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Article

Transboundary Wildlife Conservation in A Changing Climate: Adaptation of the Bonn Convention on Migratory Species and Its Daughter Instruments to Climate Change

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Abstract: Species migrating across boundaries represent the classic case for international cooperation in biodiversity conservation. Climate change is adding fresh challenges to such cooperation, on account of the shifting ranges and particular vulnerabilities to climate change of migratory wildlife. In view of the need to help migratory species adapt to climate change with minimal losses, this article performs an in-depth analysis of the present and potential future role in respect of climate adaptation of the main intergovernmental regime for migratory species conservation, the 1979 Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS) and its various daughter instruments.

Keywords: migratory species; climate change; adaptation; Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS)

1. Introduction

Migratory wildlife represents the classic case for international cooperation aimed at nature conservation. As an early article on the topic observes, migratory species "traverse national frontiers without regard for passport regulations" [1]. The same article renders a practical example of international cooperation for migratory bird conservation dating from 1931: "Flocks of swallows, caught by an unusual cold snap in the Alps, fell exhausted as they were unable to surmount the great altitude but the Austrians gathered together the survivors, packed them in wooden crates, and shipped them over the Alps to the milder climate of Venice" [1]. This case of "assisted migration" in the literal sense (please note the different meaning of the term in the context of climate adaptation, discussed below) provides

an apt opener for the present article, the focus of which is on the junction of migratory species, climate change and international law. Erratic weather spells, such as the unusual cold snap from the Alpine example, are predicted to occur more often as climate change advances [2], and many other impacts of climate change on migratory species have been documented or predicted (see Section 2.2 for an overview).

The main purpose of this article is to analyze the role of the principal intergovernmental migratory species regime, consisting of the Convention on the Conservation of Migratory Species of Wild Animals (CMS, or "Bonn Convention") [3] and its ancillary instruments ("daughter instruments"), in respect of the adaptation of wildlife to climate change. The Bonn Convention was adopted in 1979, well before the adaptation of species to climate change became an item on intergovernmental agendas. This naturally raises questions as to the suitability of the CMS regime for meeting the present challenge of facilitating the adaptation of species to climate change. Against this background, the current article aims (a) to assess the extent to which the CMS regime currently addresses the adaptation issue; (b) to identify relevant questions and future challenges in this regard; and (c) to explore suitable approaches for dealing with these questions and facing these challenges.

The article is structured as follows. Section 2 of the article introduces the conservation challenge posed by the increasing impacts of climate change on wildlife, and migratory species in particular. Section 3 discusses the role of international wildlife law generally with regard to this challenge. Sections 4 and 5 then analyze the Bonn Convention and its daughter instruments. Section 6 addresses particular legal questions in respect of the CMS regime which are expected to come to the fore as climate change advances. Section 7, finally, contains concluding remarks and recommendations. Whereas the article is predominantly legal, it has been written with a broader, transdisciplinary readership in mind.

2. Climate Change and Migratory Species

2.1. Climate Change and Wildlife: The Adaptation Challenge

It is presently well established that climate change is exercising important and increasing effects on biodiversity across the globe, and that action is urgently required if species and ecosystems are to adapt to the changing climate with as few losses as possible [4]. A transition has been set in motion, as one author put it, "from the nature we once knew to the nature that we expect to find around us on the other side of climate change" [5]. The scientific literature documenting this transition is growing rapidly. It suffices to cite a few recent examples. A major study in *Nature Climate Change* finds that bird and butterfly populations in Europe are changing fast, but not fast enough to keep pace with the changing climate [6]. In the last twenty years, bird and butterfly communities respectively moved an average 37 and 114 kilometers to the north, but are still lagging far behind the even swifter northward shift of average temperatures. The "climate debt" built up in two decades by the studied bird and butterfly communities was found to correspond to a 212 kilometers lag behind climate for birds and a 135 kilometers lag for butterflies. It thus appears that even winged creatures have trouble keeping up with changes in climatic conditions, *inter alia* because the base of their food chains does not keep up [6]. Another publication reports a recent discovery concerning the Ethiopian bush-crow (*Zavattariornis stresemanni*). It turns out that the curiously restricted range of this globally endangered bird, which has

baffled scientists since the 1930s, precisely coincides with a "bubble" of cool, dry climate [7]. Inside this area, where the average temperature is below 20 °C, bush-crows are virtually everywhere. Outside the area, where the average temperature is higher, they do not occur at all, probably because bush-crow chicks cannot survive there. Hence the description of the Ethiopian bush-crow by lead author Paul Donald as "a cool bird, that appears to like staying that way" [8]. This makes the bird one of the most vulnerable species to climate change in the world. As Nigel Collar, another of the study's authors, dramatically phrased it, "the storm of climate change threatens to swamp the bush-crow's little climatic lifeboat—and once it's gone, it's gone for good" [8]. The bush-crow is thus in the same fix as other species with nowhere else to go as their habitat warms up, including many island and mountain dwellers. A vivid example is the American pika (*Ochotona princeps*), starring in the captivating first phrase of a 2008 article by J.B. Ruhl: "The pika is toast" [9].

An array of proactive measures aimed at helping wildlife adapt to climate change has been recommended in the scientific literature. Frequently recommended actions are protecting and restoring large, robust natural areas; ensuring adequate connectivity between such areas—thus creating protected area networks; taking management measures to boost the resilience of species and ecosystems to changing conditions and extreme climatic events; and, particularly for "toast" species, undertaking the active translocation of populations to more suitable areas (also known as "assisted migration" or "assisted colonization") [4].

2.2. Migratory Species: "Travelling through a Warming World"

Migratory species, despite their mobility, portray particular vulnerabilities to climate change [10–13]. A 2009 multi-taxon review article, the title of which was borrowed for the current section, maps out several vulnerable traits of long-distance migrants in a changing climate:

> Migrants are key components of biological systems in high latitude regions, where the speed and magnitude of climate change impacts are greatest. They also rely on highly productive seasonal habitats, including wetlands and ocean upwellings that, with climate change, may become less food-rich and predictable in space and time. While migrants are adapted to adjust their behaviour with annual changes in the weather, the decoupling of climate variables between geographically separate breeding and non-breeding grounds is beginning to result in mistimed migration. Furthermore, human land-use and activity patterns will constrain the ability of many species to modify their migratory routes and may increase the stress induced by climate change [11].

An instance of the latter is described in a 2008 piece by David Wilcove: "In East Africa, where the movements of wildebeest, zebras, and other grazers are timed to the seasonal rains, any change in rainfall patterns due to global warming will probably produce concurrent changes in migratory routes. As land outside Africa's existing game reserves is converted to villages and farm fields, it may be difficult or impossible for the mammals to adjust their migratory routes in response to the changes in rainfall" [14].

Plenty more examples can be encountered in a copious, recent study conducted for the CMS by the Zoological Society of London (ZSL) [12]. It assesses the vulnerability to climate change of over forty endangered migratory species, listed in CMS Appendix I. The ZSL review finds that populations of all

assessed species are under threat from climate change. It identifies many different ways in which climate change is affecting, or is anticipated to affect, these species. These climate impacts are listed below, each accompanied by one example of a species involved. Note that many of these impacts are interrelated, and that species may be affected by various types of impact at the same time.

- INCREASING TEMPERATURES
  - Habitat loss due to the melting of sea ice—bowhead whale (*Balaena mysticetus*)
  - Changes in zooplankton abundance—basking shark (*Cetorhinus maximus*)
  - Changing sex ratios—leatherback turtle (*Dermochelys coriacea*)
- CHANGES IN PRECIPITATION
  - Loss of wetland habitat for breeding and feeding—red knot (*Calidris canutus rufa*)
  - Loss of grazing habitat for terrestrial mammals—addax (*Addax nasomaculatus*)
  - Variation in rainfall affecting breeding success—gharial (*Gavialis gangeticus*)
- EXTREME WEATHER
  - Extremes in temperature—Ganges river dolphin (*Platanista gangetica*)
  - Increased storm frequency and intensity—Mexican free-tailed bat (*Tadarida brasiliensis*)
  - Precipitation extremes—West African manatee (*Trichechus senegalensis*)
- SEA LEVEL RISE
  - Loss of low-lying coastal habitat—swan goose (*Anser cygnoides*)
  - Loss of nesting sites—green turtle (*Chelonia mydas*)
- OCEAN ACIDIFICATION
  - Impacts on food webs—North Pacific right whale (*Eubalaena japonica*)
  - Habitat loss—hawksbill turtle (*Eretmochelys imbricata*)
- CHANGES IN OCEAN CIRCULATION
  - Changes in food distribution and abundance—humpback whale (*Megaptera novaeangliae*)
  - Impacts on migrations—hawksbill turtle
- SPATIAL AND TEMPORAL RESPONSES
  - Biome shifts—Balearic shearwater (*Puffinus mauretanicus*)
  - Phenological shifts—loggerhead turtle (*Caretta caretta*)
  - Habitat loss—Siberian crane (*Grus leucogeranus*)
- EXACERBATION OF EXISTING THREATS—Basra reed warbler (*Acrocephalus griseldis*)

A conspicuous feature of climate change in the present context—which is quite independent from the question how well populations or species are doing numerically speaking—is that in some species, especially short to medium distance migrants, the gradual warming of their environment may lead to a reduction or loss of migratory behaviour. Hence, currently migratory populations or species could become partly or wholly sedentary under influence of climate change [15,16]. Indeed, with regard to birds there is already "ample observational evidence […] of migratory birds becoming more sedentary" [16]. This effect of climate change would thus be more of a threat to animal migration as a phenomenon than to species survival. Common buzzards (*Buteo buteo*) in Europe appear to provide a textbook example. This species is apparently *en route* to becoming a sedentary species. It seems likely that, in one of the next few years, observers at the famous migration bottleneck of Gibraltar will witness the last time a common buzzard glides across the Strait to Africa, whereas numbers of

buzzards crossing another migration bottleneck, at Falsterbö (Sweden), are also dropping [17]. This reduction of migratory behaviour does not appear to be affecting the species as such, which has portrayed a positive population trend in recent decades. Incidentally, a southern species of buzzard, the long-legged buzzard (*Buteo rufinus cirtensis*) is expanding its African range northward, and appears bent on colonizing Europe. Recent years have seen the first recorded breeding attempts of long-legged buzzards in Spain. Moreover, the species seems prone to hybridizing with common buzzards [17]. The buzzard example therefore also aptly illustrates the conservation policy debate on how to balance native biodiversity conservation with the accommodation of new species arriving in the wake of climate-induced biome shifts.

In general terms, recommended climate adaptation measures for migratory species for the most part coincide with those for biodiversity at large, including ensuring robust, well connected habitats and resilient populations by maintaining or creating comprehensive protected area networks and by tackling non-climate threats, and in some cases assisted colonization or other species-specific adaptation action [10–12]. The latter could, to name one potential future measure by way of illustration, involve shifting the migratory routes of Siberian cranes through imprinting and microlight plane guidance [12]. The "Travelling through a Warming World" review ends thus: "Perhaps the most important policy goal should be to encourage large, genetically diverse, populations that will enhance the ability of migratory species to adapt to, or exploit, the changes caused by increasing human impact on the global climate" [11]. Such increased adaptability, or resilience, of populations and the habitats on which they depend can be attained precisely "by reducing conventional threats such as pollution, habitat fragmentation and overexploitation" [12].

All this discussion of *adaptation* action should not obscure the fact that climate change *mitigation* action remains at least as essential from a migratory wildlife conservation point of view. In fact, the ZSL study found that for quite a few of the reviewed species "the threat of climate change is so severe and the potential for conservation to effectively increase their resilience and ability to adapt so limited that the only available option for their future survival is to mitigate climate change" [12]. Many of the species to which this applies are marine ones, including turtles, whales and seabirds. The study is quick to add that "[t]his is not to say that other conservation measures should be stopped for these species," but that such conservation measures "will only be effective if mitigation is also achieved" [12]. A dual approach is therefore recommended "whereby proactive adaptation measures are applied to species alongside considerable and rapid emissions abatement" [12].

