurious claims that something has irreversibly changed in cases where vested interests are seeking the removal of protections for an ulterior motive.

2.54 Climate change puts these questions into even sharper relief. Mis-targeting of networks in this context may occur because of changes in the distribution of suitable habitat conditions, and/or changes in species distributions for other climate-related reasons, and/or an increase in the variability of species distribution/migratory behaviour in general[24].

2.55 The issue of shifting baselines was highlighted in CMS COP Resolution 10.19 (2011) on "Migratory species conservation in the light of climate change",

[23] See for example Hobbs, R J, Higgs, E S and Hall, C (2013). Novel ecosystems: intervening in the new ecological world order. Wiley-Blackwell.

[24] See for example Zoological Society of London (2011). Climate change vulnerability of migratory species - a project report for the CMS Scientific Council. CMS document ScC17/Inf.9; and
CMS Secretariat (2011). Proceedings of the UNEP/CMS technical workshop on the impact of climate change on migratory species: current status and avenues for action. 6-8 June 2011, Tour du Valat, France. CMS document ScC17/Inf.12.

which urged the promotion of “timely conservation measures where migration patterns have changed due to climate change”, including the strengthening of “physical and ecological connectivity between sites, aiding species dispersal and colonisation when distributions shift”. The Resolution also called for an examination of whether the terms “range” and “historic coverage” in Article I of the Convention “might benefit from interpretations that take account of the requirements of species in response to climate change”, given the more static ecological presumptions that prevailed when the Article was originally drafted[25].

[25] A draft Resolution, including a proposed Programme of Work on climate change and migratory species, is due to be tabled at COP11. The draft picks up these issues and proposes a way ahead.

3. How do migratory species feature in existing networks?

3.1 Ecological networks have existed in a formally-created sense since the 1970s, since when a large variety of types and scales of network have proliferated around the world, with one source suggesting that there may be as many as 250 relevant examples[26]. Most of these have not been designed to address animal migration, tending more often to be mainly concerned with the conservation of territorial species that have limited home ranges, or with purposes such as human recreation, use of natural resources or knowledge-exchange. Some networks may have certain groups of migratory species as their sole focus, but this does not necessarily mean that even they explain the way in which they act to support the species' migratory needs as such.

3.2 The present section is not intended to be an overview of existing systems, nor to duplicate the snapshot of fifteen examples of ecological networks from a CMS perspective which are given in the "case studies" volume accompanying this report[27].

3.3 It is designed instead to illustrate the question about relevance for migratory species by reference to a few key examples of habitat conservation or protected area systems that may be regarded (or regard themselves) as ecological networks; having regard also to the definitional elements suggested here in section 2. The selection focuses mainly on intergovernmental systems applied at a broad geographical scale, featuring in particular several bodies with which the CMS has collaboration arrangements[28].

Convention on Biological Diversity

3.4 The CBD has a Programme of Work on protected areas; although it has no mechanism for establishing such areas, so the Programme must be delivered through other systems (in which it can be an important policy driver). The Programme was adopted as the annex to COP Decision VII.28 in 2004. It contain a number of far-reaching references to ecological networks, including:

- Goal 1.1: To establish and strengthen national and regional systems of protected areas, integrated into a global network, as a contribution to globally agreed goals. Target: By 2010 terrestrially, and 2012 in the marine area, a global network of comprehensive, representative and effectively managed national and regional protected area system is established …
- Goal 1.3: To establish and strengthen regional networks, transboundary protected areas and collaboration between neighbouring protected areas across national boundaries.

3.5 Migratory species are specifically referred to in the following:

- Activity 1.1.2: Parties to … take action to establish or expand protected areas … taking into consideration the conservation needs of migratory species.

[26] CBD Secretariat, 2010: Case studies illustrating the socio-economic benefits of ecological networks. Convention on Biological Diversity, Montreal. Note however that this document uses a considerably broader interpretation of ecological networks ("maintenance of ecosystem functions in combination with the sustainable use of the landscape") than that used here.

[27] CMS Secretariat (in prep); op. cit; and see Annex 2 of the present report.

[28] These include the CBD, Ramsar Convention, Bern Convention and UNESCO.

- Activity 1.1.5: Parties to … complete protected area system gap analyses … tak[ing] account of species migration requirements …
- Activity 1.2.3: Parties to integrate regional, national and sub-national systems of protected areas into broader land- and seascape, inter alia by establishing and managing ecological networks, ecological corridors and/or buffer zones, where appropriate, to maintain ecological processes and also taking into account the needs of migratory species.
- Activity 1.3.7: the Secretariat to review the potential for regional cooperation under the Convention on Migratory Species with a view to linking of protected area networks across international boundaries and potentially beyond national jurisdiction through the establishment of migratory corridors for key species.

3.6 Further references are made to various of the network-related provisions in decisions at subsequent COPs. Some additional points appear in Decision X/31 (2010), in which Parties resolved to "enhance the coverage and quality, representativeness and, if appropriate, connectivity of protected areas" as a contribution to the establishment of "representative systems of protected areas and coherent ecological networks"; and which also refers to using connectivity measures such as ecological networks to address climate change impacts and increase resilience to climate change. There are no further references to migratory species aspects in any of the post-2004 decisions.

3.7 Other CBD initiatives include a process for the identification of Ecologically or Biologically Significant Marine Areas (EBSAs), through a series of regional technical workshops that began in 2011. The selection criteria include "special importance for life-history stages of species", and among the areas initially identified (summarised in the annex to CBD COP Decision XI/17, 2012) are several which cite their importance as migratory routes. A review of the importance for migratory species of EBSAs described to date has been undertaken for the CMS by the Global Ocean Biodiversity Initiative in 2014, and its findings will be presented to COP11[29].

Natura 2000 network (European Union)

3.8 The EU's Natura 2000 network is formed from sites designated by national governments as Special Protection Areas under the Wild Birds Directive[30] together with those designated as Special Areas of Conservation under the Habitats Directive[31].

3.9 In the Birds Directive (the earlier of the two), Article 4(3) provides for the European Commission to take initiatives to ensure that SPAs "form a coherent whole which meets the protection requirements of [relevant bird species] in the geographical sea and land area where this Directive applies". Member States must classify as SPAs "the most suitable territories in number and size" for the conservation of these species; a requirement which has been tested in the courts when there have been ecologically-founded allegations of incompleteness in the network[32].

[29] See Scientific Council document UNEP/CMS/ScC18/Inf.10.3.2 (2014).

[30] Directive 2009/147 on the Conservation of wild birds (formerly Directive 79/409/EEC) (1979 and 2009).

[31] Directive 92/43 on the Conservation of natural habitats and of wild fauna and flora (1992).

[32] Early landmark examples include the European Court of Justice cases concerning Santoña Marshes, Spain (C-355/90, 1993) and Lappel Bank, UK (C-44/95, 1996).

3.10 Subsequently the Habitats Directive employed the phrase "coherent European ecological network" for Natura 2000; with the purpose (Article 3(1)) of "enabl[ing] the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range". Member States are encouraged in Art. 10 to manage features of the landscape (taken to mean outside and in addition to SACs and SPAs) "in particular with a view to improving the ecological coherence of the Natura 2000 network".

3.11 If a project which is likely to damage an SPA or SAC nevertheless meets various public interest tests and has to be approved, there is a requirement for habitat compensation which has to serve an aim of protecting the overall coherence of the network[33]. This offers a potentially more widely applicable principle, ie maintenance of network coherence as a criterion for judging the adequacy of mitigation and compensation measures more generally.

3.12 One implied assumption with this is that overall network coherence can be preserved even if there are changes in the individual constituent sites, thereby admitting some interchangeability among the components of the network. Ecologically of course this may not always be achievable, hence the system has some risk in this respect. The corollary however is that an impact on any one part of the system has to be considered in terms of its implications for the whole system.

3.13 A further benchmark for network coherence in Natura 2000 is the aim of favourable conservation status, which is defined in a similar (though not identical) way to the same aim in the CMS, and thus, under both the Directives and the Convention, includes maintenance of the natural ranges of the species concerned.

3.14 The Birds Directive points out (preamble para 10) that wild birds in the EU are mainly migratory species, and hence bird protection is "typically a trans-frontier environment problem entailing common responsibilities". In addition to listed high priority species, SPAs are to be created for all other regularly occurring migratory species, "bearing in mind their need for protection in the geographical sea and land area where this Directive applies, as regards their breeding, moulting and wintering areas and staging posts along their migration routes". Research on "areas particularly important to migratory species on their migratory routes and as wintering and nesting grounds" is cited as a priority in Annex V.

3.15 In referring to features of the landscape in Art. 10 (see above), the Habitats Directive explains that "such features are those which, by virtue of their linear and continuous structure (such as rivers with their banks or the traditional systems for marking field boundaries) or their function as stepping stones (such as ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species". The criteria for selecting SACs in Annex III include the "geographical situation of the site in relation to migration routes".

