

Red List Indices for migratory species

Report to Convention on Migratory Species Secretariat

**BirdLife International
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INTRODUCTION

IUCN Red List Index

The IUCN Red List is widely recognised as the most authoritative and objective system for classifying species by their risk of extinction (see, e.g. Regan *et al.* 2005, de Grammont and Cuarón, 2006, Rodrigues *et al.* 2006). It uses quantitative criteria based on population size, rate of decline, and area of distribution to assign species to categories of relative extinction risk (IUCN 2001). The criteria are clear and comprehensive but are sufficiently flexible to deal with uncertainty (Akçakaya *et al.* 2000). The assessments are not simply based on expert opinion; they must be supported with detailed documentation of the best available data, with justifications, sources, and estimates of uncertainty and data quality (IUCN 2005). Red List Authorities (e.g. BirdLife International for birds) are appointed to organise independent scientific review and to ensure consistent categorisation between species, groups, and assessments. A Red List Standards and Petitions Subcommittee monitors the process and resolves challenges and disputes to listings. A coordinated global program is overseen by partner organisations including the IUCN Species Survival Commission, BirdLife International, NatureServe, and the Center for Applied Biodiversity Science at Conservation International.

The Red List Index (RLI) has been developed as an indicator of trends in the status of biodiversity. It is based on the movement of species through the categories of the IUCN Red List (Butchart *et al.* 2004, 2005, 2007). The RLI shows changes in the overall threat status (extinction risk) of sets of species, with RLI values relating to the proportion of species expected to remain extant in the near future without additional conservation action.

As well as monitoring global trends for different taxonomic groups, the RLI can be disaggregated to compare trends for suites of species in different biogeographic regions, ecosystems, habitats, taxonomic subgroups or relevant to different international treaties. Here, we present an RLI for bird and mammal species.

METHODS

Calculating the RLI

The RLI is calculated from the number of species in each Red List category (Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered), and the number changing categories between assessments as a result of genuine improvement or deterioration in status (category changes owing to improved knowledge or revised taxonomy are excluded). The original methodology was described in detail in Butchart *et al.* (2004, 2005), and revised in Butchart *et al.* (2007): the latter is used here. An RLI value is calculated as follows:

$$RLI_t = 1 - \frac{\sum W_{c(t,s)}}{W_{EX} \cdot N}$$

where $W_c(t,s)$ is the weight of category c for species s at time t , which ranges from 1 for Near Threatened to 5 for Extinct (W_{EX}), and N is the number of assessed (non-data deficient) species. Put simply, the number of species in each Red List category is multiplied by the category weight, these products are summed, divided by the maximum possible product (the number of species multiplied by the maximum weight), and subtracted from one. This produces an index that ranges from 0 to 1 (see below).

These conditions are met by back-casting all non-genuine category changes to the year of first assessment (1988 for birds, 1996 for mammals). In other words, taking birds as an example, we assume that species should have been classified at their current Red List category since 1988, apart from those species for which genuine category changes have occurred, in which case they are assigned to appropriate time periods, corresponding to the dates in which all species were reassessed (see Collar and Andrew 1988, Collar *et al.* 1994, BirdLife International 2000, BirdLife International 2004, BirdLife International 2008). To determine these genuine cases, all category changes during 1988-2008 for birds and 1996-2008 for mammals were assigned a 'reason for change', allowing genuine ones to be distinguished from those resulting from improved knowledge or taxonomic revisions (see Butchart *et al.* 2004, 2005, 2007 for further details).

Defining migrants

BirdLife International and IUCN define migratory species as those for which a substantial proportion of the global or regional population makes regular or seasonal cyclical movements beyond the breeding range, with predictable timing and destinations. This includes species that may be migratory only in part of their range or part of their population, short-distance migrants and migrants that occasionally may respond to unusual conditions in a semi-nomadic way. It also includes altitudinal migrants: those that regularly or seasonally make cyclical movements to higher or lower elevations with predictable timing and destinations. In the definitions of Dodman and Diagona (2007), migratory species exclude 'rains migrants/arid migrants' i.e. species which move with unpredictable timing and destination in response to irregular rainfall patterns, 'nutrition migrants/post-roost dispersers' i.e. species that disperse daily from roosts to forage, 'post-breeding dispersers' which may not make cyclical movements i.e. dispersers that may not return to the same breeding area, and 'environmental response migrants' i.e. species that move opportunistically in response to irregular environmental conditions such as rainfall, fire, locust eruptions etc.