3. Climate Adaptation and International Wildlife Law

It follows from the above that, both for migratory and non-migratory species, climate change considerably augments the need for international cooperation in wildlife conservation. A mounting segment of scientific literature is therefore devoted to assessing the current capacity of international wildlife conservation regimes to facilitate the adaptation of species and ecosystems to climate change, and to exploring ways of enhancing that capacity [4,13,18–27]. It should be noted that, naturally, similar issues arise and are discussed within *national* contexts [9,28–30].

Before focusing on the CMS regime, it is appropriate to point out that many more international legal instruments exist which apply to migratory species and are germane to the challenge of transboundary

wildlife conservation in a changing climate. Prominent instruments with a worldwide scope are the Biodiversity Convention (CBD) [31], the Ramsar Wetlands Convention [32] and the UNESCO World Heritage Convention [33]. Some examples from the many relevant regional instruments are the Western Hemisphere Convention [34], the African Nature Conservation Convention [35] and the Bern Convention [36].

Generally, states appear well aware of the necessity of, as the G8 Environment Ministers phrased it in a (non-binding) declaration in 2009, "[p]roactively putting in place actions for climate change adaptation of natural and managed ecosystems," given that "spontaneous adaptation is not expected to be sufficient" [37]. Likewise, the Conference of the Parties (COP) to the Biodiversity Convention—that is, virtually all states (except the United States)—has acknowledged the need to "enhance the integration of climate-change considerations related to biodiversity in their implementation of the Convention," *inter alia* by incorporating such considerations in national biodiversity strategies and by taking "appropriate actions to address" climate change impacts on biodiversity [38]. In addition, the CBD COP has resolved to "take measures to manage ecosystems so as to maintain their resilience to extreme climate events and to help mitigate and adapt to climate change" [39], and to "integrate climate change adaptation measures in protected area planning, management strategies, and in the design of protected area systems" [40]. The Decision on biodiversity and climate change adopted at the latest COP in 2010 sets out more comprehensive guidance, inviting parties—subject to the qualification "according to national circumstances and priorities"—to take the following actions:

Reduce the negative impacts from climate change as far as ecologically feasible, through conservation and sustainable management strategies that maintain and restore biodiversity;

Implement activities to increase the adaptive capacity of species and the resilience of ecosystems in the face of climate change, including, *inter alia*:

(i) Reducing non-climate stresses, such as pollution, over-exploitation, habitat loss and fragmentation and invasive alien species;
(ii) Reducing climate related stresses, where possible, such as through enhanced adaptive and integrated water resource and marine and coastal management;
(iii) Strengthening protected area networks including through the use of connectivity measures such as the development of ecological networks and ecological corridors and the restoration of degraded habitats and landscapes […];
(iv) Integrating biodiversity into wider seascape and landscape management;
(v) Restoring degraded ecosystems and ecosystem functions; and
(vi) Facilitating adaptive management by strengthening monitoring and evaluation systems;

Bearing in mind that under climate change, natural adaptation will be difficult and recognizing that *in situ* conservation actions are more effective, also consider *ex situ* measures, such as relocation, assisted migration and captive breeding, among others, that could contribute to maintaining the adaptive capacity and securing the survival of species at risk, taking into account the precautionary approach in order to avoid unintended ecological consequences […];

Take specific measures […] for species that are vulnerable to climate change, including migratory species […] [41].

In the 2010 COP Decision on protected areas, climate change is also identified as one of the "issues that need greater attention" [42]. CBD parties are requested in this connection to "integrate protected areas into wider landscapes and seascapes and sectors," including through "connectivity measures such as the development of ecological networks and ecological corridors, and the restoration of degraded habitats and landscapes in order to address climate change impacts and increase resilience to climate change" [42]. Relevant decisions recommending climate adaptation measures have also been adopted under other global treaties, including the Ramsar Wetlands Convention [43,44]. It is well established that much of the required adaptation action will need to be undertaken at a regional rather than a global scale. The CBD COP, for example, has called upon parties to "cooperate regionally in activities aimed at enhancing habitat connectivity across ecological gradients, with the aim of enhancing ecosystem resilience and to facilitate the migration and dispersal of species with limited tolerance to altered climatic conditions" [45].

The analysis below does not lay any particular emphasis on the relationships, including (potential) synergies, between the Bonn Convention regime and other international wildlife conservation regimes. To avoid causing the skewed impression that the CMS and other wildlife regimes operate in sheer isolation from each other, it is stressed here that plenty such linkages exist, as described in detail elsewhere [46,47]. For instance, the CMS has been designated by the CBD COP as the Biodiversity Convention's "lead partner" on all issues concerning migratory species [48]. Similarly, close working relationships exist between the Ramsar Convention and various CMS daughter instruments, in particular the African-Eurasian Migratory Waterbirds Agreement (AEWA) [49] and several CMS Memoranda of Understanding (MoUs) [45]. Of particular interest, furthermore, are the manifold linkages between the CMS regime and the European Union's nature conservation instruments [50].

4. Climate Adaptation and the Bonn Convention

4.1. Obligations under the Bonn Convention

Excellent overall analyses of the CMS can be found elsewhere [51–53], and for present purposes no elaborate introduction is called for. The Bonn Convention, which currently has 117 parties, was adopted in 1979 with the apparent aim of ensuring a "favourable conservation status" for migratory animal species. The pre-climate change origin of the CMS is reflected in the fact that, according to Article I(1)(c)(4) of the Convention, a favourable conservation status exists when, among other things, the distribution of the migratory species concerned approaches "historic coverage" (see also Section 6.1 below). Even if not drafted with climate change in mind, some broadly formulated provisions in the Convention are nevertheless of evident relevance from a climate adaptation perspective. Appendix I of the Bonn Convention lists "Endangered Migratory Species". For these species, Article III of the Convention requires the provision of immediate and strict protection. The mandatory protection consists *inter alia* of conserving and, "where feasible and appropriate," restoring "those habitats of the species which are of importance in removing the species from danger of extinction" (Article III(4)(a)). Furthermore, parties shall "endeavour" to "prevent, remove, compensate for or minimize, as appropriate, activities or obstacles that seriously impede or prevent the migration of the species" (Article III(4)(b)). Parties are similarly called on, "to the extent feasible and appropriate, to prevent, reduce or control

factors that are endangering or are likely to further endanger the species" (Article III(4)(c)). It is not that hard to envisage circumstances where the taking of certain climate adaptation measures by Bonn Convention parties would be essential in order to meet the requirements under Article III. To illustrate, it suffices to consider the potential implications of Article III(4)(b) for roads, fences, wind farms, power lines and other infrastructure which can impair connectivity in respect of migratory wildlife. Finally, under Article III(5), CMS parties which are "range states" of Appendix I species "shall prohibit the taking of animals belonging to such species." "Taking" is defined broadly in Article I(1)(i), and exceptions to the required prohibitions are only permissible under strict conditions, outlined in Article III(5). Whereas the main focus of this article is on adaptation, it is to be noted that some of the obligations from Article III apparently call for climate change *mitigation* as well, especially the (qualified) duty to "prevent, reduce or control factors that are endangering or are likely to further endanger" Appendix I species.

Appendix II of the CMS contains migratory species with an unfavourable conservation status and other species which would significantly benefit from the negotiation of specific agreements. Note that species can be, and have been, concurrently listed on Appendix I and Appendix II. According to Article IV, species (groups) listed in Appendix II are to be the subject of focused daughter instruments. These instruments may either be "AGREEMENTS" under Article IV(3) or less formal "agreements" under Article IV(4). The latter may also be concluded for populations of non-listed species "members of which periodically cross one or more national jurisdictional boundaries" (Article IV(4)). With respect to AGREEMENTS, Article V(5) of the Bonn Convention states that these should, "where appropriate and feasible," *inter alia* provide for:

- conservation and, where required and feasible, restoration of the habitats of importance in maintaining a favourable conservation status, and protection of such habitats from disturbances;
- maintenance of a network of suitable habitats appropriately disposed in relation to the migration routes;
- where it appears desirable, the provision of new habitats favourable to the migratory species;
- elimination of, to the maximum extent possible, or compensation for activities and obstacles which hinder or impede migration;
- measures based on sound ecological principles to control and manage the taking of the migratory species.

Again, it is not difficult to relate these ingredients to climate adaptation action. A final Convention provision worth mentioning is Article II(2), which acknowledges "the need to take action to avoid any migratory species becoming endangered," thus endorsing a precautionary approach to migratory species conservation.

As discussed in more detail elsewhere [26], in conformity with Article 31 of the Vienna Convention on the Law of Treaties [54] and customary international law, treaty provisions must be interpreted in light of the treaty's objectives and taking into account any "subsequent agreements" or "subsequent practice" by the parties regarding the interpretation and application of those provisions. As regards the interpretation of the Bonn Convention in light of its objective, it is significant that for many species it may be difficult or impossible to secure a favourable conservation status without taking comprehensive climate adaptation (and mitigation) measures. Interpretation with reference to "subsequent agreements"

or "subsequent practice" entails that also CMS COP Resolutions regarding climate change and ecological connectivity, although themselves not legally binding, may influence the interpretation of the binding Convention obligations described above.

4.2. CMS COP Resolutions

Strictly speaking, many CMS COP Resolutions aimed at reducing "conventional threats"—for instance bycatch in fishing gear [55] or collisions with electrical power lines [56]—are of relevance in the present context, as their implementation will boost the resilience of species to climate change. Resolutions addressing connectivity are clearly relevant as well. That the objectives of the Bonn Convention cannot be achieved without ensuring adequate ecological connectivity, both generally speaking and specifically in connection with climate change, has been acknowledged by the CMS COP on various occasions. Resolution 10.3, adopted by the most recent COP in 2011, is specifically devoted to critical sites and ecological networks [57]. Its Preamble underscores that "the identification and conservation of habitats, in particular the critical sites and connecting corridors," are of "paramount importance" for migratory species conservation. It recalls the multiple advantages of ecological connectivity, including "maintenance of viable populations and migration pathways, reduced risk of a population becoming extinct and higher resilience to climate change." The Preamble of Resolution 10.3 also acknowledges that "networks of critical sites are needed in order to achieve connectivity and to protect migratory species along their entire migration route, and that corridors can occur in any habitat and should meet the requirements of the targeted species." Finally, the Preamble emphasizes 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." With a view to their considerable significance for present purposes, a number of the operative paragraphs of Resolution 10.3 are reproduced here in full:

(1) *Requests* Parties to promote the identification of the most relevant sites and corridors for migratory species, with an emphasis on those that are transboundary and would benefit from international cooperation;
(2) *Invites* Parties to enhance the coverage, quality and connectivity of protected areas as a contribution to the development of representative systems of protected areas and coherent ecological networks that include all taxonomic groups of migratory species;
(3) *Urges* Parties to undertake habitat restoration and management at protected areas and critical sites in order to ensure habitat availability during the different stages of the life cycle of migratory species;
(4) *Urges* Parties to explore actively the potentially suitable areas for cooperation over transboundary protected areas, ensuring that barriers to migration are to the greatest possible extent eliminated or mitigated and that migratory species are managed under commonly agreed criteria;
(6) *Invites* Parties to undertake concerted efforts to integrate protected areas into wider landscapes and sectors, including through the use of connectivity measures such as the development of biological corridors, where appropriate, and the restoration of degraded habitats and landscapes in order to address the impacts of and increase resilience to climate change;

(9) *Encourages* Parties to explore the applicability of ecological networks and corridors to marine migratory species that are under pressure from human activities such as oil and gas exploration, overexploitation, fishing and coastal development.