[33] Habitats Directive Art. 6(4); applied also to Birds Directive sites by virtue of Art. 7.

Ramsar sites (Convention on Wetlands)

3.16 The second goal in the Ramsar Convention's Strategic Plan[34] is to develop and maintain an international network of important wetlands. The Plan also expects regional site networks and initiatives to be in place for (*inter alia*) wetland-dependent migratory species (citing CMS initiatives/Agreements as examples of such initiatives)[35].

3.17 Detailed guidance on this is given in the Convention's Strategic Framework for Wetlands of International Importance (= sites qualifying for designation as Ramsar sites)[36], which explains that the international network is to be built from "coherent and comprehensive" national networks of such sites "which fully represent the diversity of wetlands and their key ecological and hydrological functions".

3.18 The national networks are to be used to help achieve Aichi target 11 (see section 2 above) (Objective 1.3). In addition to selecting sites according to the Ramsar criteria (which are set out in the same Framework document), each national network should include at least one qualifying representative of every natural or near-natural wetland type occurring in each biogeographic region[37], plus wetlands that are "critical to the conservation of biological diversity in each biogeographic region" and those that "provide important habitat for plant and animal species at critical stages in their life cycle" (Objectives 1.1, 2.3 and 2.4).

3.19 The benefits of networks of protected wetland areas are described as including the ability to conserve multiple local populations of a species and thus contribute to the survival of metapopulations; to conserve patterns of diversity at scales larger than an individual site; and to support ecological or hydrological processes operating at wide geographical scales. Concepts of coherence and objective-setting are discussed, drawing on Pritchard (2006) as cited in section 2 of the present report.

3.20 Other types of connectivity are mentioned too; for example Objective 1.2 of the Framework emphasises "those wetlands that play a substantial ecological or hydrological role in the natural functioning of a major river basin, lake, or coastal system".

3.21 Migration is implicated in the criteria for selecting individual Ramsar sites, which include reference to sites that support species "at a critical stage in their life cycles" (criterion 4) and sites that are important migration paths on which fish stocks depend (criterion 8). Parties are urged to consider the opportunities provided by site designation for contributing to initiatives under other Conventions, "in particular the CBD and the CMS and its Agreements"; while Objective 3.1 in the Strategic Framework for the Ramsar List includes pursuing opportunities for "cooperative management agreements for wetlands

[34] The Ramsar Strategic Plan 2009-2015, adopted by COP Resolution X.1 (2008).

[35] Key Result Area 3.5.iii.

[36] Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance of the Convention on Wetlands. The current revised version of the Framework was adopted as Annex 2 to COP Resolution XI.8 (2012).

[37] The Convention does not define its own biogeographic regionalisation scheme, but instead gives guidance (in the same Strategic Framework document) on various already existing schemes, and on their potential application in the context of Ramsar site selection.

along migratory species routes". In relation specifically to networks of protected areas, the Framework notes that these "can provide for the requirements of migratory species as they undertake their annual cycle of movements".

Bern Convention and Emerald Network

3.22 The Bern Convention is the Council of Europe's 1979 Convention on the Conservation of European Wildlife and Natural Habitats. In Article 4.3 the Parties undertake to give special attention to the protection of areas of importance for migratory species, "which are appropriately situated in relation to migration routes, as wintering, staging, feeding, breeding or moulting areas". A later interpretation elaborated "importance" by reference to "critical sites" for those migratory animals requiring specific habitat conservation measures[38]. Art. 10.1 requires Parties to co-ordinate their efforts for the protection of the migratory species.

3.23 The Convention's governing Standing Committee in 1989 recommended Parties to identify (*inter alia*) migratory species requiring specific habitat conservation measures[39], and "to indicate, as far as possible, their sites"[40]. It then recommended that they designate "areas of special conservation interest" in which to take appropriate conservation measures, with the selection criteria for these sites including (*inter alia*) (e) importance for one or more migratory species[41]. Although not named as such at the time, this later became known as the Emerald Network[42]. It extends to observer states as well as full Parties to the Convention, and is harmonised with the Natura 2000 network (discussed above).

3.24 Significantly, in addition to criteria for selecting individual sites, the Convention has also devised criteria for assessing "network sufficiency" in the national lists of sites proposed as ASCIs/Emerald sites[43]. Four requirements are defined, for a representative list of sites to meet, if it is to be considered "sufficient to enable a favourable conservation status for a given species (or habitat type) at bio-geographical level". One of these is that it "must include the whole range of habitats that are needed for the different stages of [a relevant species'] life-cycle, such as reproduction, migrations, foraging, etc".

3.25 The Bern Convention has also adopted a Recommendation on "the conservation of natural areas outside protected areas"[44]; which lists example measures including "the conservation and, where necessary, the restoration of ecological corridors", in particular by (*inter alia*) "restor[ing] or compensat[ing] for the loss of ecological corridors caused by the building of

[38] Bern Convention Standing Committee Resolution No. 1 (1989).

[39] A list was subsequently adopted as an Appendix to Resolution No. 6 (1998), and was later updated by the Standing Committee at its 31st meeting in 2011.

[40] Recommendation No. 14 (1989).

[41] Recommendation No. 16 (1989).

[42] In Resolution 3 (1996) the Committee resolved to "set up a network (Emerald Network) which would include the Areas of Special Conservation Interest designated following its Recommendation No. 16".

[43] Bern Convention Secretariat (Council of Europe Directorate of Culture and Cultural and Natural Heritage) (2010). Criteria for assessing the national lists of proposed Areas of Special Conservation Interest (ASCIs) at biogeographical level, and procedure for examining and approving Emerald candidate sites. Document T-PVS/PA (2010) 12; as adopted by the 30th meeting of the Bern Convention Standing Committee, Strasbourg, 6-9 December 2010.

[44] Recommendation No. 25 (1991).

new roads and other constructions that prevent animals from migrating or interchanging".

Pan-European Ecological Network

3.26 European Ministers of the Environment at their third conference in 1995 adopted the Pan-European Biological and Landscape Diversity Strategy (PEBLDS), as an instrument to support the implementation of the Convention on Biological Diversity in the 54 countries concerned. The Strategy also seeks to integrate biodiversity and landscape conservation more closely together.

3.27 A key part of the Strategy was the establishment of a Pan-European Ecological Network (PEEN), to include both protected areas and other habitat, contributing to the favourable conservation status of species[45].

3.28 Core areas consisting of existing systems such as Natura 2000 (see above) are meant to combine with ecological corridors, buffer zones and restoration zones. The aims of the Network include reducing habitat fragmentation and facilitating animal dispersal and migration. Otherwise, apart from general references to the expected benefits for migratory species, there are no provisions relating specifically to migration.

3.29 A principal output has been a series of maps[46]; and supporting projects have been funded by the EECONET Action Fund (a consortium of organisations operating under the umbrella of NatureNet Europe). In future it is intended to work further on ways of integrating the Network with local planning for "green infrastructure", and on "full translation of the protected area networks into functional ecological networks"[47].

OSPAR Convention

3.30 The Ministerial Meeting of the Convention for the protection of the marine environment of the North-East Atlantic (OSPAR) agreed in 1998 to promote the establishment of a network of marine protected areas in the Convention area. The purposes of the network were subsequently defined to include (*inter alia*) conservation and restoration of species, habitats and ecological processes; representation of the range of such interests in the OSPAR maritime area; and coherence of the network overall.

3.31 In 2010 it was noted that the network was "not yet considered to be ecologically coherent", and a Recommendation was adopted seeking to ensure that by 2012 it would (*inter alia*) be ecologically coherent and include sufficiently representative sites from all biogeographic regions in the maritime area; and it listed various steps to this end[48]. A review in 2012 concluded that the question could not yet be assessed comprehensively, but that available

[45] Bonnin, M, Bruszik, A, Delbaere, B, Lethier, H, Richard, D, Rientjes, S, van Uden, G and Terry, A (2007). The Pan-European Ecological Network: taking stock. Council of Europe, Nature and Environment No. 146.

[46] See http://www.ecnc.org/ecological-network-maps/ .

[47] Jones-Walters, L and Civic, K (2013). Action Plan on the strategic development of the Pan-European Ecological Network, 2012-2020. Document T-PVS/PA (2013) 06, for the 5th meeting of the Council of Europe Group of Experts on Protected Areas and Ecological Networks, 18-19 September 2013, Strasbourg.

[48] OSPAR Recommendation 2010/2; amending Recommendation 2003/3.

evidence suggested the ecological coherence goal had not been achieved; although in most areas things were moving in the right direction[49].

3.32 The OSPAR MPA example offers perhaps the most detailed consideration available for any network of ways in which assessment of coherence has been attempted; based for example on representativity and gaps in spatial distribution[50]. It has however no specific provisions relating to migratory species or migration.