This definition is more biologically based than the definition used by the Convention on Migratory Species (CMS) which defines a migratory species as one in which 'a significant proportion of [the population] cyclically and predictably cross one or more national jurisdictional boundaries'. Nevertheless, there is likely to be a high degree of overlap between the two, and any differences are judged unlikely to bias the results.

Using the BirdLife/IUCN definition, RLIs were calculated for 1988-2008 for 2,193 migrant bird species. For mammals, migratory status has not been coded completely for all species, so for the analyses presented here an RLI was calculated for 1996-2008 for the 166 species listed on the CMS Appendices.

Interpreting the RLI

RLI values relate to the proportion of species expected to remain extant in the near future without conservation action. An RLI value of 1.0 equates to all species being categorised as Least Concern, and hence that none are expected to go extinct in the near future. An RLI

value of zero indicates that all species have gone Extinct. A downwards trend in the graph line (i.e. decreasing RLI values) means that the expected rate of species extinctions is increasing i.e. that the rate of biodiversity loss is increasing. A horizontal graph line (i.e. unchanging RLI values) means that the expected rate of species extinctions is unchanged. An upward trend in the graph line (i.e. increasing RLI values) means that there is a decrease in expected future rate of species extinctions (i.e. a reduction in the rate of biodiversity loss).

RESULTS

Migrant birds

Of the world's 9,990 bird species (as recognised by BirdLife International 2008), 2,200 are considered migrants, including 343 altitudinal migrants. Of the total, two are classified by BirdLife as Extinct, four are Critically Endangered (Possibly Extinct), 26 are Critically Endangered, 48 are Endangered, 128 are Vulnerable, 109 are Near Threatened and 1,876 are Least Concern. Seven are listed as Data Deficient and therefore excluded from the RLI.

During 1988–2008, there were 62 genuine status changes among the bird taxa, involving 54 species. Eight species improved in status sufficiently to be downlisted to lower categories of threat: Barau's Petrel *Pterodroma baraui*, Black-vented Shearwater *Puffinus opisthomelas*, Puna Flamingo *Phoenicoparrus jamesi*, Black-faced Spoonbill *Platalea minor*, Dalmatian Pelican *Pelecanus crispus*, White-tailed Eagle *Haliaeetus albicilla*, Lesser Florican *Sypheotides indicus* and Kirtland's Warbler *Dendroica kirtlandii*. These all improved in status as a consequence of conservation action, apart from Lesser Florican which increased owing to breeding season rainfall patterns. Forty-seven species deteriorated in status sufficiently to be uplisted to higher categories of threat during 1988–2008. Examples include Spoon-billed Sandpiper *Eurynorhynchus pygmeus* which deteriorated from Vulnerable to Endangered during 1994–2000, and from Endangered to Critically Endangered during 2004–2008, and European Roller *Coracias garrulous* which declined from Least Concern to Near Threatened during 1994–2000.

The RLI for migrants shows the net effect and timing of these changes by plotting the overall extinction risk of this set of species over 1988–2008. It can be compared to the RLI for non-migrants (Fig. 1). This shows that, overall, migrant birds are less threatened than non-migrants (i.e. RLI values are higher), although their status has deteriorated equally fast (i.e. the RLI slope is similar). This former result is perhaps not surprising given that migrants tend to have large ranges and fairly large populations, notwithstanding the fact that they may be particularly susceptible to human impacts owing to their dependence on a combination of breeding, passage and non-breeding habitats. It is interesting to note that altitudinal migrant birds are less threatened on average than other (i.e. latitudinal) migrants (Fig. 2).

Figure 1. Red List Index of species survival for migratory birds (n=2,191 non-Data Deficient species extant in 1988) and for non-migratory bird species (n=7,600), showing the proportion of species expected to remain extant in the near future without additional conservation action. An RLI value of 1.0 equates to all species being categorised as Least Concern, and hence that none are expected to go extinct in the near future. An RLI value of zero indicates that all species have gone Extinct.