CMS COP 10 also adopted a closely related decision on flyway conservation, Resolution 10.10 [58]. It requests parties to "ensure that migratory bird habitat requirements are integrated into land-use policies, including protected areas but also especially outside protected areas" (Paragraph 4). Furthermore, it urges parties to review "the coverage and protection status of current site networks," and to "consider the resilience of sites to climate change, taking account of the potential for shifts in the range of species due to climate change, as well as other factors" (Paragraph 6). Parties are also requested to "ensure that key migratory stop-over sites are identified to form part of coherent site networks for migratory species" and to promote the "development of flyway-scale site networks, especially where they are least developed, to include the widest possible range of available habitat for migratory birds" (Paragraph 7).

Moreover, Resolutions specifically devoted to climate change have been adopted by the parties to the Bonn Convention at the last three COPs in 2005, 2008 and 2011. In the first of these, Resolution 8.13, CMS parties acknowledged that climate change "may significantly affect the behaviour, distribution and abundance of migratory species and may change the ecological character of their habitats" (Preamble) [59]. Range states of Appendix I species were urged to "implement, as appropriate, adaptation measures that would help reduce the foreseeable effects of climate change" on the species involved (Paragraph 3), and the CMS Scientific Council was requested to "afford climate change high priority" in its future programme of activities (Paragraph 1). At its next meeting in 2008 the COP, in Resolution 9.7, more affirmatively expressed its concern about the fact that climate change "is already known to be affecting the habitat, behaviour, distribution and abundance" of CMS-listed species (Preamble) [60]. Parties recognized that "due to climate change, ranges of migratory species are changing and that CMS instruments may need to adapt to these variations" (Preamble). A precautionary call was issued not to delay action "despite the remaining uncertainty surrounding the full scale of the impacts of climate change on migratory species" (Paragraph 1). Resolution 9.7 urges parties to "identify which migratory species are most likely to be directly or indirectly threatened or impacted by climate change" (Paragraph 2) and calls for a reduction of the threats concerned (Paragraph 3). In particular, parties are requested to "design and implement adaptation strategies" for vulnerable species, and "wherever possible" to "act upon and fully implement advice relating to climate change as provided by the Scientific Council" (Paragraph 4). Finally, parties and the Secretariat are to strive for the "incorporation of climate change impacts and relevant adaptation measures into species-specific Action Plans" (Paragraph 12). Climate change is also addressed in Resolution 9.9 concerning marine migratory species, adopted at the same meeting of the COP [61]. The Resolution expresses concern over the "multiple, cumulative and often synergistic threats" faced by marine migratory species, "such as by-catch, over-fishing, pollution, habitat destruction or degradation, marine noise impacts, deliberate hunts as well as climate change" (Preamble). It draws special attention to the "major and accelerating changes to Arctic regions due to climate change and its consequences for migratory marine mammals in these regions" (Preamble). The Scientific Council is instructed to review the latest available information on "the current and predicted conservation status,

in relation to the possible consequences of climate change, of all Arctic migratory marine species listed in the CMS appendices;" and to consider "whether additional Arctic migratory marine species might warrant listing on the CMS appendices" (Paragraph 4(c,d)).

The latest COP in 2011 saw the adoption of the hitherto most elaborate CMS Resolution on climate change, Resolution 10.19 [62]. At a general level, Resolution 10.19 urges parties to "employ adaptive management measures and the ecosystem-based approach in addressing climate change impacts" (Paragraph 4). The Resolution requests the identification of those migratory species which are most vulnerable to climate change. It takes a broad view by calling for such identification not only for species from Appendix I and II, but also for "other migratory species on the IUCN Red List" (Paragraph 5(b)). As an example of the latter, the Resolution expressly mentions the polar bear (*Ursus maritimus*), which is currently not listed on the CMS Appendices. After identifying the most vulnerable species, parties are to "consider whether these should be listed or uplisted on the CMS appendices, as appropriate" (Paragraph 5(b)). Incidentally, it has already been proposed that the polar bear be listed by the next COP on Appendix II and also on Appendix I, in particular with a view to its "extreme vulnerability to habitat loss as a result of climate change" [63]. For the Appendix I species considered most susceptible to climate change, Resolution 10.19 calls for the preparation of focused, "single species action plans" (Paragraph 5(c)). The Resolution urges CMS parties and daughter instrument signatories to develop and implement monitoring regimes for analyzing the impact of climate change on migratory species, stipulating that such regimes must be "adequate for distinguishing true declines in populations from transboundary range shifts" (Paragraph 7).

The actual adaptation action required is addressed in Resolution 10.19 in more specific terms than in its predecessors. A cross-reference is made in this regard to the aforementioned Resolution 10.3 on ecological networks, the implementation of which is to "improve the resilience of migratory species and their habitats to climate change" (Paragraph 8). In particular, parties are urged when implementing Resolution 10.3, to (a) "ensure that individual sites are sufficiently large, holding a variety of habitats and topography;" to (b) "strengthen the physical and ecological connectivity between sites, permitting dispersal and colonization when species distributions shift;" and, interestingly, to (c) "consider the designation of seasonal protected areas in areas where migratory species occur at critical stages in their lifecycle and would benefit from extra protection" (Paragraph 8). It is also noteworthy that Resolution 10.19 requests Bonn Convention parties in so many words to "consider ex situ measures and assisted colonization, including translocation, as appropriate for those migratory species most severely threatened by climate change" (Paragraph 6(b)). In general, parties are urged to "improve the resilience of migratory species and their habitats to climate change, *inter alia*, by reducing other threats in order to maintain or increase population size and genetic diversity" (Paragraph 6(a)).

Several provisions in the Resolution aim at minimizing the adverse effects on migratory species of climate change mitigation and (human) adaptation activities (Paragraphs 10–13 and 21). To illustrate, one of these requests parties to ensure that wind farms "are operated in ways that minimize the mortality of migratory species," for instance through "short-term shutdowns or higher turbine cut-in speeds" (Paragraph 13). Overall, parties are asked to make sure that "mitigation or [human] adaptation activities do not result in a deterioration of the conservation status of CMS-listed species" (Paragraph 21). Resolution 10.19 also encourages parties to "evaluate and reduce" the additional impacts on migratory species of so-called "tertiary effects"—that is to say, changes in human behaviour due to climate

change—under reference to the prominent example of "increased shipping and exploitation in the Arctic ocean areas, which are made possible by retreating ice" (Paragraph 9). Finally, parties and non-parties alike are called on to include the measures contained in Resolution 10.19 "in their national climate change strategies, National Biodiversity Strategies and Action Plans (NBSAPs) and other relevant policy processes" (Paragraph 21).

4.3. Beyond the Black Letter

Whereas the focus of the present article is predominantly legal, it should be realized that the significance of the Bonn Convention for migratory wildlife adaptation cannot adequately be grasped through reference to the legally most significant documents alone. A case in point is the wealth of information on the impacts of climate change on migratory species which has become available as a result of research commissioned by, or otherwise produced in connection with, the CMS [10,12].

Generally, the work of the CMS Scientific Council has been instrumental in the present context. Particular mention should be made of the CMS Working Group on Climate Change, which is closely affiliated with the Scientific Council. The Working Group was created on the basis of a 1997 COP Recommendation [64]. Its task is to review the impact of climate change on migratory species and to identify and prioritize options for action by Bonn Convention parties. In addition, a CMS Technical Workshop, attended by external experts, was organized in 2011 to procure guidance regarding the future role of the Bonn Convention in respect of climate change [65]. Most recently, Resolution 10.19 established a COP-Appointed Scientific Councillor for Climate Change, charged with preparing a "programme of work on climate change" (Paragraph 17). Since the last COP the Appointed Councillor, Colin Galbraith, has been leading efforts to create and carry out an effective Action Plan for the implementation of Resolution 10.19.

5. Climate Adaptation and CMS Daughter Instruments

Of the twenty-six CMS daughter instruments currently in force [51,66], seven are treaties, setting out legally binding obligations for their parties. The other nineteen are non-legally binding Memoranda of Understanding. As discussed in more detail below, the need to facilitate the adaptation to climate change of the migratory species covered has hitherto been dealt with to hugely disparate degrees under the various CMS daughter instruments. For the purpose of the following analyses it is helpful to bear in mind that a number of consecutive stages can roughly be distinguished in the way the climate adaptation issue has been addressed to date under the instruments concerned:

(1) Climate change is formally recognized as a (potential) threat to the species in question;
(2) Research into climate change impacts is called for and/or commissioned;
(3) Adaptation measures are called for;
(4) Specific guidance regarding adaptation measures is produced.

The extent to which these steps have actually been taken under the various daughter instruments ranges from zero to all four. Before turning to the discussion of CMS treaty and MoU daughters, attention should be drawn to the existence of several CMS Action Plans, lacking the fullgrown "daughter" status, some of which address climate change, e.g., the 2008 Central Asian Flyway Action

Plan [67] stipulates that "Range States shall cooperate to determine and monitor the impacts of climate change on migratory waterbirds and their habitats and where appropriate respond to the threats" (Paragraph 3.5.1).

5.1. Treaty Daughters

Of the seven CMS treaty daughters concluded thus far, four are "AGREEMENTS" under Article IV(3) of the Bonn Convention, whereas the other three constitute "agreements" under Article IV(4). The treaties deal with seals, cetaceans, bats, birds and gorillas:

1990 Wadden Sea Seals Agreement (WSSA) [68]—Article IV(4)
1991 Agreement on Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS) [69]—Article IV(4)
1991 European Bats Agreement (EUROBATS) [70]—Article IV(3)
1995 African-Eurasian Migratory Waterbirds Agreement (AEWA) [49]—Article IV(3)
1996 Agreement on Cetaceans of the Mediterranean, Black Sea and Contiguous Atlantic (ACCOBAMS) [71]—Article IV(4)
2001 Agreement on Albatrosses and Petrels (ACAP) [72]—Article IV(3)
2007 Gorilla Agreement [73]—Article IV(3)

None of these, including the most recently adopted instruments, expressly focus on climate adaptation in their binding provisions. A modest reference to climate impacts in the AEWA Action Plan, adopted by amendment in May 2012 and described below, is the only exception. Climate change has been expressly addressed in formal decisions by the Meetings of the Parties (MOP) to these agreements only in the cases of AEWA, ACCOBAMS and ASCOBANS, discussed below. That the need to aid the adaptation of species to climate change has not yet been officially acknowledged under the other four treaty daughters does not rule out, of course, that the issue may have been the focus of attention on a less formal level, e.g., within the framework of the scientific bodies established under the agreements.

Moreover, generally speaking, given that all treaty daughters—and the same is true of the MoUs—strive for a favourable conservation status for the species covered and for the reduction of conventional threats, they may be assumed to contribute to some extent to the bolstering of populations and therewith to the resilience of the species involved to climate change. Similarly, in parallel to the Bonn Convention, the relevance of several daughter treaty provisions—despite not mentioning climate change as such—stands out in the current context. For instance, it is significant from a connectivity perspective that the Gorilla Agreement requires parties to "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" (Article III(2)(c)). Still, the state of affairs just depicted plainly indicates that in the context of the Bonn Convention's treaty daughters, climate adaptation is not yet receiving the attention which, from the point of view of long term migratory species conservation, it evidently deserves. This state of affairs may derive in part from the particular motivations behind the establishment of some of the treaties—such as harbour porpoise (*Phocoena phocoena*) bycatch in the case of ASCOBANS and

disease and emergency planning in the cases of the WSSA and ACCOBAMS—that have coloured the mentality and practice of associated treaty bodies.

The African-Eurasian Waterbirds Agreement is a striking exception to the above pattern, however, and it is fair to say that AEWA currently represents "best practice" among the twenty-six CMS daughter instruments in respect of the adaptation of species to climate change. In fact, AEWA is presently the only CMS daughter combining all four stages outlined above. A closer look at AEWA is therefore clearly appropriate.