Helsinki Convention (HELCOM)

[To be added]

World Heritage Convention

[To be added]

Western Hemisphere Shorebird Reserve Network

[To be added]

East Asian-Australasian Flyway Network

[To be added]

[Others could be added; but the ones above are probably the most relevant, and a line needs to be drawn somewhere].

[To add: concluding observations from the accounts above. For example, some of these systems offer useful scope for strengthened synergy with CMS, which could be pursued within the framework of (existing or potential) formal cooperation arrangements. Some issues may not be receiving adequate attention from any existing system, and hence may indicate gaps needing attention. It may also be possible to define some gaps in knowledge. Suggestions for action to address these things can then be picked up in section 5].

[49] OSPAR Commission (2013). 2012 Status Report on the OSPAR Network of Marine Protected Areas. OSPAR Biodiversity Series.

[50] Guidance available on the methodology includes:
OSPAR Commission (2006). Guidance on developing an ecologically coherent network of OSPAR Marine Protected Areas. Ref. 2006-3.
OSPAR Commission (2007). Background document to support the assessment of whether the OSPAR Network of Marine Protected Areas is ecologically coherent. Publication No. 320/2007.
OSPAR Commission (2008a). Background document on three initial spatial tests used for assessing the ecological coherence of the OSPAR MPA Network. Publication No. 360/2008.
OSPAR Commission (2008b). A matrix approach to assessing the ecological coherence of the OSPAR MPA Network. Ref. MASH 08/5/6-E.

4. How do networks feature in migratory species agreements?

4.1 This section presents a brief qualitative overview of the relevance of ecological networks to the various formally-concluded instruments (Agreements[51] and Memoranda of Understanding or MoUs) in the CMS Family.

4.2 As mentioned earlier above, there is a general expectation expressed in the Convention text (Art. V.3(f)) that Agreements concluded under Article IV.3 should provide for "maintenance of a network of suitable habitats appropriately disposed in relation to the migration routes". The exact nature of needs and possibilities for this will vary from case to case.

4.3 COP 10 (Res. 10.3) further called on Parties and Signatories of CMS MoUs to "consider the network approach in the implementation of existing CMS instruments and initiatives".

4.4 In relation to bird-based Agreements, Res. 10.10 on global flyway conservation is also noteworthy in stressing the importance of protecting critical sites (including stop-over sites and habitat corridors) as part of the development of coherent networks at the flyway scale.

4.5 The table below highlights some of the main expressions of ecological network-related objectives or initiatives that are associated with each of the instruments in the CMS family[52]. **Note: a strict interpretation of "network-related" has been adopted for this, based on the definition in section 2 above. Mere provision for inventory, protection or management of important sites, for example (addressed in some way by most CMS instruments) is not specific enough to merit inclusion here**.

Agreement/MoU	Text of the instrument	Policy statements[53]	Projects and other initiatives
TERRESTRIAL SPECIES			
Agreement on the Conservation of Populations of **European Bats** (EUROBATS) *Signature: 1991* *Entry into force: 1994* *Range States: 64*	Not mentioned.	Successive MOP Resolutions on the Agreement's Conservation and Management Plan (most recently Res. 6.16 in 2010) cross-refer to the Natura 2000 and Emerald Networks. MOP6 also adopted Res. 6.7	[Any specifically relevant projects funded under the EUROBATS Project Initiative?]

[51] Typographical presentations of the word "agreement" under CMS vary according to the context. For convenience throughout the present document it is presented informally as "Agreement" (upper case initial letter only), to refer generically to all forms of CMS instruments concluded under Article IV of the Convention, including Memoranda of Understanding.

[52] Documents were read in their entirety to confirm the context, and/or searched for terms such as "network", "corridor", "connecting", "critical habitats", etc. Relevance of references was judged according to the definition in section 2 of the present report. References to networks of *people* or *institutions* (for research or knowledge-exchange etc) were excluded, since the focus here is instead on *ecological* networks.

[53] This includes strategic plans, MOP Resolutions, and any equivalent statements that have similarly been adopted in a collective manner by the countries concerned.

		on "Conservation and management of critical feeding areas, core areas around colonies and commuting routes" which addresses landscape connectivity issues.	
Agreement on the Conservation of **Gorillas and their Habitats** *Signature: 2007* *Entry into force: 2008* *Range States: 10*	*Article III.2:* Parties shall (c) coordinate their efforts to ensure that a network of suitable habitats is maintained or re-established throughout the entire range of all species and sub-species, in particular where habitats extend over the area of more than one Party to this Agreement.	MOP2 (2011) noted the importance of ecological networks, by reference to CMS Resolution 10.3 (Meeting report; no decision). Action Plans adopted under the Agreement place emphasis on transboundary management of protected areas linked to the migratory movements of gorillas.	
Memorandum of Understanding concerning Conservation and Restoration of the **Bukhara Deer** *(Cervus elaphus bactrianus)* *Signature: 2002* *Entry into effect: 2002* *Range States: 5*	*Annexed Action Plan programme 2*: Development of an interstate econet (system of protected areas) which could support self-sustainable population development of Bukhara.	None.	The GEF-funded WWF "Econet" project (2003-2006) sought to develop proposals for an ecological network scheme in Central Asia, with Bukhara among the 400 species theoretically covered. The MoU's 1st Meeting of Signatories (MOS1, 2011) considered the potential relevance of this work to the species.
Memorandum of Understanding on the Conservation of the **South Andean Huemul** (*Hippocamelus bisulcus*) *Signature: 2010* *Entry into effect: 2010* *Range States: 2*	Not mentioned.	[Anything to add?]	[Anything to add?]
Memorandum of Understanding for the Conservation, Restoration and Sustainable Use of the **Saiga Antelope** (*Saiga* spp.) *Signature: 2005* *Entry into effect: 2006* *Range States: 5*	*Medium Term International Work Programme* (equivalent to MoU Action Plan) *2011-2015, section 7.1*: Expand and enhance national protected area networks to benefit Saiga, with particular emphasis on protecting key areas (birthing and rutting) and migratory corridors. (Section 7.2 also provides for a feasibility study of transfrontier protected	None.	The Altyn Dala Conservation Initiative, and related projects, aim to expand a relevant protected area network in Kazakhstan. "Temporary protected area" initiatives for Saiga are linked with this. Publication in 2013 of "Guidelines and

	areas).		recommendations to mitigate barrier effects of border fencing and railroad corridors on Saiga Antelope in Kazakhstan" is also contributing.
Memorandum of Understanding concerning Conservation Measures for the **West African Populations of the African Elephant** (*Loxodonta africana*) *Signature: 2005* *Entry into effect: 2005* *Range States: 13*	Not mentioned.	The *CMS - CITES Joint Work Programme 2012–2014* aims to strengthen transboundary protected area systems for the species, and this may support network-related aims.	Transboundary protected area projects funded by the EU (Bia-Gossou-Bossemati-Djambarakrou) and GTZ (W-Arly-Pendjari) are considered to be contributing to network development.
AQUATIC SPECIES			
Agreement on the Conservation of **Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area** (ACCOBAMS) *Signature: 1996* *Entry into force: 2001* *Range States: 29*	*Article II.1:* … Parties shall … co-operate to create and maintain a network of specially protected areas to conserve cetaceans.	*MOP Resolution 4.15* (2010) urges Parties, in collaboration with relevant others, to "share their draft plans for marine protected areas networks that include cetacean habitat as well as additional proposals for marine protected areas with cetacean habitat, in order to allow the Scientific Committee to give advice on the proposals across the entire region and to facilitate assessment of regional coverage and conservation needs". *ACCOBAMS Strategy 2014-2015* (annexed to Resolution 5.1, 2013), Specific Objective B5: Enhance effective conservation of cetaceans critical habitats.	A European Cetacean Society/ ASCOBANS/ ACCOBAMS workshop on "Selection criteria for Marine Protected Areas for cetaceans" in 2008 reviewed ecological network aspects in this context. (Report at http://ascobans.eaudeweb.ro/sites/default/files/publication/MPA_Workshop2007_final.pdf)
Agreement on the Conservation of **Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas** (ASCOBANS) *Signature: 1991* *Entry into force: 1994* *Range States: 18*	Not mentioned.	*MOP Resolution 6.1* (2009) appends the revised Jastarnia Recovery Plan for Baltic Harbour Porpoises; in which Recommendation 14 includes: "Expand the network of protected areas in the Baltic Sea and improve its	A European Cetacean Society/ ASCOBANS/ ACCOBAMS workshop on "Selection criteria for Marine Protected Areas for cetaceans" in 2008 reviewed ecological network aspects in this context. (Report at http://ascobans.ea