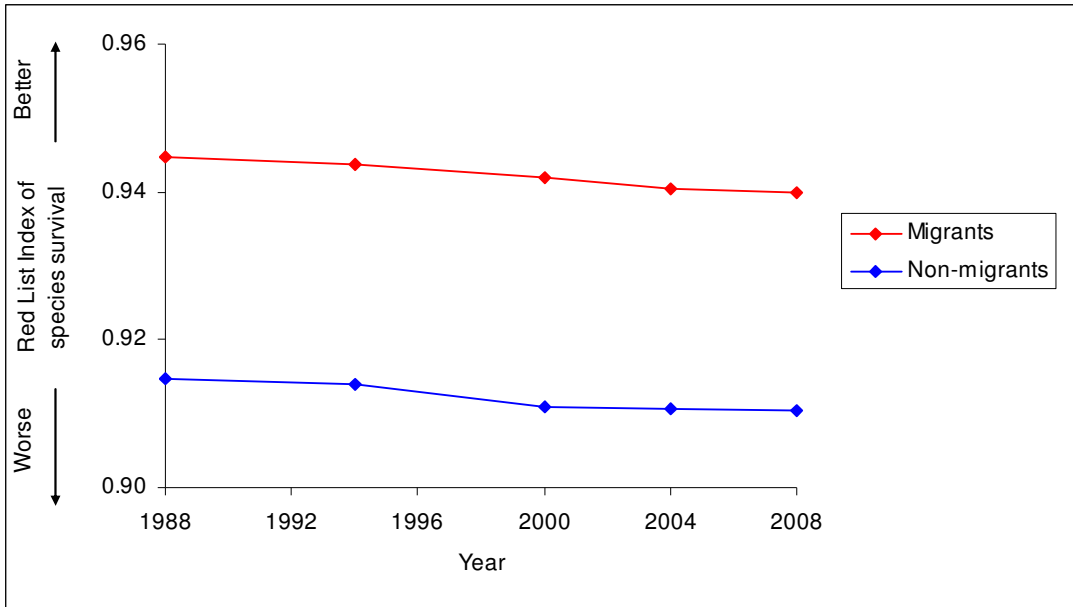
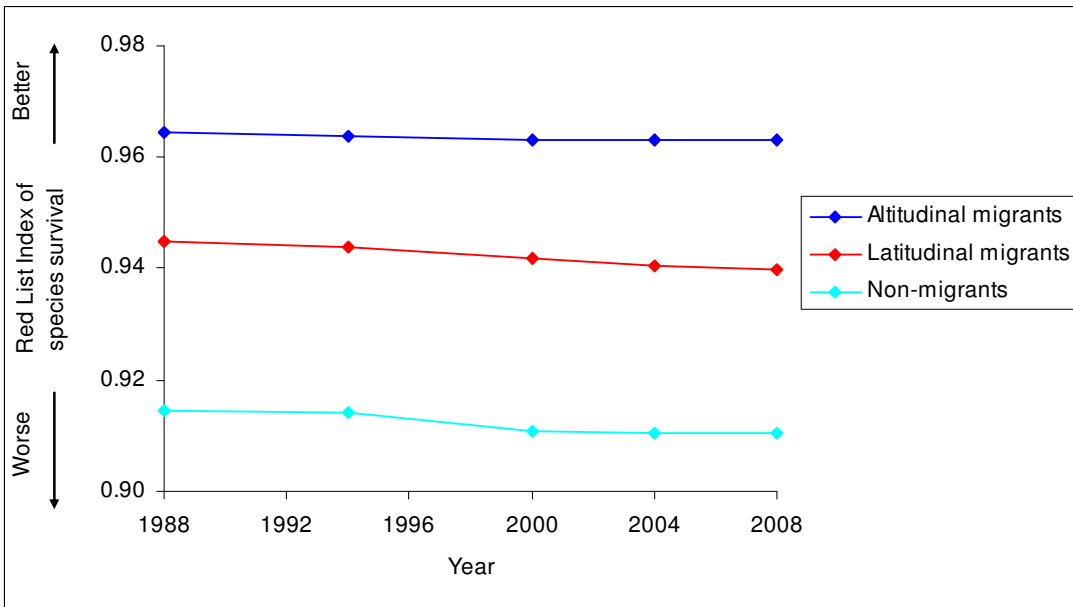