With its huge geographical scope, the 255 waterbird species presently covered, and 65 states and the EU as parties, AEWA is an ambitious daughter instrument [74–76]. Climate adaptation action is not expressly called for in the text of the Agreement or in the, equally binding, Action Plan which is attached to the treaty as Annex 3 and applies to the vulnerable populations listed in Table 1 of Annex 3. In 2005, however, the Meeting of the Parties (MOP) to the Agreement adopted a first Resolution devoted to the topic. Resolution 3.17 [77] acknowledges that climate change "will significantly influence measures to achieve AEWA's fundamental objective" of ensuring a favourable conservation status for migratory waterbirds (Preamble). The Resolution commits parties to "address climate change in so far as it is regarded as likely to bring about significant change in the ecological character of wetlands and affect the behaviour of migrating waterbirds" (Paragraph 5), and stresses the importance of "including potentially beneficial adaptation measures in the development and implementation of single and multi-species action plans at both national and international scales" (Paragraph 6). Significantly, Resolution 3.17 underscores that climate change and other human impacts should not be treated in isolation from each other, stipulating that "the regulation of harvesting […] should be responsive to significant changes in pressures on waterbirds caused by climate change" (Preamble). Finally, the MOP identified a need to develop technical "Conservation Guidelines" on climate adaptation measures (paragraph 4), and instructed the AEWA Technical Committee to conduct further research into climate impacts on migratory waterbirds as well as required adaptation measures (Paragraph 1). In connection with the latter instruction, the British Trust for Ornithology (BTO) was commissioned to conduct a study of the effects of climate change on migratory waterbirds within the AEWA region [78].

The outcome of the study is conveniently summarized in the Preamble to Resolution 4.14, adopted by the next MOP in 2008 [79]:

> *Recognising* that scientific modelling shows that migratory waterbirds throughout the Agreement area are likely to be increasingly adversely affected by climate change through geographic shifts of their breeding, staging and wintering grounds; loss and fragmentation of their habitats; changes in timing of seasonal aspects in their life-cycle; and possible long-term changes in their survival and productivity,
>
> *Further* recognizing that socio-economic consequences of climate change are likely to pose an additional negative impact on migratory waterbirds, because of increase in human demand for water resources and associated changes in agriculture and water management practices,
>
> *Conscious* that species with small populations and/or ranges (especially where this is highly fragmented), species associated with threatened or vulnerable habitats, and species with specialist ecological requirements are those considered most at risk from climate change,

Further noting that species or populations are particularly vulnerable when they are associated with montane habitats, habitats on poleward edges and seasonal wetlands in arid, semi-arid and sub-arid regions,

Also noting that, on the basis of current scientific knowledge, two species listed in Annex 2 of the Agreement are judged to be critically threatened by climate change, seven are considered highly threatened, 14 considered moderately threatened, and a further 61 judged to experience some threat from climate change; but *Also noting* that knowledge is still not sufficient to fully predict impacts of climate change on migratory waterbirds.

Resolution 4.14 requests AEWA parties to "develop and strengthen climate change-related research, monitoring and conservation action" for waterbirds, with special regard for the vulnerable species and populations described in the BTO study (paragraph 1). In terms of concrete adaptation action, parties are urged to (a) "designate and establish comprehensive and coherent networks of adequately managed protected sites as well as other adequately managed sites, to accommodate range-shifts and facilitate waterbirds' dispersal;" to (b) "maintain the ecological character of the sites important for waterbird populations under changing climatic conditions through appropriate management measures […] and by integrating migratory waterbird interests into climate change adaptation measures such as flood prevention measures;" and to (c) "provide wider habitat protection for species with dispersed breeding ranges, migration routes or winter ranges where the site conservation approach would have little effect, especially under climate change conditions" (Paragraphs 4, 6 and 7). Lastly, the MOP requested the AEWA Technical Committee to "assess whether the existing international networks of sites are sufficient for the protection of migratory waterbirds, including the projected climate change effects" and, if necessary, to indicate what complementary measures should be taken (Paragraph 5). One of the targets of the AEWA Strategic Plan for 2009–2017, which was also adopted by the 4th MOP [80], is the achievement of a "coherent flyway site network, which aims to be resilient to the effects of climate change" (Target 1.2).

The Conservation Guidelines on climate adaptation action called for in Resolution 3.17 were also prepared by the BTO, and finished in 2008 [81]. Before discussing their content it should be noted that Conservation Guidelines are not themselves legally binding documents, but are not necessarily devoid of legal significance either. They are based on an instruction in the AEWA Action Plan (Paragraph 7.3), requiring the Agreement's Secretariat to coordinate the development of Conservation Guidelines so as to assist the parties in the implementation of their binding duties under the Agreement. Conservation Guidelines are formally adopted by way of MOP Resolutions, on the basis of AEWA Article IV(4). The MOP itself, in any event, views the Guidelines as providing "a common framework for action, which aids the coherent implementation of the Agreement by Contracting Parties" [82]. The "Guidelines on the Measures Needed to Help Waterbirds Adapt to Climate Change" [81] were adopted through MOP Resolution 4.13 [82], which calls on parties to "utilize these guidelines in a practical way that leads to a minimum of additional bureaucracy and that recognizes the different social, economic and environmental conditions within the Agreement area" (Paragraph 2). The Guidelines propose a five-step approach:

(1) Identify parties to be involved in implementing species-based, site-based, regional, national and international measures to help birds adapt to climate change.

(2) Identify species and populations most at risk from climate change and identify priority measures.
(3) Prepare a priority list of key sites most at risk from climate change and identify priority measures.
(4) Prepare a priority list of key regional, national and international measures for helping birds adapt to climate change.
(5) Implement climate change adaptation management measures.

Detailed potential lists of species, sites and measures are provided to guide steps (2), (3) and (4). For instance, in respect of step (2) the Guidelines propose concrete adaptation measures for each of the AEWA species and populations identified in the other BTO review as being particularly at risk from climate change. One species is singled out here for illustrative purposes. The Cape gannet (*Morus capensis*) is a seabird with a specialized diet, breeding on a small number of offshore islands in Namibia and South Africa. Its limited ability to move to the south due to lack of land will pose major difficulties as the range of its prey species shifts poleward to escape the warming sea water. The possible adaptation measures outlined in the Conservation Guidelines for the Cape gannet include the identification of potential new nesting sites in the Southern Ocean, the provision of artificial nesting platforms, and supplementary feeding [81].

The most recent, 5th MOP also saw the adoption of a Resolution specifically concerned with climate change, Resolution 5.13 on Climate Change Adaptation Measures for Waterbirds [83], and several other Resolutions touching on the topic [84–87]. Resolution 5.13 stresses the close links between AEWA and the Ramsar Convention in respect of climate adaptation and the importance of "climate-proof" protected area networks throughout [83]. The Resolution refers to AEWA Article III(2)(c) on site protection in this regard, noting "the need, expressed in Article III of the Agreement, for Contracting Parties to identify networks of sites and habitats for migratory waterbirds, and to protect, manage, rehabilitate and restore these as essential actions to maintain the favourable conservation status of species" (Preamble). Parties are called on to "complete the identification of relevant areas and build national networks of protected areas and other adequately managed areas" and to "undertake national assessments of the resilience of these sites both individually and collectively" (Paragraph 2). Most significantly, Resolution 5.13 provides for the adoption of a "framework" as "further guidance for actions related to national adaptation measures related to the conservation of waterbirds and their wetland and other habitats" and urges parties to "implement these principles in their implementation of the Agreement" (Paragraph 1).

The comprehensive principles laid down in this AEWA Guidance Framework for Climate Change Adaptation, which is attached as Annex I to the Resolution, stipulate detailed action embodying a precautionary approach, and contain many cross-references to existing AEWA and Ramsar guidance documents. A few selected examples are given here by way of an impression. The Framework takes the unambiguous position that "[e]xisting conservation efforts are insufficient" in light of climate change and is adamant about the need to take adaptation action promptly without waiting for further evidence of climate impacts on waterbirds, "as delay will result in more severe impacts, fewer available options for action and increased costs of damage and intervention" (Principle 1). It calls on AEWA parties to maintain and increase the resilience of the ecosystems involved and avoid further habitat fragmentation (Principle 2). Furthermore, parties are urged to accommodate change by, *inter alia*, reserving "space for the natural development of rivers and coasts" and establishing

"ecological networks through habitat restoration and creation" (Principle 3). With regard to active translocation, the Framework carefully suggests that this "may be used to conserve some species as appropriate" (Principle 3).

As far as the binding obligations under the treaty and Action Plan themselves are concerned, it is noteworthy that the 3rd AEWA MOP already discerned a "need to include relevant actions related to climate change impacts and adaptation in the Agreement's Action Plan," and requested the AEWA Standing and Technical Committees in Resolution 3.17 to identify any relevant amendments for consideration at a future MOP (Paragraph 7). The 4th MOP postponed such amendment of the Action Plan, however, asking the Technical Committee in Resolution 4.14 to "identify further research priorities that will inform future adaptation measures, and to bring these to the next session of the Meeting of the Parties for possible inclusion in the Action Plan" (Paragraph 3). In 2012, the 5th MOP indeed agreed on a pertinent amendment, concerning paragraph 3.3 of the Action Plan, which formerly stated that "Parties shall endeavour to rehabilitate or restore, where feasible and appropriate, areas which were previously important for the populations listed in Table 1." The amendment adopted by the MOP clarifies that areas impaired by climate change are within the scope of this provision [85]. The revised Action Plan provision, which enters into force in August 2012 for all AEWA parties except any states filing a reservation (see AEWA Article X(5)), reads:

> Parties shall endeavour to rehabilitate or restore, where feasible and appropriate, areas which were previously important for the populations listed in Table 1, including areas that suffer degradation as a result of the impacts of factors such as climate change, hydrological change, agriculture, spread of aquatic invasive non-native species, natural succession, uncontrolled fires, unsustainable use, eutrophication and pollution.

Although still not phrased in the strongest of legal language—the wording "endeavour" and "where feasible and appropriate" was retained from the original—this provision nevertheless constitutes the first explicit mention of climate change in a binding CMS instrument. Obviously, however, the amendment does not represent anything near a comprehensive translation of necessary climate adaptation measures into the AEWA Action Plan. It will thus take yet (an)other meeting(s) of the MOP to ensure that.

It would, in any case, be erroneous to conclude that besides this new Action Plan provision AEWA contains no legally binding obligations concerning the adaptation of species to climate change. Several provisions, including Articles II, III(1), III(2)(b)–(e) and various clauses in the AEWA Action Plan, seem of implicit relevance to the issue. For instance, the general duty in Article II(1) of the Agreement prescribes that parties "shall take co-ordinated measures to maintain migratory waterbird species in a favourable conservation status or to restore them to such a status." This result-oriented provision ostensibly requires parties to simply do what it takes to secure a favourable conservation status for the species listed in Annex 2 to the Agreement. If what it takes includes climate adaptation action, then that is what parties must undertake if they are to implement their treaty obligations in good faith. In other words, Article II, albeit without stating this in so many words, arguably implies a legal duty for AEWA parties to take action to facilitate the adaptation of waterbirds to climate change. The Conservation Guidelines on climate adaptation take a similar position. With respect to AEWA Article II, and also Article III(2)(e), the document submits that "[a]lthough neither Article makes explicit

reference to climate change, both suggest that remedial measures are needed to combat adverse effects, including climate change, on waterbirds" [81]. Significantly, comparable reasoning applies to obligations in other CMS treaty daughters.