		connectivity". *MOP Resolution 7.2* (2012) appends the ASCOBANS Work Plan, Activity 8 of which is to "Review best practice approaches to management of marine protected areas for small cetaceans and make recommendations to Parties and other relevant authorities". (This is seen as an opportunity for enhancement of network-related approaches).	udeweb.ro/sites/default/files/publication/MPA_Workshop2007_final.pdf). ACCOBAMS interactive database (http://accobams.geo2i.com/) includes data layers on protected areas with cetacean habitat, and areas of special importance. Is a useful tool for strategic network planning (and is due to be enhanced in 2015)..
Agreement on the Conservation of **Seals in the Wadden Sea** *Signature: 1990* *Entry into force: 1991* *Range States: 3*	*Article VII.1:* Parties shall … pay due regard to the necessity of creating and maintaining a network of protected areas also in the migration areas of the seals in the Agreement Area and of ensuring the preservation of areas which are essential to the maintenance of the vital biological functions of seals.	*Conservation and Management Plan for the Wadden Sea seal population 2012-2016, section 3:* Efforts should be made to identify, maintain, extend and create protected areas for seals of an appropriate size in the trilateral Wadden Sea Cooperation Area and in adjacent areas and to take appropriate measures; and to ensure that the existing seal reserves cover the main birth, nursery and resting areas of seals and ensure that there is an adequate number of seal reserves.	[Anything to add?]
Memorandum of Understanding on the Conservation and Management of **Dugongs** (*Dugong dugon*) **and their Habitat** throughout their Range *Signature: 2007* *Entry into effect: 2007* *Range States: 42*	*Annexed Conservation and Management Plan, objective 3 (habitat):* Examples of specific actions that could be implemented include (b) Consider protecting dugong habitats as part of ecosystem based management (eg networks of marine protected areas).	None.	The Dugong, Seagrasses and Coastal Communities Initiative (endorsed in 2013 by MOS2 as the implementation framework for the MoU Conservation and Management Plan) seeks (inter alia) to establish a network of protected seagrass habitats across 10 countries in East Africa, South Asia, South East Asia and the Western Pacific, with support from GEF and the MoU Small

			Grants Fund.
Memorandum of Understanding on the Conservation and Management of **Marine Turtles and their Habitats of the Indian Ocean and South-East Asia** (IOSEA Marine Turtles MOU) *Signature: 2001* *Entry into effect: 2001* *Range States: 47*	*Annexed Conservation and Management Plan, activity 2.1(a):* Identify areas of critical habitat such as migratory corridors, nesting beaches, inter-nesting and feeding areas.	In a Resolution at their 6th meeting (SS6) in 2012, the Signatories established the "IOSEA Network of Sites of Importance for Marine Turtles in the Indian Ocean – South-East Asia Region", and adopted accompanying guidance. The Network is designed as a "mechanism for sites to operate more cooperatively and synergistically, both ecologically and administratively" and aims (*inter alia*) to "derive ecological and governance benefits that are not possible to achieve by managing individual sites in isolation", including "protection of ecological connectivity between habitats through strategic spacing and shape of sites", and "optimisation of regional resistance and resilience of marine turtle habitats to environmental stress", by "including and managing sites containing marine turtle habitats necessary for different life cycle phases", "protecting multiple examples of each habitat type" and "including sites that act as refugia".	Activities to implement the IOSEA Marine Turtle Site Network; including publication (in 2013) of site evaluation criteria (covering *inter alia* Network-wide considerations of area sufficiency, representativity and ecological connectivity).
Memorandum of Understanding concerning Conservation Measures for the **Eastern Atlantic Populations of the Mediterranean Monk Seal** (*Monachus monachus*) *Signature: 2007*	*Article 3:* The Action Plan will include measures to … (c) create a network of protected areas for the Monk Seal. *Annexed Action Plan* cites the creation of a Network of Special Areas of Conservation for the Monk Seal (SACMS) (action 10.3) as its "main action".	[Anything to add?]	The Spain-UNEP Partnership for Protected Areas, in support of the LifeWeb initiative launched at CBD COP9, makes some passing reference to networks and is (*inter alia*) helping to support monk seal conservation projects. [Anything more to

Entry into effect: 2007 *Range States: 4*			add?]
Memorandum of Understanding for the Conservation of **Cetaceans and their Habitats in the Pacific Islands Region** *Signature: 2006* *Entry into effect: 2006* *Range States: 22*	*Article 4:* The Action Plan will address … (b) habitat protection, including migratory corridors. (Annexed Whale & Dolphin Action Plan 2013-2017 says only, in Objective 4.3: identify and protect critical habitat and migratory pathways).	None.	None.
Memorandum of Understanding on the Conservation of **Migratory Sharks** *Signature: 2010* *Entry into effect: 2010* *Range States: 151*	*Article 12:* The Signatories should endeavour to … (c) ensure to the extent practicable the protection of critical habitats and migratory corridors and critical life stages of sharks. *Annexed Conservation Plan, item 9.1:* Designate and manage conservation areas, sanctuaries or temporary exclusion zones along migration corridors and in areas of critical habitat… .	None.	None.
Memorandum of Understanding Concerning the Conservation of the **Manatee and Small Cetaceans of Western Africa and Macaronesia** *Signature: 2008* *Entry into effect: 2008* *Range States: 29*	*Annexed Action Plan for the conservation of small cetaceans of Western Africa and Macaronesia, Objective 3.2:* identify key critical habitats, hotspots and migratory pathways that are candidates for improved conservation; (actions for which include) establish and manage networks of specially protected areas corresponding to the areas that serve as habitats and/or which provide important food resources for small cetaceans. *Annexed Action Plan for the conservation of the West African Manatee, Expected Outcome 3.1:* (includes) create networks of sanctuaries that provide excellent habitat and refuge areas for the West African Manatee (e.g. community based sanctuaries, Marine Protected Areas), both at the coast and in each river basin.	None.	None.
Memorandum of Understanding concerning Conservation Measures for **Marine Turtles of the Atlantic Coast of Africa** *Signature: 1999* *Entry into effect: 1999* *Range States: 25*	Not mentioned.	[Anything to add?]	[Anything to add?]

AVIAN SPECIES			
Agreement on the Conservation of **Albatrosses and Petrels** (ACAP) *Signature: 2001* *Entry into force: 2004* *Range States: 25*	Not mentioned.	[Anything to add?]	[Anything to add?]
Agreement on the Conservation of **African-Eurasian Migratory Waterbirds** (AEWA) *Signature: 1995* *Entry into force: 1999* *Range States: 120*	*Preamble:* Conscious that migratory waterbirds are particularly vulnerable because they migrate over long distances and are dependent on networks of wetlands that are decreasing in extent and becoming degraded. *Art III.2:* Parties shall (d) coordinate their efforts to ensure that a network of suitable habitats is maintained or, where appropriate, re-established throughout the entire range of each migratory waterbird species concerned, in particular where wetlands extend over the area of more than one Party to this Agreement. *Annex 3 (Action Plan) 7.4:* (The Secretariat shall prepare international reviews) on (c) the networks of sites used by each population, including reviews of the protection status of each site as well as of the management measures taken in each case.	*AEWA Strategic Plan 2009-2017, Target 1.2:* a comprehensive and coherent flyway network of protected and managed sites and other adequately managed sites of international and national importance for waterbirds is established and maintained, while taking into account existing networks and climate change. *Indicator:* Parties maintaining comprehensive national networks of sustainably-managed, protected, and other managed areas, that form a coherent flyway site network, which aims to be resilient to the effects of climate change. MOP Resolution 5.2 (2012) urges Parties "to develop and implement national action plans for filling gaps in designation and/or management of internationally and nationally important sites to establish a comprehensive and coherent flyway network by 2017 […]". [Still to check older MOP decisions]	Beginning with MOP5 (2012), MOPs to receive a periodic "Report on the site network for waterbirds in the Agreement area". Critical Site Network (CSN) Tool (http://wow.wetlands.org), developed through a GEF project by a partnership of AEWA, Ramsar, Wetlands International and BirdLife International: web portal for flyway-level information on waterbirds and the sites they use in the AEWA region, to underpin planning and management at site level.
Memorandum of Understanding on the Conservation of **High Andean Flamingos** (*Phoenicopterus andinus* and *P. jamesi*) **and their Habitats** *Signature: 2008* *Entry into effect: 2008* *Range States: 4*	Not mentioned.	Not mentioned.	There is a Network of Wetlands of Importance for Flamingo Conservation as the regional strategy to conserve flamingos and key habitats. Several sites in this network overlap with other existing initiatives, such as the Ramsar