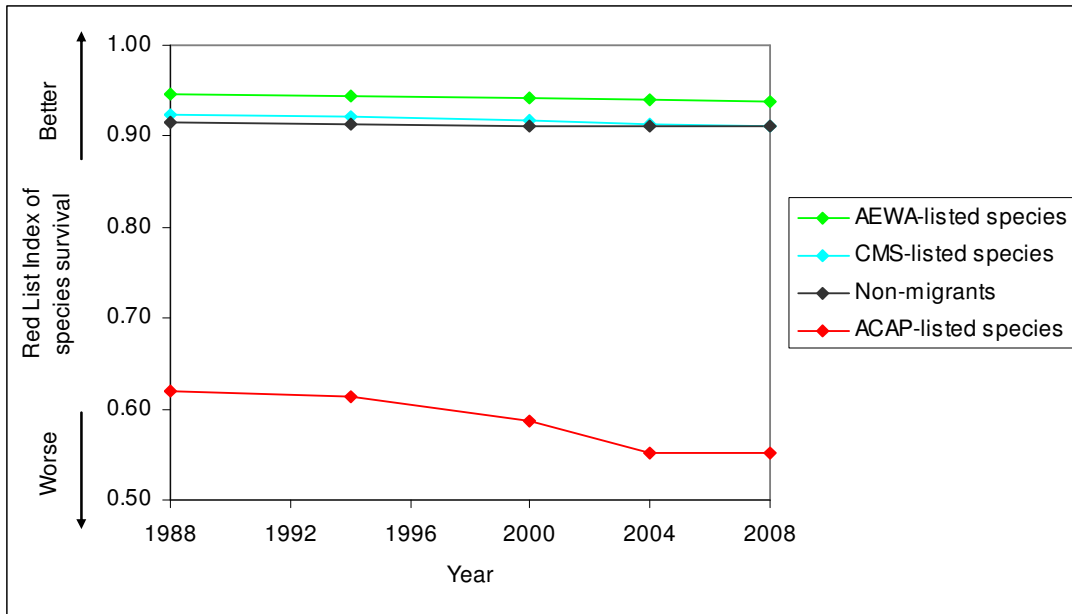
Figure 2. Red List Index of species survival for latitudinally migratory birds (n=1,848 non-Data Deficient species extant in 1988), altitudinally migratory bird species (n=343), and for non-migratory bird species (n=7,600), showing the proportion of species expected to remain extant in the near future without additional conservation action. An RLI value of 1.0 equates to all species being categorised as Least Concern, and hence that none are expected to go extinct in the near future. An RLI value of zero indicates that all species have gone Extinct.



Species listed on the appendices of the CMS and the African-Eurasian Waterbird Agreement (AEWA) under the CMS are less threatened on average than non-migrant species, consistent with the result above, although they have continued to deteriorate in status as rapidly (Fig. 3). However, it is striking to note that species listed on the appendix of the Agreement on the Conservation of Albatrosses and Petrels (ACAP) are substantially more threatened (with lower RLI values), and have deteriorated in status faster (Fig. 3). This reflects the impacts of

bycatch on commercial long-line fisheries in combination with other threats such as invasive species at breeding colonies (BirdLife International 2008). Such declines were the major impetus behind the establishment of the agreement.

Figure 3. Red List Index of species survival for AEWA-listed bird species (n=234 non-Data Deficient species extant in 1988), ACAP-listed species (n=29), CMS-listed species (n=741), and for non-migratory bird species (n=7,600), showing the proportion of species expected to remain extant in the near future without additional conservation action. An RLI value of 1.0 equates to all species being categorised as Least Concern, and hence that none are expected to go extinct in the near future. An RLI value of zero indicates that all species have gone Extinct.



Once the species listings for the draft MOU on the conservation of migratory birds of prey in Africa and Eurasia are finalized, it will be possible to develop a similar RLI for the relevant suite of raptor species. Although further disaggregations of these RLIs are theoretically possible (e.g. by biogeographic realm, ecosystem or habitat), their robustness is limited by the number of species undergoing genuine status changes. It is advisable to wait until data are available from a broader suite of taxonomic groups before attempting to examine trends for additional subsets of migrants.