The parties and Scientific Committee of ACCOBAMS have also begun to pay serious attention to the consequences of climate change for cetacean populations in the region covered by the Agreement, although efforts are still in an early stage compared to AEWA. For the time being, the main focus is on research and monitoring of climate effects and on climate change mitigation. ACCOBAMS MOP Resolution 4.14, adopted in 2010 [88], draws attention to climate scenarios which "envisage rapid environmental changes to take place in the marine ecosystem of the ACCOBAMS area," and to "recent scientific data showing the impact of climate change on cetacean populations in the Agreement area" (Preamble). Parties are encouraged, principally, to "take necessary actions to reduce anthropogenic contributions to climate change and marine acidification" (Paragraph 1), in other words, climate change mitigation actions. The Resolution furthermore endorses the proposal of the Scientific Committee [89] to organize a region-specific workshop on climate change and cetaceans (Paragraph 3), which has been scheduled for September 2012. Furthermore, climate change is expressly referred to in one of the Conservation Plans elaborated under ACCOBAMS auspices. The 2004 (non-binding) Conservation Plan for short-beaked common dolphins (*Delphinus delphis*) in the Mediterranean Sea [90], the implementation of which is urged in various MOP Resolutions [91], draws attention to the "combined pressure of human impact and climate change" on the Mediterranean ecosystems on which the dolphins rely [90]. In this regard, the Conservation Plan signals the need to prevent further climate change, which can, in the words of the Plan, only be achieved "through strong political will and compliance with the existing legal commitments" [90].

Climate change is also mentioned in similar plans adopted for harbour porpoises by the MOP of ASCOBANS. The Conservation Plan for Harbour Porpoises in the North Sea (Annex 2 of MOP Resolution 6.1 of 2009 [92]) notes that climate change may be depleting harbour porpoise prey, and that southern cetacean species which are presently colonizing the North Sea under influence of climate change might displace harbour porpoises. As regards the action to be taken, the Plan underscores the significance of climate change mitigation efforts under other legal instruments and "strongly" recommends that "existing legislation and agreements with respect to […] climate change are implemented effectively" [92]. Reference to climate change in the revised version of the Recovery Plan for Baltic Harbour Porpoises (or Jastarnia Plan), which was adopted as Annex 1 to the same 2009 Resolution, is limited to the austere observation that "[o]f the factors potentially contributing to the decline in porpoise abundance in the Baltic, which could include climatic variability, contaminants, and changed ecological conditions, bycatch is probably the only one for which the effect of remedial action would be immediate and unambiguous" [92].

It would obviously be advisable, from a migratory species conservation perspective, to incorporate provisions expressly dealing with the adaptation of species to climate change into relevant CMS daughter treaties. The practical feasibility of such incorporation varies from treaty to treaty. In particular, with respect to ACCOBAMS, AEWA, ACAP and the Gorilla Agreement it would appear suitable to include any such provisions in the Action Plans (or, in the case of ACCOBAMS, Conservation Plan) attached to these agreements. These annexes are legally binding but nevertheless easily amendable—a two-thirds majority of the MOP suffices to adopt amendments, which then enter

into force in a matter of months for all parties except those which enter a reservation (ACCOBAMS Article X(4); AEWA Article X(5); ACAP Article XII(5); Gorilla Agreement Article X(5)). As discussed below, amending treaty provisions proper amounts to a more strenuous exercise.

5.2. MoU Daughters

For the purposes of this article, all CMS MoU texts, MoU Action Plans and other documents adopted by MoU signatories were examined. The results are rendered schematically below for each of the nineteen MoUs which are currently operational under the Bonn Convention. The numbers accompanying several of the instruments correspond to the four stages described previously (at the outset of Section 5).

1993	MoU on the Siberian Crane (*Grus leucogeranus*) [93]	1, 2
1994	MoU on the Slender-Billed Curlew (*Numenius tenuirostris*) [94]	-
1999	MoU on Marine Turtles of the Atlantic Coast of Africa [95]	1, 2
2001	MoU on Middle-European Great Bustards (*Otis tarda*) [96]	1, 3
2001	MoU on Indian Ocean and South East Asian Marine Turtles [97]	-
2002	MoU on the Bukhara Deer (*Cervus elaphus yarkandensis*) [98]	-
2003	MoU on the Aquatic Warbler (*Acrocephalus paludicola*) [99]	-
2005	MoU on Western African Elephants (*Loxodonta africana*) [100]	-
2006	MoU on Cetaceans of the Pacific Islands Region [101]	1, 2
2006	MoU on the Saiga Antelope (*Saiga tatarica tatarica*) [102]	1, 2
2006	MoU on the Ruddy-Headed Goose (*Chloephaga rubidiceps*) [103]	-
2007	MoU on South American Grassland Birds [104]	-
2007	MoU on the Mediterranean Monk Seal (*Monachus monachus*) [105]	-
2007	MoU on the Dugong (*Dugong dugon*) [106]	-
2008	MoU on Aquatic Mammals of Western Africa and Macaronesia [107]	1, 2, 3
2008	MoU on African-Eurasian Raptors [108]	1, 2, 3
2008	MoU on High Andean Flamingos [109]	-
2010	MoU on Migratory Sharks [110]	1
2010	MoU on the South Andean Huemul (*Hippocamelus bisulcus*) [111]	-

Climate change has been formally acknowledged as an actual or potential threat to the conservation of the species concerned under eight MoUs. Calls for further research or monitoring of climate impacts have been issued under six of these. In three cases, MoU signatories have actually resolved to undertake climate adaptation action to aid the species involved.

Again, as with the treaty daughters, whereas this survey arguably provides some indication of the comparative relevance of the respective MoUs to the climate adaptation problem, it should not be interpreted too rigidly. In fact, the implementation of *each* CMS MoU is likely to further the resilience and adaptability of related species to climate change to some degree, as all MoUs aim for the strengthening of populations and the reduction of conventional threats. For instance, the improvement of habitat connectivity, even if not undertaken expressly or primarily for climate adaptation purposes, will clearly enhance the chances of species to adapt to climate change. It is noteworthy in this respect

that CMS COP Resolution 10.3 on ecological networks [57], discussed earlier, urges states "to consider the network approach in the implementation of existing CMS initiatives and instruments such as the Sahelo-Saharian Antelopes Action Plan, the Monk Seal MoU, the West African Elephant MoU, the Gorilla Agreement, the Saiga Antelope MoU, the Bukhara Deer MoU, South Andean Huemul MoU and—as is already the case—in the work on flyways" (Paragraph 7).

All the same, a better look is warranted at those cases where express attention has been paid to climate change in the framework of CMS MoUs. The Conservation Plan adopted by the signatories to the Siberian Crane MoU in 2007 [112], contains a commitment to monitor and assess the effects of human development on habitats of importance to Siberian cranes, "including possible impacts of climate change" (Paragraph 4.1(e)). Similar action has been agreed in the context of the MoU on Marine Turtles of the Atlantic Coast of Africa. The MoU's Conservation and Management Plan of 2002 [113] classifies the assessment of "the nature and extent of the impact of […] climate change" on marine turtles as a top priority (Paragraph 1.2.2). The need to take action in respect of the consequences of climate change for great bustard populations, which was duly acknowledged by the signatories to the Great Bustard MoU in 2008, is discussed further below (see Section 6.2). The Preamble to the Pacific Cetaceans MoU expresses the concern that "the conservation status of cetacean populations that frequent the waters of the Pacific Islands Region, particularly those that have been severely depleted, can be affected by factors such as […] climate change" [101]. The Whale and Dolphin Action Plan adopted by the 2nd Meeting of the Signatories in 2009 catalogs climate change as "potentially a high threat to whales, dolphins and their habitats in the region through the potential disruption of ocean circulation, changes in the amount and distribution of prey, changes in salinity, temperature and acidity and other parameters" [114]. One of the Action Plan's objectives, with a "high priority", is to improve the understanding of climate impacts on cetaceans (Paragraph 2.4). The Saiga Antelope Action Plan, which is an integral part of the corresponding MoU [102], includes a commitment of signatory states to "[c]ollect data on and assess long-term impacts of climate change" on saiga antelope populations (Paragraph 5.1). The Preamble to the Sharks MoU documents the signatories' worries regarding "the significant mortality of sharks, including those listed on Appendices I and II of the Convention from a range of impacts and threats including […] increasing pressures on the marine environment due to climate change" [110].

The two most advanced MoUs, from a climate adaptation perspective, are the ones on Aquatic Mammals of Western Africa and Macaronesia [107] and on African-Eurasian Migratory Raptors [108]. The Aquatic Mammal MoU, in its Preamble, signals the threat of climate change to the cetacean populations covered by the instrument, in wording identical to the Pacific Cetaceans MoU cited above. The Action Plan for Small Cetaceans, attached to the MoU as Annex II, describes climate change as "potentially a severe threat" and recommends a number of related actions. These include "standardised, long-term research and monitoring" of climate change impacts, the incorporation of "climate change considerations into conservation plans, assessments and strategies" and, significantly, the implementation of "adaptation strategies aiming to increase the resilience of marine ecosystems and species to climate change" (Objective 5.6). In the Manatee Action Plan, which is Annex I to the MoU, loss of habitat due to climate change is qualified as one of the main threats to West African manatees, as numerous manatees have already been recorded stranded in dwindling lakes, streams and other

wetland habitats during extended dry periods [107]. In this respect, the plan calls for the development of "long-term strategies to protect manatee habitats in relation to climatic changes" (Paragraph 3).

The Preamble to the Migratory Raptor MoU highlights that "migratory birds of prey serve as high-level indicators of ecosystem health and climate change across their range," as well as the signatories' awareness that "climate change is likely to cause further adverse effects on bird of prey populations". The accompanying Action Plan urges signatories to carry out "collaborative research into the effects of climate change on birds of prey and their habitats" and, moreover, to "implement appropriate adaptation measures" (Paragraph 5.10). To achieve the matching target, climate change impacts must have been assessed by 2013, and "measures implemented to facilitate adaptation" (Paragraph 5.10). It is interesting to recall the buzzard story from Section 2.2 in this context, in particular the hybridization threat posed by the climate-induced colonization by long-legged buzzards of common buzzard breeding range in Southern Europe. Both buzzard species feature in the MoU's Annex 1 and are therefore covered by the instrument. A noteworthy provision in this regard is Paragraph 8(g) of the Memorandum text, which calls on signatories to "take appropriate measures to prevent the introduction into their territory of non-native birds of prey, including hybrids where this would have an adverse effect on the conservation of native biodiversity." It must be assumed, however, that this provision was drafted with the release of birds kept for falconry purposes in mind, and probably not with a view to "climate immigrants" like the pioneering long-legged buzzards in Spain. It would probably go too far to count such climate-induced range shifts as "introductions" in this or similar legal contexts. This position is reinforced by a 2009 clarification agreed by the parties to the Bern Convention (which include many of the signatories to the Raptor MoU), in order to avoid the European Strategy on Invasive Alien Species [115] from posing an obstacle to the adaptation of species to climate change. "Worried that native species moving to neighbouring areas may be considered as alien due to the fact that climate change is the result of human action and that such species may be unnecessarily controlled," the Standing Committee Recommendation in question urges parties to "interpret the term 'alien species' for the purpose of the implementation of the European Strategy on Invasive Alien Species as not including native species naturally extending their range in response to climate change" [116].

6. Legal Nuts Still to Be Cracked

The latter observations on the evolving interpretation of the term "invasive alien species" illustrate how climate change necessitates the reassessment of the meaning of certain long-standing, legally significant terms. Two particular features in the text of Article I of the Bonn Convention are, at least potentially, problematic for efforts under the CMS regime to facilitate the adaptation of species to climate change, namely the terms "historic coverage" and "range (state)" [117].

6.1. Favourable Conservation Status, "Historic Coverage", and Climate Change

The former concerns the objective of achieving or maintaining, as the case may be, a "favourable conservation status" for migratory species, which is apparently at the heart of the CMS regime. As stated earlier, according to Article I(1)(c)(4) of the Bonn Convention, one of the conditions to be fulfilled for the conservation status of a species to qualify as "favourable" is that its distribution must

approach "historic coverage […] to the extent that potentially suitable ecosystems exist and to the extent consistent with wise wildlife management".