			Convention, BirdLife's Important Bird Areas and the Western Hemisphere Shorebird Reserve Network.
Memorandum of Understanding concerning Conservation Measures for the **Aquatic Warbler** (*Acrocephalus paludicola*) *Signature: 2003* *Entry into effect: 2003* *Range States: 22*	*Annexed Action Plan, Expected Result 2:* All sites currently used by the Aquatic Warbler during its annual life cycle are in favourable conservation condition; and *Action 2.1:* Seek formal designation as protected areas of all sites regularly holding Aquatic Warblers. *[Emphasis added]*.	[Anything to add?]	[Anything to add?]
Memorandum of Understanding on the Conservation of **Migratory Birds of Prey in Africa and Eurasia** (Raptors MoU) *Signature: 2008* *Entry into effect: 2008* *Range States and Territories: 132*	*Article 8:* Signatories will endeavour to ... (b) coordinate their efforts to ensure that a network of suitable habitats is maintained or, where appropriate, established, *inter alia* where such habitats extend over the territory of more than one Signatory … . *Annexed Action Plan Target 2.1:* All important sites have conservation measures in place. *[Emphasis added].*	None.	International Species Action Plans are in development for the Saker Falcon, Sooty Falcon and Egyptian Vulture (Balkans and Central Asia). All three Plans will cover identification of networks of key sites.
Memorandum of Understanding on the Conservation and Management of the **Middle-European Population of the Great Bustard** (*Otis tarda*) *Signature: 2000* *Entry into effect: 2001* *Range States: 20*	*Annexed Action Plan, Objective 1.1.1:* protected areas for the Great Bustard should include the entire range of semi-natural habitat, such as partly-cultivated land, steppes, semi-steppes and grasslands, in which the movement of juveniles and adults during dispersal occurs.	[Anything to add?]	[Anything to add?]
Memorandum of Understanding concerning Conservation Measures for the **Ruddy-headed Goose** (*Chloephaga rubidiceps*) *Signature: 2006* *Entry into effect: 2006* *Range States: 2*	Not mentioned.	[Anything to add?]	[Anything to add?]
Memorandum of Understanding Concerning Conservation Measures for the **Siberian Crane** (*Grus leucogeranus*) *Signature: 1993* *Entry into effect: 1999*	*Annexed Conservation Plan, Objective 6.2:* Development of the Western/Central Asia Site Network for the Siberian Crane and other waterbirds.	[Anything to add?]	Western/Central Asian Site Network for Siberian Cranes and other waterbirds (WCASN) launched 2007 (26 sites);

Range States: 11			implemented mainly through UNEP/GEF Siberian Crane Wetlands Project (SCWP). [Anything else?]
Memorandum of Understanding Concerning Conservation Measures for the **Slender-Billed Curlew** (*Numenius tenuirostris*) *Signature: 1994* *Entry into effect: 1994* *Range States: 29*	*The Action Plan shall include:* ... (d) actions to protect all identified breeding areas as well as key migration and wintering sites … . *Annexed Action Plan:* specifies development/expansion of protected wetland networks in certain individual Range States.	[Anything to add?]	[Anything to add?]
Memorandum of Understanding on the Conservation of **Southern South American Migratory Grassland Bird Species and their Habitats** *Signature: 2007* *Entry into effect: 2007* *Range States: 5*	Not mentioned.	[Anything to add?]	[Anything to add?]

4.6 Of the 26 instruments currently in effect (seven Agreements and 19 MoUs), two-thirds (17) make some meaningful reference in their primary provisions (ie in the adopted instrument texts or equivalent) to ecological networks or related issues.

4.7 Some of these make provision in general terms for the creation of a network of protected areas or maintained habitats. Some emphasise coverage of an entire migratory range or inclusion of all key relevant sites for breeding, resting, feeding etc. Three (marine) examples refer to corridors. The AEWA Strategic Plan introduces the concept of a "comprehensive and coherent" flyway network composed of comprehensive national networks; and also refers to resilience to climate change.

4.8 There is no apparent pattern in whether the instruments making strong reference to networks are those that are more recently established[54] or have a larger number of Range States[55]. Perhaps surprisingly, more marine & aquatic instruments feature networks prominently than those which do not; while the terrestrial and aerial categories are each evenly divided[56]. It is not clear whether there is any meaningful reason for this.

4.9 As typically conceived, network provisions might be particularly important for animals that tend to be more site-concentrated (eg through habitat

[54] Adoption dates for instruments mentioning network issues range from 1990 to 2010, while the others date from between 2001 and 2010.

[55] Range State numbers for instruments mentioning network issues range from three to 151, while for the others they range from two to 64.

[56] Eight marine & aquatic instruments mention network issues compared to only one which does not. For terrestrial instruments the ratio is 3:2, and for aerial ones it is 6:6.

specialisation or congregatory behaviour), more site-faithful (which can include intermittent fidelity[57]) or distributed across more Range States. Such factors however do not appear to have determined where the concept appears most strongly in the list of instruments.

4.10 The differences are as likely to arise from the varied origins of each instrument, the organic evolution of their respective drafting negotiations and the general conservation models they each happened to draw upon, as from any empirically differing views about network concepts.

4.11 It would seem, moreover, that in principle there is no fundamental reason why the network concept could not be as applicable to those instruments which currently do not mention it, as to those which do.

4.12 In the existing cases where it does not appear, and in the case of new instruments under development, those concerned may wish to study the example formulations already in use as shown above, together with the definition parameters discussed in section 2, to devise an appropriate expression of what could be included.

4.13 Similar considerations would apply to certain other initiatives under CMS, such as concerted actions, cooperative actions and single species action plans (SSAPs). One prominent example, the Sahelo-Saharan megafauna concerted action, currently makes no reference to ecological networks in its primary framework document[58] (although its Action Plan is currently being updated). The Central Asian Flyway initiative however makes provision for a flyway site network (described in a mixture of terms relating both to ecological functions and to knowledge-exchange)[59], while under the Central Eurasian aridland mammals concerted action[60] a Programme of Work is due to be submitted for adoption at COP11, in which ecological networks and connectivity are included; and the draft SSAP for Argali includes an action aimed at increasing the effectiveness of protected area networks in terms of their coverage and interconnectivity[61].

[To add: any further discussion points, once the table is as complete as it can be. To highlight in particular the operational tools being used in the CMS context (eg AEWA Critical Site Network tool; IOSEA Marine Turtles Network criteria & guidance).
A concluding paragraph also to be added.].

[57] See comment under “scope” in section 2.

[58] Beudels-Jamar, R C, Devillers, P and Lafontaine, R M (1998). Action Plan for the conservation and restoration of Sahelo-Saharan antelopes. Revised version adopted by the workshop on conservation and restoration of Sahelo-Saharan antelopes, Djerba, Tunisia, 19-23 February 1998.

[59] Central Asian Flyway Action Plan for the conservation of migratory waterbirds and their habitats (2005). Finalised by the second meeting of Range States, New Delhi, 10-12 June 2005.

[60] CMS COP Recommendation 9.1 (2008): Central Eurasian aridland mammals. (Note that the species now covered by this include Saiga Antelope, Bukhara Deer and Argali, on which more specific instruments exist and are discussed separately here).

[61] Mallon, D, Singh, N, and Röttger, C (in prep). International Single Species Action Plan for the Conservation of the Argali *Ovis ammon*. CMS Technical Series, Bonn.

5. Opportunities and recommendations

5.1 The fundamentals of an agenda for action on ecological networks in the CMS context were set out in Resolution 10.3, and they remain applicable. The main opportunities for the future consist of increasingly making those provisions operational (they are re-summarised below). This report in section 2 has further elaborated a range of strategic considerations to help Parties and others attend more fully to this.

5.2 Sections 3 and 4 above have illustrated some of the existing frameworks upon which enhanced network approaches can be built, in order to achieve generally better connectivity and coherence in ecological networks for migratory species in future, as urged by the Resolution.

Policy principles, objective-setting and network design

5.3 Resolution 10.3 invites and encourages Parties and others to (*inter alia*):

- collaborate to identify, designate and maintain comprehensive and coherent ecological networks of protected sites and other adequately managed sites of international and national importance for migratory animals;
- enhance the quality, monitoring, management, extent, distribution and connectivity of terrestrial and aquatic protected areas, including marine areas, so as to address as effectively as possible the needs of migratory species throughout their life cycles and migratory ranges, including their need for habitat areas that offer resilience to change (including climate change);
- make explicit the relationship between areas of importance to migratory species and other areas which may be ecologically linked to them, for example as connecting corridors or as breeding areas related to non-breeding areas, stopover sites, feeding and resting places;
- make full use of all existing complementary tools and mechanisms for the identification and designation of critical sites and site networks for migratory species and populations, for example by further designations of wetlands of international importance (Ramsar sites);
- select areas for relevant protection and conservation measures in such a way as to address the needs of migratory species as far as possible throughout their life cycles and migratory ranges;
- set network-scale objectives for the conservation of migratory species within protected area and equivalent area-based conservation systems, relating for example to restoration of fragmented habitats and removal of barriers to migration.

5.4 Case studies of ecological networks, compiled in parallel with the present report, demonstrate a number of examples of useful practices that have been shown to be effective. As summarised in the separate compilation document[62], these include: *[Amend these points as necessary if the case studies doc gets amended]*

[62] CMS Secretariat (in prep). Ecological Networks - Case studies, challenges and lessons learned. UNEP-CMS report.

- Having a shared vision among cooperating parties, and a clearly expressed purpose;
- Having strong, sufficiently broad and influential institutional structures, backed by an explicit formal agreement;
- Incorporating (and making the network relevant to) socioeconomic factors;
- Having a well-researched scientific basis; but also making good use of local wisdom;
- Genuinely involving stakeholders (not just consulting them);
- Designing the network according to the functional ecological needs at stake, including both spatial and temporal dimensions;
- Planning according to a recognition that the system overall may only be as strong as the (ecologically) "weakest link in the chain";
- Designing (where appropriate) in a way that will spread risks, to underpin resilience;
- Where necessary, building a network by joining relevant existing measures together;
- Making appropriate use of "flagship species" to promote wider conservation agendas;
- Adopting an "adaptive management" approach (adjusting in the light of experience).

5.5 Based on the discussion in section 2 of the present report, factors to consider in designing an ecological network might usefully include the following:

Objectives

- Define a common purpose to which all the constituent areas contribute;
- Have some idea of a conservation function being performed by the system as a whole, as well as by any one site within it;
- Define objectives for sufficiency and coherence of the system overall, in terms of its functional integrity and (eg) representativity, risk-management, ecological viability and "spreading" vs "concentrating" distribution objectives;

Scope

- As well as formally protected areas, consider including other special sites, connecting corridors, the wider fabric of landscape/seascape they sit within, and the ecological processes that bind them together;
- Take a holistic view of how these various ingredients all interrelate;
- Aim to cater where appropriate for the entire migratory range/migratory system of the animals concerned;
- Consider how the network will address temporal factors as well as spatial ones; for example in behaviour of the animals or in the distribution of water, food, temperature, wind, sight-lines/visibility, predators, prey and human interference; such that critical factors that distribute in the landscape according (for example) to a seasonal succession are catered for sufficiently;

Ensuring functional benefits of connectivity

- Consider how the “connectivity” dimension of the network can contribute to the elimination of obstacles to migration, including disturbance, habitat fragmentation and discontinuities in habitat quality as well as the more obvious physical obstacles;
- Be clear about the functional relationships between places that are important in supporting the process of migration at an ecosystem level and a network scale;
- Be clear how particular individual contributions in the network add up to its intended total result;
- Where possible, test assumptions about intuited connectivity factors, eg the assumed importance of structural factors in the landscape;

Other design factors

- Include consideration of less visible aspects of functional connectivity, eg genetics, trophic processes and climate risk factors;
- Tailor the given network to the particular migratory patterns of the animals concerned, and to whether they travel over land, in water or through the air;
- Select areas against an appropriate timeframe for defining the range of natural variation;
- Consider using a combination of connecting “hotspots”, buffering the core, providing “spare” capacity at times of ecological stress and disruption, and otherwise spreading risks across multiple locations as a way of supporting resilience to negative change;
- Take account of site use that may be intermittent and less than annual, but a form of site-fidelity nonetheless;
- Include capacity for variability and resilience to change, as well as covering normal cycles of migration;
- Be clear about the role of any “critical” sites in the system, and ensure they are included;

Assessing risks

- Be alive to any risks of potential unwanted consequences of increased connectivity in respect of non-target species, such as disease organisms, problematic predators, ecological competitors or invasive species; and the potential for exacerbating certain kinds of human pressures;

The implementation regime

- Ensure consistency and coordination of management and policy responses from one place to another;
- Consider any need to adapt the network’s design and/or coverage in light of shifting baselines, novel ecosystems and changes related to climate change (while guarding against spurious claims of irrecoverable change based on ulterior motives).

[To add - any other relevant sources of information, guidance and tools that can be used?]

Further work required

[To add. The suggestions listed below are in most cases merely topic headings at this stage and will need further discussion and elaboration. They identify potential areas of activity to be pursued in the period following COP11. In combination perhaps with some elements from the paragraphs of section 5 above, these can then feed in to the recommendations to be appended to the draft COP11 Resolution on "Advancing ecological networks to address the needs of migratory species". Possibilities include:

- Bring existing tools and guidance together better/differently.
- Develop new tools, guidance, training etc as necessary.
- Any other priorities for capacity building.
- Find a way of undertaking some results-based assessment of the implementation of Res 10.3 para 7 (whether Parties are addressing as effectively as possible the needs of migratory species throughout their life cycles and migratory ranges by means of ecological networks and enhanced habitat connectivity); and para 9(i) (the extent to which and the manner in which existing major protected area systems and initiatives aimed at promoting ecological networks address the needs of migratory species throughout their life cycles and migratory ranges). Results could generate further case studies too.
- (Arising from section 3) improving/harmonising the ways in which the needs of migratory species are reflected in particular existing networks.
- Steps for improving other synergies between MEAs on this subject.
- (Arising from section 4) improving/harmonising the ways in which ecological networks are reflected in particular existing CMS instruments/initiatives.
- Better knowledge on animal distributions and movement patterns etc will obviously help, especially for gap-analyses in networks (role for tools such as Movebank and ICARUS, and a proposed atlas of animal migration); although this goes into a wider/more general research subject than is relevant for the present report.
- Perhaps need to stimulate more publication of research in the scientific literature on ecological networks, to address migratory species aspects specifically.
- Follow further development and operation of BIP indicator on "protected area overlays with biodiversity" for Aichi target 11, in particular to explore possibilities for its application to data on migratory species and migratory ranges. (Links to implementation of Stategic Plan for Migratory Species).
- Investigate the prospects for other relevant biodiversity indicators to shed light on the "ecologically representative and well connected" element of Aichi target 11. (Links to implementation of Stategic Plan for Migratory Species).
- Advocate for all network managing authorities to review (i) the functionality of their network for supporting migratory species and migration, and (ii) provisions in relevant governing frameworks and guidance etc for ensuring that migratory species aspects are taken fully into account. The network design principles etc listed in the paras above will assist in devising appropriate guidance for such reviews.
- Follow further development of coherence assessment methodologies in OSPAR and Helcom (they don't address migration, and they may be too

advanced to change that now; but there are nevertheless some useful aspects to consider in the CMS context).

- Consider ways of using network coherence as a yardstick for assessing proposals for habitat compensation in relevant circumstances (ie developing from the principle adopted for Natura 2000).
- Conversely, perhaps consider also how to approach compensating for irrecoverable loss of functionality, extent or other values of networks themselves.
- Other issues?]

Annex 1. COP Resolution 10.3

UNEP/CMS/Resolution 10.3

The role of ecological networks in the conservation of migratory species

Adopted by the Conference of the Parties at its Tenth Meeting
(Bergen, 20-25 November 2011)

Recognizing that habitat destruction and fragmentation are among the primary threats to migratory species, and that the identification and conservation of habitats of appropriate quality, extent, distribution and connectivity are thus of paramount importance for the conservation of these species in both the terrestrial and marine environments;

Recognizing in particular that opportunities for dispersal, migration and genetic exchange among wild animals depend on the quality, extent, distribution and connectivity of relevant habitats, which support both the normal cycles of these animals and their resilience to change, including climate change;

Further recognizing that sites that perform a critical role in a wider system, such as core areas, corridors, restoration areas and buffer zones, may be linked by strategies that, through a concept of ecological networks, address habitat fragmentation and other threats to migratory species;

Considering that the designation of protected areas across very large areas is not always possible and that additional wider landscape measures usually need to be applied in order to address and mitigate anthropogenic changes at the wider landscape scale;

Acknowledging that the practical approach to the identification, designation, protection and management of critical sites will vary from one taxonomic group to another or even from species to species, and that the flyway approach provides a useful framework to address habitat conservation and species protection for migratory birds along migration routes;

Further acknowledging that flyways constitute a specific type of migration corridor, that migratory birds depend on widely separated areas for their survival, and that measures designed to conserve these networks should focus on the breeding grounds, stop-over sites, non-breeding areas and feeding and nesting places;

Noting that the Convention text makes specific reference to habitat conservation, for example in Article III.4, Article V.5e and Article VIII.5e;

Aware that several initiatives aimed at promoting ecological networks are in existence already at different scales, including bird flyway initiatives, protected area programmes under the auspices of relevant Multilateral Environmental Agreements, and initiatives that extend to areas that are not protected;

Further aware that the success of many of these initiatives and programmes depends fundamentally on, *inter alia*, effective international cooperation, including transboundary cooperation, among governments, different conventions, Non Governmental Organizations (NGOs) and other actors;

Considering that migratory species merit particular attention in designing and implementing initiatives aimed at promoting ecological networks, in order to ensure that the areas selected are sufficient to meet the needs of such species throughout their life cycles and migratory ranges;

Recalling Target 11 of the Aichi Biodiversity Targets 2020 approved by the Convention on Biological Diversity in 2010, which states "By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes", is especially relevant for the conservation of terrestrial and marine migratory species;

Acknowledging that functional networks of habitats encompassing full regional variation can assist migratory species in adapting to climate change in line with Resolution 10.19 and can strengthen conservation strategies where the response of species to climate change is uncertain;

Also acknowledging that marine species habitat is not a stationary resource for many coastal species and most oceanic species listed on the CMS Appendices;