This criterion clearly reflects the fact that the Convention was drafted back in the 1970s. Presently, to use the words employed in CMS COP Resolution 9.7 [60], "due to climate change, ranges of migratory species are changing" (Preamble). Hence, the distributions of many species are expected to coincide less and less with areas occupied historically, and "suitable ecosystems" will occur less and less within species' historic ranges. Given the need to facilitate the adaptation process in order to conserve species in the long term, efforts aimed at securing ranges which approach "historic coverage" may risk being counterproductive. (Incidentally, whereas the discussion in this article is limited to climate change, it should be realized that the notion of "historic coverage" is also problematic for the CMS regime more broadly speaking, *inter alia* because it is not at all apparent what time period is meant by the term "historic".)

It could be asked how big of a problem the words "historic coverage" in Article I really pose in the context of climate change, from both a practical and a legal point of view. As regards the former, one may wonder whether CMS parties will really let this issue get in the way of climate adaptation action for migratory species which they have agreed to undertake in COP Resolutions and perhaps also within the context of one or more daughter instruments. In view of the rather flexible interpretations of other terms in the Bonn Convention by CMS parties in the past (see *inter alia* Section 6.3 below), this may even seem unlikely. When approaching the same question from a legal perspective, the issue may at first sight likewise appear insignificant. Despite the elaborate definition of what constitutes a "favourable conservation status" in CMS Article I, the concept is surprisingly unimportant in respect of most of the actual obligations set forth in the Bonn Convention. Indeed, in the crucial Article III on the protection of Appendix I species the term is not even mentioned. This is different for Appendix II species. In particular, the requirement in Article V(1) that the "object of each AGREEMENT shall be to restore the migratory species concerned to a favourable conservation status or to maintain it in such a status" indicates legal trouble on the horizon. At the level of the daughter instruments themselves this trouble could actually materialize, as many of these expressly aim for a favourable conservation status for covered species, under application of the same definition of such a status.

It is convenient to illustrate this point with reference to the recommended adaptation action under AEWA already described above (see Section 5.1). It will be recalled that one of the candidate adaptation measures proposed for the Cape gannet in the AEWA Conservation Guidelines on the topic is to scout out potential new nesting sites in the Southern Ocean and actively move gannets there [81]. Suppose that the competent South African authorities were indeed to adopt a policy based on the premise that sustained maintenance of gannet colonies at their current, historic locations has become untenable in light of climate change, and were to opt for an ambitious translocation programme aimed at establishing new colonies at sites well outside the present gannet breeding range. For anyone opposed to this operation because of the public expenses involved or for whatever other reason, it could certainly be convenient to claim that the programme would in fact run counter to South Africa's duties as a contracting party to AEWA. After all, Article II(1) of the Agreement prescribes that South Africa "shall take co-ordinated measures to maintain [Cape gannets] in a favourable conservation status or to restore them to such a status." AEWA contains no definition of its own clarifying what a "favourable conservation status" implies. Instead, Article I(2) of the Agreement declares the

applicability of the Bonn Convention's definition by stating that "the terms defined in Article I, subparagraphs 1(a) to (k), of the Convention shall have the same meaning, *mutatis mutandis*, in this Agreement." Hence, it could be argued that, strictly speaking, AEWA requires South Africa to focus its conservation efforts on keeping Cape gannets where they are, in their historic range. It is to be noted that comparable considerations apply to obligations contained in other daughter instruments, e.g., Article II of ACAP [72].

It may of course be some time before a scenario like the one just described plays itself out in a concrete instance, if indeed it ever will. Yet, it cannot be excluded. Besides, as a matter of principle, it would hardly befit an international lawyer to conclude in an academic article that it is appropriate to just ignore a treaty obligation in circumstances where it has become inconvenient to comply with it. The first available option with respect to the identified problem, which is to do nothing about it, should therefore be discarded.

A second option would be to amend Article I(1)(c) of the Bonn Convention, and the identical definitions of favourable conservation status employed in daughter instruments—for instance, Article I of ACAP [72]. This could in theory render a satisfactory and lasting solution. A relatively modest amendment of the wording of CMS Article I(1)(c)(4) and parallel definitions might already deliver such a solution, namely the insertion of the words "the dimensions of" before the words "historic coverage". Thus, CMS parties would be directed at attaining distributions of migratory species resembling the *size* of, but not necessarily coinciding *geographically* with, historic coverage. This result can only be achieved, however, by mastering the hurdles formed by the onerous requirements of the procedure for amendment of the Bonn Convention laid down in its Article X. These include a two-thirds majority for adoption of the amendment and another two-thirds majority for its entry into force. Another downside of the procedure of Article X is that for a long time (and perhaps permanently) different legal regimes will apply to different states parties.

Besides this general drawback, there are several potential difficulties with the particular amendment suggested above, which ought to be carefully evaluated and discussed before actually proposing this or a similar amendment to the CMS COP [118]. For example, a focus on species distributions approaching the dimensions of, rather than overlapping geographically with, historic range, might in individual cases invite claims by vested interests that the loss of animals from an area is caused by climate change rather than by the adverse impacts of human activities, and that as such no action is required under the CMS to maintain or restore the species' occurrence in that area. More fundamentally, it may be questioned whether it is desirable at all to create a situation wherein new circumstances, with shifted ranges as a consequence of climate change, can be called "favourable". Put plainly, just because something is irrecoverable, that does not mean it should be regarded as favourable when previously it was not. This could negatively affect the imperative for compensation and restoration. Furthermore, any tinkering with the definition of favourable conservation status under the CMS regime should take into consideration the understanding of analogous concepts in the context of other regimes, for instance Article 1(i) of the European Union's Habitats Directive [119].

A third option is the adoption of a CMS COP Resolution clarifying what is the correct interpretation of the terms concerned in the context of climate change. This is manifestly easier to achieve than treaty amendment and would also secure a more uniform approach. This option would build on the generally accepted rule of treaty interpretation laid down in Article 31 of the Vienna Convention on the Law of

Treaties [54], cited previously, according to which a treaty is to be interpreted in line with, *inter alia* "any subsequent agreement between the parties regarding the interpretation of the treaty or the application of its provisions". There is precedent for such an approach, as on more than one occasion in the past the CMS COP has adopted agreed interpretations of certain terms from Convention provisions, including from Article I [120,121]. A limitation of the COP Resolution method is that *contra legem* interpretation is to be avoided, meaning that an interpretation may not be stretched to the point where it actually contradicts the terms employed in the treaty provision in question.

Concretely, as regards the problem at hand, the degree of flexibility which seems to follow from the use of the term "approach" in Article I(1)(c)(4) might offer a first foothold. Moreover, a way out may conceivably be looked for in the second half of CMS Article I(1)(c)(4), which clarifies that for a species' conservation status to be favourable, the species' distribution is to approach historic coverage "to the extent that potentially suitable ecosystems exist and to the extent consistent with wise wildlife management". Although this qualification was evidently not drafted with climate change in mind, it can at present well be maintained that "suitable ecosystems" are gradually being reduced in many species' historic ranges under influence of climate change, and that resisting climate-induced range shifts would be incompatible with "wise wildlife management". This would thus open the door to a reading of the provision which is reconcilable with the taking of conservation action beyond species' historic geographical ranges, in response to climate change. If CMS parties were to consider the above reading of Article I(1)(c)(4) plausible, it would seem advisable to unambiguously confirm this in a COP Resolution. Importantly, the text of such a Resolution ought to minimize the potential for unintended consequences like the ones discussed above in respect of the amendment of Article I(1)(c)(4), by including carefully drafted clarifications forestalling each of those.

In any event, the following provision in Resolution 10.19 [62] demonstrates that the Bonn Convention COP apparently shares the unease with the words "historic coverage" in the current era of climate change, and portrays the parties' preference for the third option—an agreed interpretation—for dealing with the issue:

> *Requests* the Secretariat and the Scientific Council to examine whether Convention provisions, including the terms "range" and "historic coverage" in Article I, might benefit from interpretations that take account of the requirements of species in response of climate change, in view of the fact that climate change was not explicitly considered when the Convention text was signed in 1979 (Paragraph 22).

6.2. The Definition of "Range" and the Role of Future "Range States" in Light of Climate Change

The other term mentioned in the Resolution provision just quoted could also be viewed as a potential obstacle in the current context. It is abundantly clear from Articles II–VI of the Bonn Convention that two central, and closely related, concepts in the CMS regime are "range" and "range state". The description of "range" in Article I(1)(f) of the Convention—which in turn informs the definition of "range state"—defines it to mean "all the areas of land or water that a migratory species inhabits, stays in temporarily, crosses or overflies at any time on its normal migration route". "Range state" is defined in Article I(1)(h) as any state that "exercises jurisdiction over any part of the range of that migratory species" or a state "flag vessels of which are engaged outside national jurisdictional

limits in taking that migratory species". For present purposes, it is particularly significant to note that full participation as party or signatory, as the case may be, in the daughter instruments developed under Article IV of the Convention is typically reserved for range states of the species involved.

Due to climate change, as CMS COP Resolution 9.7 [60] puts it, "ranges of migratory species are changing and […] CMS instruments may need to adapt to these variations" (Preamble). In this regard, COP Resolution 8.13 [59] requests the Scientific Council to "[r]eview the range states list for CMS species as changes in distribution are seen as a consequence of climate change" (paragraph 1(d)). Clearly, however, it is not sufficient to document range changes after they occur and then adapt conservation policies to the new situation. To achieve effective conservation, adaptation action must be undertaken in a proactive manner, not lagging behind developments in species ranges but anticipating them as far as possible.

It is therefore potentially problematic that the description of "range" in the Bonn Convention employs the present tense. The concept of "range state" thus includes the states where a given species is found at present, but excludes those states where the same species is predicted to occur in the near future as a consequence of climate change, but where it has not arrived yet. Evidently, the reference to the "normal migration route" of species in the same definition is likewise potentially problematic in light of climate change.

On a side note, the employment of the present tense in Article I(1)(f) of the Convention not only excludes *future* ranges, but also *past* ranges. As a result, states that used to harbour a population of a certain species but where the species has gone extinct, no longer qualify as "range states" according to the letter of the "range" definition. This is likewise obviously undesirable from a conservation—in particular, restoration—perspective, as such states cannot, strictly speaking, (any longer) fully participate as signatory or party in relevant daughter instruments. Stripping a state from which a species has disappeared from its status as a "range state" is not only counter-productive, but also appears at odds with the aforementioned objective of securing geographic distributions of species approaching "historic coverage". A loss of range state status would thus be legally tautologous under the present wording of the Bonn Convention. An interesting instance of relevant practice is provided by ASCOBANS. The long-standing official justification by Latvia (a CMS party since 1999) of its refusal to become a party to ASCOBANS is that small cetaceans have (virtually) disappeared from Latvian waters, and that therefore the Agreement is irrelevant to Latvia—an argument the validity of which has been stridently and consistently rejected by ASCOBANS parties [122–124].

To return to the current context, that the state of affairs as just outlined can stand in the way of a forward-looking approach to migratory species conservation in the face of climate change, can be illustrated with reference to the Great Bustard MoU [96]. At the 2nd Meeting of the MoU Signatories in 2008 it was noted that it would be desirable if a number of states where great bustards do not occur yet, but where the birds are expected to move in the future under influence of climate change, were already to join the MoU. The Meeting was also aware, however, of the hurdle posed by the fact that accession as signatories is possible only for *current* range states as defined in the Bonn Convention (see the Final Clauses of the MoU). In sum, according to the Meeting Report [125], signatories were interested in the options for "the inclusion of those states that are currently not listed as range states but are likely to become range states due to climate change" (Paragraph 25). It is convenient to reproduce some further considerations from the Meeting Report on this count (Paragraphs 27 and 28):

> It was noted that while it would be relatively straightforward to invite further countries currently not listed as range states under the MoU to join as observers, such an arrangement may make participation of these new observers difficult since national funding is not necessarily available. Signatory status would on the other hand facilitate such national funding. As a result it may be more practical in the long-term to suggest to new countries interested in joining the MoU to do so as signatories rather than observers.
>
> The CMS Secretariat is invited to use the example of the Great Bustard MoU to encourage debate amongst member states […] on the implications of likely range shifts due to climate change, which may require a change of MoU range.