Further acknowledging that processes, workshops and tools are underway within the Convention on Biological Diversity that can assist in identifying habitats important for the lifecycles of migratory marine species listed under CMS Appendices; *Aware* of the importance for the conservation of migratory species of integrating approaches to ecological networks in national environmental planning, including plans currently being developed under the auspices of other Multilateral Environmental Agreements, such as National Biodiversity Strategies and Action Plans (under the Convention on Biological Diversity), as recognized by UNEP/CMS/Resolution10.18, and National Adaptation Plans (under the United Nations Framework Convention on Climate Change);

Also aware of the importance of promoting cooperation though the competent international and regional organizations where appropriate to seek the adoption of conservation measures to support ecological networks in the marine environment;

Welcoming the progress described in Document UNEP/CMS/Conf.10.33 on bird flyway conservation policy, as well as Resolution UNEP/CMS/10.10 on guidance on global flyway conservation and options for policy arrangements;

Recognizing the increasing number of national and regional migratory species-related networks globally and *welcoming* the two CMS-linked ecological networks to promote conservation of migratory waterbirds and their habitats: the Western/Central Asian Site Network for the Siberian Crane and other Migratory Waterbirds under the UNEP/GEF Siberian Crane Wetland Project to further implement the MOU concerning the Siberian Crane, as an important step to establish a network to protect migratory waterbirds in this region, and the East Asian - Australasian Flyway Partnership and its East Asian – Australasian Flyway Site Network (as recognized by Resolutions 9.2 and UNEP/CMS/Res.10.10);

Noting with pleasure the widespread recognition of the recently developed Critical Site Network Tool under the African-Eurasian Flyways GEF Project, also known as Wings over Wetlands, as an innovative and effective instrument for

underpinning the management of important sites for waterbirds in the African-Eurasian Waterbird Agreement area, and which *inter alia* sets those sites in their flyway context;

Welcoming global databases such as MoveBank which make tracking data available to conservation planners and to the public, and which are likely to assist in the identification of critical conservation sites; and

Acknowledging that the ability to track small animals globally will greatly enhance the knowledge base for informed conservation decision making, and that this could be achieved by new space-borne global tracking initiatives such as ICARUS (International Cooperation for Animal Research Using Space), planned for implementation on the International Space Station by the European Space Agency (ESA);

The Conference of the Parties to the Convention on the Conservation of Migratory Species of Wild Animals

1. *Calls on* Parties and Signatories of CMS Memoranda of Understanding to consider the network approach in the implementation of existing CMS instruments and initiatives;

2. *Encourages* Parties and other Range States, when identifying areas of importance to migratory terrestrial, avian and aquatic species, to take into account and make explicit by description, schematic maps or conceptual models the relationship between those areas and other areas which may be ecologically linked to them, in physical terms, for example as connecting corridors, or in other ecological terms, for example as breeding areas related to non-breeding areas, stopover sites, feeding and resting places;

3. *Invites* Parties and other Range States and relevant organizations to collaborate to identify, designate and maintain comprehensive and coherent ecological networks of protected sites and other adequately managed sites of international and national importance for migratory animals while taking into account resilience to change, including climate change, and existing ecological networks;

4. *Urges* Parties and other Range States and partners to make full use of all existing complementary tools and mechanisms for the identification and designation of critical sites and site networks for migratory species and populations, including through further designation of Wetlands of International Importance (Ramsar Sites) for migratory waterbirds and other migratory wetland-dependent taxa;

5. *Highlights* the added value of developing ecological networks under CMS where no other network instruments are available, as for example with the West Central Asian Flyway Site Network and the East Asian-Australasian Flyway Site Network, and *urges* Parties and *invites* Range States to strengthen management of existing network sites and their further development through designation and management of additional sites;

6. *Further encourages* Parties and relevant organizations, when implementing systems of protected areas, and other relevant site- and area-based conservation measures, to:

(i) select areas in such a way as to address the needs of migratory species as far as possible throughout their life cycles and migratory ranges;

(ii) set network-scale objectives for the conservation of these species within such systems, including by restoration of fragmented and degraded habitats and removal of barriers to migration; and (iii) cooperate internationally for the achievement of such objectives;

7. *Invites* Parties, in collaboration with other Multilateral Environment Agreements (MEAs), NGOs and other stakeholders, as appropriate, to enhance the quality, monitoring, management, extent, distribution and connectivity of terrestrial and aquatic protected areas, including marine areas, in accordance with international law including UNCLOS, so as to address as effectively as possible the needs of migratory species throughout their life cycles and migratory ranges, including their need for habitat areas that offer resilience to change, including climate change, taking into account the wider landscape and seascape;

8. *Further invites* Parties and other States as well as relevant international fora, as appropriate, to explore the applicability of ecological networks to marine migratory species, especially those that are under pressure from human activities such as over exploitation, oil and gas exploration/exploitation, fisheries and coastal development;

9. *Requests* the Scientific Council, in conjunction with the Secretariat and in consultation with relevant organizations and key stakeholders, to conduct a strategic review to:

(i) assess the extent to which and the manner in which existing major protected area systems and initiatives aimed at promoting ecological networks address the needs of migratory species throughout their life cycles and migratory ranges, including the issue of resilience to climate change and taking into account the significant difference in ecology and behaviour between terrestrial and aquatic species;

(ii) identify among CMS Agreements and other CMS instruments the current use and potential future use of ecological network concepts and approaches;

(iii) identify opportunities for enhancing the effectiveness of and synergies between relevant initiatives and programmes on protected areas and ecological networks in respect of the conservation needs of migratory species; and

(iv) report the results, including recommendations, to the Conference of the Parties at its eleventh Meeting;

10. *Requests* the Secretariat to compile existing case studies that are relevant to migratory species representative of the different taxonomic groups and/or groups related to major ecosystem types and report the results, including recommendations, to the Conference of the Parties at its eleventh meeting to illustrate the practical application of the approaches described in the present Resolution and to support the sharing of experience among Parties;

11. *Further requests* the Secretariat, subject to availability of resources, to work with Parties and the Scientific Council and other international and regional organizations, including the Convention on Biological Diversity, in organizing regional and sub-regional workshops to promote the conservation and management of critical sites and ecological networks among Parties;

12. *Requests* Parties and *invites* relevant funding agencies to provide adequate, predictable and timely financial support for the work of the Scientific Council and the Secretariat in pursuit of the work defined in the present Resolution;

13. *Invites* the Global Environment Facility (GEF) in making its funding disbursement decisions to give support to activities that will assist in taking forward the areas of work defined in the present Resolution, in particular, to support improved habitat management at the site level through the use of tools and resources developed specifically for the conservation of migratory species in their flyway, migratory path or ecological network context, and to support the sharing of information and experience;

14. *Calls on* MEAs, other intergovernmental organizations and relevant Non-Governmental Organizations to support the implementation of the present Resolution, including by sharing information and by collaborating in the technical work described above;

15. *Urges* Parties, the scientific community and other organizations to support the use of existing databases for research aimed at scientifically based conservation decisions within the CMS framework and other policy fora; and

16. *Urges* CMS National Focal Points and Scientific Councillors to work closely with relevant organizations such as the European Space Agency and its Focal Points to support new technology developments such as the ICARUS experiment to track the movement and fate of migratory animals globally.

Annex 2. Case studies: lessons learnt

In Resolution 10.3 (2011), the CMS Parties requested the Secretariat to "compile existing case studies that are relevant to migratory species representative of the different taxonomic groups and/or groups related to major ecosystem types and report the results, including recommendations, to the Conference of the Parties at its eleventh meeting to illustrate the practical application of the approaches described in the present Resolution and to support the sharing of experience among Parties".

That work has been undertaken in parallel with the present report[63], and recommendations arising from its findings have been incorporated into section 5 above.

For each of the 15 case studies, a number of lessons learnt from the practical case experiences have been distilled, and these in particular have helped to inform the resulting recommendations. They are reproduced below.

Amend these extracts as necessary if the case studies doc gets amended

1. The Selous - Niassa Wildlife Corridor: African Elephants and Wild Dogs

Game reserves, corridors and community involvement

Lessons learnt from this example:

- Detailed, on-the-ground prior studies of migratory animals' spatial usage of the wildlife corridor at the heart of this network have provided a robust scientific basis for its delineation.
- A strategic network-scale approach has resulted from the application of a well-coordinated mix of different management and protection tools (game reserves, Wildlife Management Areas, buffer zones etc).
- Close involvement of stakeholders and village communities in establishing and operating the network has built awareness and support, and integration of a sustainable livelihoods dimension has ensured the network's relevance to local people.

2. Central Albertine Rift Protected Areas: Mountain Gorillas

Landscape-scale cooperation at the intersection of three countries

Lessons learnt from this example:

- Collective recognition by three adjoining countries that the ecological system for gorillas centred on the intersection of their respective jurisdictions, was an essential starting-point.
- High-level institutional frameworks, such as the CMS Gorillas Agreement and MoUs between the protected area authorities of the three countries, have provided the necessary political infrastructure to enable a truly joint approach.
- A revenue-sharing agreement has been an important ingredient in the basis for cooperation
- Good partnership working between NGO and government players has been key to effective delivery.

[63] CMS Secretariat (in prep). Ecological Networks - Case studies, challenges and lessons learned. UNEP-CMS report.

3. The "Tridom" Landscape network: Forest Elephants and Western Lowland Gorillas

Addressing multiple threats through an ecosystem-based approach

Lessons learnt from this example:

- The willingness of the governments of Cameroon, Congo and Gabon to take a purpose-driven trilateral view of their protected area systems allowed a single strategic plan for corridor areas to be devised.
- A formal trilateral agreement and governance structure have been helpful; as have the institutional structures created under the wider Yaoundé Declaration on sustainable forest management (7 countries).
- Coordination has also been assisted by park wardens from the three countries undertaking activities on a joint basis, and by engagement at a strategic level of private sector mining and logging interests (which, along with hunting and poaching, still represent considerable challenges for conservation of the area).

4. The Kanchenjunga Conservation Area: Snow Leopards

Networking for a low-density, widely-dispersed species

Lessons learnt from this example:

- Special considerations apply when planning ecological networks for species with low population densities and large home ranges. When the overall numbers of the species are also very low, such networks can be important not only for supporting migratory patterns but also in facilitating genetic flow between populations.
- In identifying critical sites for the Kanchenjunga network, local knowledge from farmers played an important role alongside research by conservation experts.
- A shift from a species-focused approach to one based more on community-based landscape management has provided more enlightened solutions.

5. The Mesoamerican Biological Corridor: Jaguars

Using a charismatic "flagship" species to promote sustainable resource use

Lessons learnt from this example:

- Formal endorsement of the Mesoamerican Biological Corridor at Heads of State level has given it good political status, but strong coordination at institutional level has been lacking.
- The evocative "branding" of the network ("Path of the Panther") succinctly conveys the concept and may have helped to raise its profile; although its specific purposes could have been more clearly promoted.
- Significant investment in the design mapping stage allowed relevant land and resource use/socioeconomic factors to be taken into account.
- A lack of legally protected status for most of the areas has required more emphasis to be put on other measures, such as economic incentives. This has some advantages, but is also a precarious situation, with pressures on habitats being high, and fragmentation of habitat corridors remaining a problem in many places.
- A small project grants regime proved divisive and lost its focus on migration-related network connectivity aims: its purposes could have been more clearly agreed and then followed more closely.

- An independent evaluation of the network was useful in highlighting practical implementation strengths and weaknesses.

6. An International Protected Area for the Daurian steppe: Mongolian Gazelles

Catering for regular and irregular migratory movements over a wide area

Lessons learnt from this example:

- The network approach in this instance provided a mechanism for one CMS Party (Mongolia) to cooperate with two non-Parties (China and Russian Federation) in joint action for migratory species.
- A clear choice and definition of purposes at the outset can fundamentally affect what is ultimately delivered. This network was conceived mainly as a protected area for a transboundary ecological region, rather than specifically to address the migration system of the gazelles (although it may have delivered better for migratory requirements of cranes). Subsequent area extensions have included more parts of the gazelles' migratory system; but the overall network design remains shaped by the original concept.
- Foresight in accounting protocols also pays dividends: in the three national jurisdictions here, insufficient provision under specific budget-lines for the kind of cooperation required made funding this network difficult.
- Communication is the basic currency of cooperation: insufficient resources for language translation in this case also caused difficulties.

7. A management plan for the Danube River Basin: Sturgeons

Tackling obstacles to migration throughout an entire river system

Lessons learnt from this example:

- Defining the aim of this network in terms of securing habitat continuity has made it very clearly focused on the specific added value of a network approach, for the migratory species concerned. A similarly focused emphasis on targeting obstacles to migration (while also addressing habitat quality and other issues) has also contributed to its success.
- For migratory fish in rivers, a truly strategic approach can only be organised at the river basin scale. In the case of the Danube, the 14-country International Commission for the Protection of the Danube River provides an appropriate institutional cooperation platform for this.
- EU legislation (the Water Framework Directive) has provided a strong policy driver for the operation of this network.

8. The North Atlantic "Sister Sanctuary" partnership: Humpback Whales

Linking protection of critical feeding and breeding areas

Lessons learnt from this example:

- A good basis in scientific research has given a robust justification for addressing humpback whale conservation with a sufficient extent of protected areas in different parts of its migratory range.
- The nature of the conservation controls and protections applied varies considerably between the different jurisdictions and protected area types in this network. Where strengthened protection has been achieved, this appears to be unrelated to the existence of the network; the added value of the latter lying instead more with collaboration on research and outreach.

9. The Great Barrier Reef Marine Park: Dugongs

A network of sub-zones within one large protected area

Lessons learnt from this example:

- The network in this instance consists of zones with particular restrictions (eg no-take zones) all within the Great Barrier Reef Marine Park; hence this shows an application of the "network" concept within a single protected area, rather than (for example) a chain of such areas. The migratory movements primarily addressed by this take place within one country (albeit at continental scale, since the country is Australia) rather than as migration in the CMS sense; but the concept would in principle be applicable to transfrontier protected areas too.
- The scale of the network design has had to be sufficient to encompass natural variability in the distribution of the dugong's favoured habitat (seagrass beds), resulting from cyclones and other episodic extreme weather events.

10. Marine Protected Areas in the Lesser Sunda Ecoregion: Large Marine Fauna

Coastal and marine areas integrated in a single network

Lessons learnt from this example:

- Given the threats of system-level change to fragile underwater habitats in this area, linked to a range of pressures (including climate change) it has proved valuable to design this network according to concepts of resilience (for example in determining adequate representation of habitat and species distributions).
- In order to cater for elements such as marine species that nest on beaches, migratory routes that span shallow and deep waters, land-based threats to the marine environment, and human use of marine resources, this network has had to be designed in such a way as to take an integrated approach to both the coastal and offshore components of the ecoregion.

11. Asian wetland networks: Siberian Crane

How a network was developed from a GEF project

Lessons learnt from this example:

- The development of this network gained significant impetus from a dedicated multi-country GEF project backed by a CMS MoU, and from being designed specifically to match the entire flyway (and life-cycle) of a single species (while also simultaneously benefiting other species that have related habitat needs).
- The key to the flyway approach required in this case was felt to lie with linking conservation efforts at local and national level with the international context.
- Where pre-existing initiatives could be drawn upon and integrated (notably the North East Asian Crane Site Network), this helped to accelerate progress in those areas.
- Indigenous people generally supported the project, since they perceived it as helping to safeguard their heritage. Incorporation of a socioeconomic dimension in the creation of the network helped to secure people's cooperation and commitment to it.

- An evaluation of the project during its first phase allowed adaptive improvements to be made in the second phase.

12. European steppe farmland: Great Bustards

Agri-environment measures and connectivity

Lessons learnt from this example:

- The projects described here illustrate the application of "network thinking" or "flyway thinking" to a situation where conservation measures for a migratory species had been actively underway, but had focused more on habitat improvement in core areas. Mitigating obstacles to migration (powerlines) therefore added a useful "connectivity" dimension to the existing (EU) policy measures.
- Paradoxically, greater success in protection/favourable management of core habitat areas may have worked against the interests of promoting network connectivity and maintenance of the bustards' migration system (by concentrating birds more than before, and reducing their tendency to travel to other sites).

13. The Western Hemisphere Shorebird Reserve Network: Red Knots

Critical sites and their role in a flyway

Lessons learnt from this example:

- This case shows an example of a network approach based on research knowledge about the relative importance of sites in a flyway, and about why particular sites are critical to the whole system (such as Delaware Bay and its Horseshoe Crab harvest). Harmonized monitoring methods have been important to this.
- This case also provides an example of regional network initiative which, supported by its research activities, acted as the stimulus for global prioritisation of the conservation needs of the species (through CMS Appendix I listing), rather than Convention listing being the stimulus to set up the network. Both of these scenarios are therefore possible.

14. A "Nectar Corridor" for migrating pollinators: birds, bats and butterflies

Designing for both spatial and temporal factors

Lessons learnt from this example:

- Effective networks for pollinators depend not only on suitable spatial design but also on catering for critical temporal factors related to flowering of the pollen-bearing plants.
- This case also shows that measures can be successfully taken to improve the conservation status of invertebrate migrants.

15. The Danube River Protected Areas Network: White-tailed Eagles

A network built by scaling-up existing schemes

Lessons learnt from this example:

- Use of a charismatic "flagship species" can help to promote a network with a broad range of benefits for other species sharing similar needs.
- It proved possible in this case to construct a network covering the whole river corridor by building on pre-existing bilateral and other cooperation arrangements for smaller components of the system.