As with the "historic coverage" issue, available options to respond to the current problem include (1) doing nothing; (2) amending pertinent provisions in the Bonn Convention and/or daughter agreements; and (3) clarifying what CMS parties believe to be the correct interpretation, in the context of climate change, of the provisions involved in a COP resolution. The first option is unappealing, as the "range state" problem is likely to make itself felt increasingly as climate change progresses—the great bustard example discussed above being merely one out of many which could be given. Besides, leaving an issue unresolved which could be clarified is generally unappealing from a legal (not to be confused with a lawyer's) point of view.

At first sight, amending Article I(1)(f) of the Convention might seem to go some way to providing a solution to the "range state" problem. This might be achieved, for instance, by adding the phrase "as well as the areas which the species is likely to occupy in the future under influence of climate change", or something similar, to the definition of "range" in this provision. Inevitably, however, such an amendment would introduce a measure of legal uncertainty into the CMS framework. The legal consequences of the inclusion of species' future distributions within the scope of their formal "ranges" are difficult to foretell precisely. It should be borne in mind in this respect that the question at what point in time a state becomes a "range state" not only determines the possibility to join relevant daughter instruments, but also entails the applicability of, *inter alia*, the obligations in Article III of the Convention on the strict protection of Appendix I species. This legal uncertainty could well make it harder to gain sufficient support for the amendment in question, adding on to the general difficulties of Convention amendment pointed out above. Broadening the scope of "range" to encompass future (and past) range could also be attempted following the route of an agreed interpretation laid down in a COP Resolution. The CMS COP has already indicated in Resolution 10.19 that it wishes to explore this option further (see Paragraph 22, quoted above at the end of Section 6.1). However, adopting an agreed clarification which boils down to an extension of the term "range" as just described appears difficult to achieve without walking or crossing the edge of *contra legem* interpretation, especially if unaccompanied by the initiation of an amendment procedure.

Moreover, whether pursued by means of treaty amendment or interpretation, widening the scope of the "range" definition opens up a number of potential pitfalls [126]. A significant one is the result of the fact that the term "range" features in one of the four conditions that must, according to Article I of the CMS, be met for the conservation status of a species to qualify as "favourable", namely that "the range of the migratory species is neither currently being reduced, nor is likely to be reduced, on a long-term basis" (Article I(1)(c)(2)). Presumably, in the scenario currently pondered, the formal

"range" of a considerable number of species would suddenly increase, not on account of a physical change in distribution but because of the redefinition or reinterpretation of the "range" concept to include potential as well as actual habitats. Hence, unless some mechanism is invented to guard against this, the reform of the term "range" could have the unintended effect of spuriously switching the classified status of species from "unfavourable" to "favourable", even though their real status in the world remains unchanged. Furthermore, to avoid disagreement over what the expanded list of range states for each species should look like after the new definition of "range" takes effect, uniform standards ought to be agreed in advance on the criteria for deciding when a country is to qualify as a range state for a particular species. These criteria must address intricate questions like the following. How likely must a future extension of a species' distribution into a state's territory be? What timeframe is to be chosen in the assessment: five, ten, twenty-five years or yet a different number? Widening the scope of the "range" definition may thus solve one problem while engendering a battery of new problems in the process.

It would therefore seem altogether more advisable to leave the term "range" in Article I of the Bonn Convention well alone, and focus instead on alternative ways of involving future range states in conservation efforts for species which appear to be headed their way in the wake of climatic changes. It will be recalled that similar considerations apply to past range states from which species have disappeared under influence of conventional threats. The common denominator is thus to achieve the involvement of (currently) non-range states in cases where their participation is expected to be conducive to the long-term conservation of the migratory species involved.

It is noteworthy from a legal perspective that the possibility of future and/or past range states becoming full parties or signatories to daughter instruments is neither expressly encouraged, nor expressly precluded in the text of the Bonn Convention (see Articles IV(3)–(4) and V(2)). CMS daughter instruments themselves, however, tend to enable full participation as treaty party or MoU signatory only for "range states". Representative examples, besides the aforementioned Great Bustard MoU, are ACAP [72], which allows only "range states" of the albatross and petrel species covered by the Agreement as parties (Article XV), and the Western African Elephants MoU [100], which likewise stipulates that "[a]ll West African Range States of the African Elephant will be eligible to sign this Memorandum of Understanding" (Paragraph 13).

Whichever way, at its last meeting the CMS COP unequivocally opted for the proactive "full participation" in daughter instruments of countries which are not yet range states but are anticipated to become so in the future as a result of climate change. In the first two operational paragraphs of Resolution 10.19, the COP:

> *Urges* Parties and Signatories to CMS instruments and *encourages* Non-Parties exercising jurisdiction over areas that a migratory species inhabits or is expected to inhabit, in the near future due to climate change, to participate in CMS and relevant CMS instruments, in order to promote timely conservation measures where migration patterns have changed due to climate change;
>
> *Further urges* Parties and Signatories to CMS instruments to enable and support the full participation in CMS of those states, where migratory species are expected to occur, in the near future due to climate change.

The question, still, is how to achieve this. The unambiguous "range state" requirement spelt out as a condition for full participation in the text of most daughter instruments constitutes an obstacle that cannot

simply be "interpreted away" in a decision by the meetings of the parties or signatories. Consequently, from an international law point of view, the amendment of the provisions in question on a case-by-case basis appears the only viable course of action to warrant compliance with Resolution 10.19.

It is in keeping with this conclusion that the CMS Secretariat, in response to a query from the signatory states to the Great Bustard MoU in connection with the aforementioned discussions on future range states, in 2009 pointed out the option of amending the MoU text so as to make it possible for future range states to become full signatories [127]. The procedure to achieve this is uncomplicated, as the Great Bustard MoU "may be amended at any meeting of the Signatories […] by consensus", and such amendment becomes "effective on the date of its adoption by the meeting" (Final Clauses). This is a good place to mention something of an apparent anomaly, following from the fact that non-gouvernmental organizations (NGOs) may become signatories of the same MoU on the mere condition that they are "especially involved in the conservation and management of the Great Bustard" (Final Clauses). This suggests the existence of a more stringent bar to participation by governments of future range states than by NGOs [128].

To follow up on the other examples of instruments mentioned earlier, the amendment procedure of the Western African Elephants MoU is similarly straightforward (Paragraph 11). Modifying the germane provisions of ACAP and other treaty daughters is cumbersome in comparison. For instance, like the Bonn Convention, amendment of ACAP requires a two-thirds majority for adoption and another two-thirds majority for entry into force (Article XII). Also, the slow pace by which amendments under daughter treaties have been implemented in the past, particularly under ACCOBAMS and ASCOBANS, is not precisely encouraging. Still, treaty amendment appears to be the only proper option available to comply with Resolution 10.19. Naturally, the provisions of daughter instruments to be newly adopted in the future should be drafted so as to enable the full participation of future (and past) range states from the start. Of interest from a participation viewpoint, furthermore, is the concept of "cooperating partner" which was introduced in the relatively recent Migratory Sharks MoU [110]. The instrument provides that also "non-range states […] may associate themselves with this Memorandum of Understanding through their signatures as cooperating partners, in particular with respect to the implementation of the Conservation Plan" (paragraph 30). This provision is preceded, however, by a standard clause declaring that the MoU is open for signature for "range states" of the shark species covered (Paragraph 29). It is thus less than clear whether the "cooperating partner" concept would meet the standard of "full participation" of future range states set in CMS COP Resolution 10.19.

In sum, if the request by the CMS COP to provide for full participation of future range states in daughter instruments is to be complied with, the next few years will witness the setting in motion of many amendment procedures by the parties and signatories to CMS treaties and MoUs. It would seem strongly advisable to take advantage of those occasions by drafting the new provisions on participation in such a way as to enable not only *future* range states but also *past* range states to join the instruments concerned as full parties or signatories, given that the latter's participation may be just as desirable from the perspective of the species in question. It would appear particularly expedient if the CMS Secretariat were to develop and distribute one or more model formulations along those lines, which could then be used as a blueprint for all future amendments and new instruments. This would evidently

represent a more constructive exercise than a further exploration of the apparent blind alley of reinterpreting the term "range".

6.3. Migration as a Phenomenon, Non-Migratory Species, and the Scope of the CMS

The last issues dealt with in this article do not so much involve potential obstacles to climate adaptation, but two interesting questions raised by climate change regarding the scope of the CMS regime. The first of these concerns the impact of climate change on migratory behaviour, discussed above with reference to the progressively less migratory common buzzard (see Section 2.2). Specifically, climate change gives rise to the question whether the CMS regime has a role to play in respect of the conservation of migration as a phenomenon, as viewed apart from the conservation of migratory *species*. A first thing to note is that, generally speaking, there is not much attention in the legal discipline for the conservation of migration as such. A recent article written in the US on this topic finds that "there is scant systematic legal concern about conserving the migrations" of wild animal species, while also observing that "serious legal efforts to protect the process and function of migration would represent significant broadening of the current framework for biodiversity protection policy" [129].

Judging from its text, overall the Bonn Convention would appear to fit this picture. Whereas CMS provisions are clearly aimed at preventing the loss of migratory *species*, they do not explicitly aim to prevent the loss of migratory *behaviour* as such. The only potential exception is Article III(4)(b), which arguably comes close to embodying an obligation to prevent adverse impacts of climate change on migratory behaviour as such, by stipulating that parties shall "endeavour" to "prevent, remove, compensate for or minimize, as appropriate, activities or obstacles that seriously impede or prevent the *migration*" (emphasis added) of Appendix I species. A comparison between Articles III(4)(b) and III(4)(c)—which latter broadly instructs parties to "prevent, reduce or control factors that are endangering or are likely to further endanger the *species*" (emphasis added)—appears to plead in favour of such an interpretation. That is to say, if the drafters of the Bonn Convention had merely been concerned about obstacles to migration in terms of their adverse impact on the status of species, it would not have been necessary to separately frame Article III(4)(b) [128].

That the issue of protecting migration as such—regardless of whether threats to migration also threaten the species involved—is taking on an urgency of its own has been duly acknowledged by the CMS COP at its last meeting. Resolution 10.19 records the parties' concern that "climate change is already having an adverse impact on migratory species *and the phenomenon of animal migration*" (Preamble, emphasis added). None of the actions recommended in the Resolution are, however, specifically devoted to countering the threat posed by climate change to migratory behaviour. Perhaps this is not surprising, as there seems to be little in the way of concrete measures which can be taken to counter this dimension of climate impacts on migratory species, except in general terms of climate change mitigation and possibly the objective of keeping populations as large as possible so as to cater for genetic variation.

In any event, it seems improbable that listed species which become non-migratory will be removed from CMS Appendices for that reason, even if strictly speaking the species no longer classifies as "migratory species" according to the definition of this term in Article I of the Bonn Convention (see below). Besides, as regards Appendix I species, Article III(3) of the Convention allows for the delisting

of such species only when it is demonstrably no longer endangered and unlikely to become endangered again as a result of its deletion from Appendix I. Hence, other circumstances—including when a species no longer migrates, no longer has a transboundary population (e.g., due to a constriction of its range or the unification of formerly separate states), or otherwise no longer meets the CMS definition of "migratory species"—cannot justify the removal of any species from Appendix I.

The latter observation creates a convenient bridge to the second and final issue considered here. That is the question to what degree a role can be envisaged for the CMS regime with regard to the conservation of *non-migratory species*. This is a pertinent issue not only because of the potential loss of migratory behaviour just discussed, but also because the question may be asked whether a future role for the CMS regime can be envisaged in respect of the transboundary, climate-induced range shifts of classical *sedentary* species. It may appear incongruous to suggest such a thing in connection with the Convention on *Migratory* Species, but there is some motive to explore the suggestion further, albeit with due caution.

A proper starting point for this exploration is the definition of "migratory species" in Article I(1)(a) of the Bonn Convention:

> "Migratory species" means 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.

This definition is evidently based on international policy considerations as much as on biological ones. In any case, in connection with the latter, the absence should be noted of a commonly accepted, uniform definition of "migration" in the scientific literature [130]. In 1988, the CMS COP recorded an agreed interpretation of the terms "cyclically and predictably" in Resolution 2.2 [120]. The Resolution clarifies that "cyclically" relates to "a cycle of any nature, such as astronomical (circadian, annual *etc*.), life or climatic, and of any frequency;" and that "predictably" implies that "a phenomenon can be anticipated to recur in a given set of circumstances, though not necessarily regularly in time" (Paragraph 1(a)). These liberal interpretations obviously enable the listing in CMS Appendices of more species than would have been the case upon a stricter reading of the terms.

As far as the legal significance of the definition is concerned, it should be noted that according to Articles III and IV of the Bonn Convention, listing in Appendices I and II is reserved for "migratory species". Consequently, the corresponding obligations concerning strict protection for Appendix I species and the conclusion of "AGREEMENTS" for Appendix II species will in principle only apply to species which qualify as "migratory species". Species which do not fit the description may still benefit from the call on CMS parties in Article IV(4) of the Convention to consider the conclusion of "agreements" for a much wider category of species "members of which periodically cross one or more national jurisdictional boundaries".

When it comes to the application of the definition in Article I(1)(a) to concrete species, "CMS practice does not reveal absolute consistency", as the second edition of *Lyster's International Wildlife Law* delicately phrases it [53]. The following examples properly illustrate this. On the one hand, a suggestion to bring the Asian elephant (*Elephas maximus*) under CMS auspices was rejected at the 4th CMS COP because, as the Meeting Report [131] recounts, the species was judged merely to "oscillate" across national frontiers, and to fall short of being genuinely migratory (Paragraph 105). On the other

hand, several other species have made it into CMS Appendices despite comparable doubts as to whether their movements across national borders are sufficiently cyclical and predictable. These include the mountain gorilla (*Gorilla beringei*), the Mediterranean monk seal and the South Andean huemul. The justification given in the South Andean Huemul MoU [111] for considering this deer species a "migratory species" is especially narrow. The MoU's Preamble notes that "some populations of the South Andean Huemul (*Hippocamelus bisulcus*) can be considered migratory because their habitat partly covers the border area between" Argentina and Chile. Animals like these, which do not portray anything resembling regular migrations in the classical sense, but periodically cross national boundaries for the simple reason that their range overlaps more than one country, are sometimes referred to as "technical migrants". Technical migrants make a good fit with the aforementioned category of species "members of which periodically cross one or more national jurisdictional boundaries", for which CMS parties are encouraged to adopt daughter instruments under Article IV(4) of the Bonn Convention, whether or not the species is listed under the Convention. As just explained, however, technical migrants have also found their way into Appendices I and II, as a result of flexible interpretations of the term "migratory species". To provide one further illustration, the bukhara deer was not listed under either CMS Appendix at the time the MoU for this species was concluded [98], but was simultaneously added to both Appendix I and II three years later, in 2005 [53].

On the whole, CMS practice thus appears to be dominated by a tendency "not to adopt an unduly restrictive approach" to the issue [53]. Inclusive and pragmatic rather than dogmatic, the approach taken under the CMS is perhaps best described as *transboundary* species conservation, instead of *migratory* species conservation. "Convention on Transboundary Wildlife Conservation" might indeed have been a more accurate title for the Bonn Convention. And if, as it seems to be, the basic rationale of the CMS regime today is to conserve "species which cross boundaries" and not just migratory species proper, then a role for the regime can legitimately be envisaged also in respect of *sedentary* species the ranges of which are expected to shift across national boundaries under influence of climate change.

This would naturally raise some additional questions regarding the division of work between the CMS and other legal instruments, in particular the Biodiversity Convention—of which, as observed earlier, the CMS is "lead partner" in the field of migratory species conservation. Some things to note in this regard are the significantly larger number of states that are parties to the CBD, as well as its more expressly comprehensive scope, which evidently covers migratory as well as sedentary species, and plants as well as animals. Conversely, the CBD lacks the daughter instrument toolbox and the strong focus on species-specific transboundary cooperation of the CMS. The latter attributes apparently plead in favour of strengthening the complementary role of the CMS concerning the adaptation of transboundary wildlife, both migratory and non-migratory, to climate change. Budgetary or other practical constraints may in the short term well prevent a more pronounced role of CMS with respect to climate-driven animal range shifts generally. The only point made here is that, from a legal point of view, such a role is plainly conceivable.

7. Conclusions and Recommendations

This final section sets out the main findings of this article, as well as a number of associated recommendations.

Species migrating across national boundaries constitute the classic case for the creation of international nature conservation law. Climate change is complicating this enterprise of international cooperation for migratory wildlife conservation, on account of the shifting ranges and particular vulnerabilities to climate change of migratory species. In one of its studies, the Zoological Society of London submits that the Bonn Convention and its daughter agreements provide "an unparalleled opportunity to develop strategies at the international level and foster cooperation between countries to tackle the impacts of climate change on specific species" [12]. The present article clearly demonstrates that the CMS regime has in fact already begun to come to terms with the novel challenge of helping migratory species adapt to climate change with minimal losses.

Having been drafted before climate change appeared on intergovernmental agendas, the provisions of the Bonn Convention do not explicitly address the implications of climate change for migratory species conservation. The implementation of general Convention duties on the protection of migratory species may, nonetheless, further the adaptability of species to climate change. Besides, some provisions, albeit without stating this in so many words, can be construed as requiring the taking of climate adaptation measures. This position is reinforced by the fact that action to facilitate the adaptation of species to climate change has expressly been called for in a series of significant CMS COP Resolutions. Various pertinent studies, including species-specific vulnerability assessments, have furthermore been carried out under CMS auspices. The priority accorded to the issue is reflected, finally, in the existence of an active Working Group on Climate Change, led by a COP-Appointed Scientific Councillor for Climate Change. The CMS regime is also plainly of relevance to climate change *mitigation*. In particular, the Bonn Convention (and the same is true of various daughter instruments) evidently reinforces existing obligations of parties to prevent further harmful climate change, including in the context of the UN Framework Convention on Climate Change [132].

Practice concerning climate adaptation in the context of CMS daughter instruments has hitherto been patchy. Climate change has been formally acknowledged as a (potential) threat to migratory species under eleven of the twenty-six daughter instruments—three treaty daughters and eight Memoranda of Understanding. The parties or signatories to some of these have taken actual steps towards the development and implementation of adaptation measures for the species involved. In the context of most of the eleven instruments in question, however, action has remained limited to recognizing the threats posed by climate change and calling for further research. None of the seven CMS treaty daughters, with the exception of one minor reference in the AEWA Action Plan, expressly address climate change in their binding provisions. Yet, in parallel to the Bonn Convention, various treaty provisions are of indirect relevance and some can arguably be understood to prescribe the taking of adaptation—and mitigation—measures. Besides, as all daughter instruments strive for a favourable conservation status for the species covered and for the reduction of conventional threats, their implementation must be assumed to contribute to some extent to the resilience and adaptability of the species involved. The most comprehensive steps have been taken under the African-Eurasian Waterbirds Agreement, including commitments by parties to taking adaptation measures, and the provision of detailed guidance on such measures. AEWA has thus set the gold standard so far among CMS daughter instruments.

The article identifies a few tough legal nuts which relate to the fact that the Bonn Convention was adopted before climate change became a big issue, and explores alternative methods of cracking them.

These nuts are also of interest from a broader academic perspective, as they touch on the question to what extent the limits of the general rules on treaty interpretation can be stretched. One of the identified problems is that participation in CMS daughter instruments as party or signatory, as the case may be, is reserved for "range states" of the species concerned. "Range" is defined in Article I of the Bonn Convention as the areas *presently* occupied by a species. Consequently, the "range state" requirement can stand in the way of proactive climate adaptation action, by preventing the timely participation of states where species do not yet occur but are expected to turn up in the future due to climate change. CMS COP Resolution 10.19 explicitly urges such "future range states" to participate in relevant CMS instruments and instructs the parties and signatories to daughter instruments to "enable and support the full participation" of such states. The analysis conducted above indicates that, from an international law point of view, the amendment of the participation provisions in each individual daughter instrument in question appears to be the only viable course of action to warrant compliance with these requests by the COP. Incidentally, to secure comprehensive and long-term conservation of the species involved, it is submitted that the modified provisions should not only permit the full participation of *future* range states, but also—albeit for reasons unrelated to climate change—of *past* range states. Interestingly, Resolution 10.19 also calls for the examination of a possible reinterpretation in light of climate change of the term "range" as defined in CMS Article I. The examination performed in the current article reveals that, on the whole, such reinterpretation would probably be counterproductive.

In addition, Resolution 10.19 calls for a similar investigation to verify whether the term "historic range" as defined in Article I of the Bonn Convention, could benefit from an agreed interpretation by the CMS COP, with a view to its potential incompatibility with the needs of species under climate change. According to Article I(1)(c)(4), for the conservation status of a species to classify as "favourable", its distribution must "approach historic coverage […] to the extent that potentially suitable ecosystems exist and to the extent consistent with wise wildlife management". Striving for a favourable conservation status as so defined—*i.e.*, for a range that coincides with species' historic distributions—could be problematic because of ongoing and anticipated climate-induced distribution shifts. This article concludes that it would indeed be advisable for the CMS COP to lay down an agreed interpretation in a Resolution at its next meeting, clarifying that Article I(1)(c)(4) of the Convention is compatible with the taking of conservation action beyond the historic ranges of species in response to climate change. Such a clarification could probably usefully exploit the term "approach" as well as the second half of the provision, which refers to "wise wildlife management" and the availability of "suitable ecosystems".

Other interesting questions identified in this article pertain to the significance of the CMS regime for species gradually losing their migratory behaviour, and even the regime's potential role regarding the adaptation of *non*-migratory species to climate change. Analysis of Convention provisions, including the term "migratory species", and CMS practice renders the conclusion that a more pronounced role of the CMS regime in respect of the adaptation to climate change of transboundary wildlife generally—both migratory and sedentary—is conceivable.

A general recommendation flowing forth from the article is that it would obviously be appropriate for the CMS Scientific Council, Secretariat and COP, in view of the central CMS objective of migratory species conservation, to maintain the current strong focus on climate change in their activities for some time to come. Likewise, it would evidently be in line with the same objective to

progressively incorporate provisions regarding the adaptation of migratory species to climate change in CMS ancillary instruments, in particular through the amendment of Action Plans to treaty daughters and the amendment of MoUs. Besides, the research in this article gives rise to the following concrete recommendations for CMS bodies concerning the follow-up of COP Resolution 10.19:

- Secretariat: remind meetings of parties and signatories of daughter instruments of the need to amend instruments to enable and support full participation of future (and past) range states, in compliance with CMS COP Resolution 10.19.
- Secretariat: develop and distribute one or more model formulations enabling such full participation, to be used as blueprint for amendments and new instruments.
- COP: in the next Resolution on climate change, expressly call for the amendment of daughter instruments to enable the full participation, as party or signatory, of future (and past) range states, insofar as this has not already been done.
- COP: in the next Resolution on climate change, include an agreed interpretation along the lines suggested above, on the meaning in light of climate change of Article I(1)(c)(4) of the Bonn Convention, according to which the distribution of a species is to approach "historic coverage" for its conservation status to qualify as "favourable".
- COP: in the next Resolution on climate change, *not* include any agreed interpretation of the term "range" as defined in Article I(1)(f).

In summary, it can safely be concluded that the CMS regime has taken significant first steps towards becoming a "climate-proof" international wildlife conservation regime. At the same time, much potential remains for enlarging its contribution to ameliorating the impacts of climate change on migratory—and to some degree perhaps non-migratory—species conservation.

One thing is clear. As climate change advances, the need for the continued development and effective implementation of the CMS regime will increase concomitantly.

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