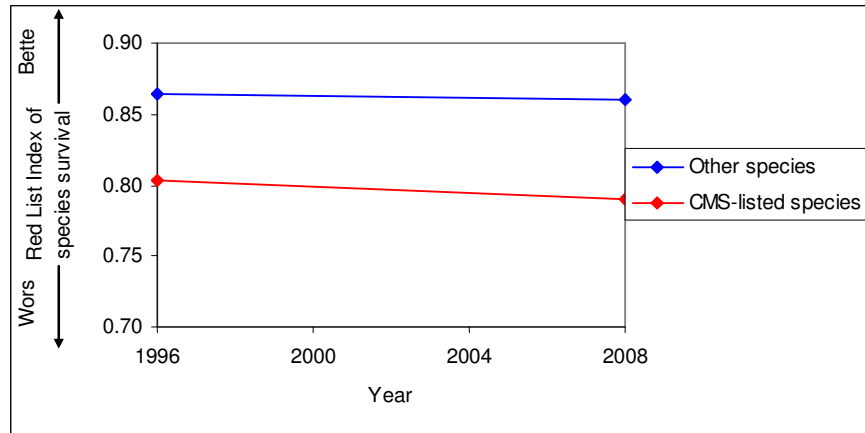
Migrant mammals

Of the 5,487 mammal species in the world, 166 are listed on CMS Appendix I (32) or II (134). One is listed on the 2008 IUCN Red List as Critically Endangered (Possibly Extinct), one is Extinct in the Wild, 7 are Critically Endangered, 19 are Endangered, 20 are Vulnerable, 14 are Near Threatened and 75 are Least Concern. An additional 29 species are listed as Data Deficient and therefore excluded from the RLI.

During 1996-2008, 18 of these taxa underwent genuine status changes (see Appendix 2). Four species (*Balaena mysticetus*, *Balaenoptera musculus*, *Megaptera novaeangliae*, *Loxodonta africana*) improved in status sufficiently to be downlisted to lower categories of threat, while the remainder deteriorated in status sufficiently to be uplisted to higher categories of threat during.

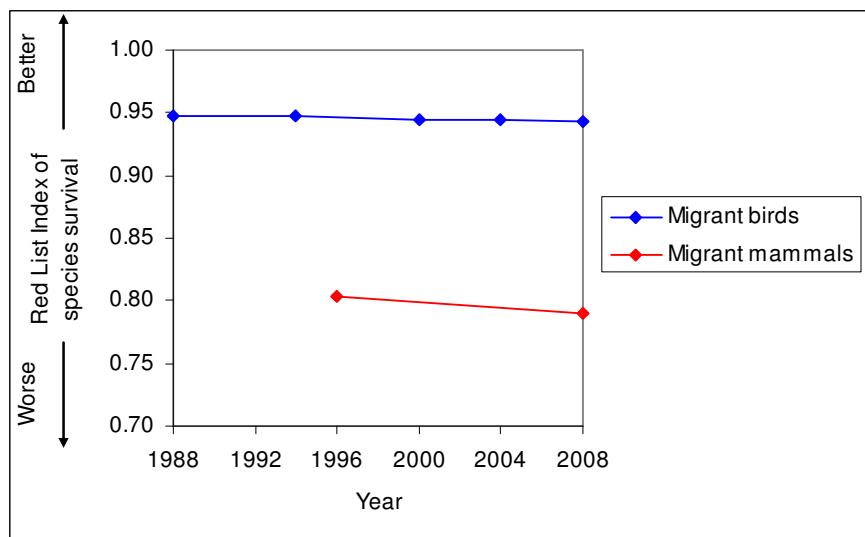
The RLI for migrant mammals integrates these status changes and shows that CMS-listed mammals are more threatened overall than other species (their RLI values are lower), and that they deteriorated in status during 1996-2008 faster than non-CMS listed species (Fig 2.).

Figure 2. Red List Index of species survival for CMS-listed mammal species (n=137 non-Data Deficient species) and for other mammal species (n=4,437 non-Data Deficient species), showing the proportion of species expected to remain extant in the near future without additional conservation action. An RLI value of 1.0 equates to all species being categorised as Least Concern, and hence that none are expected to go extinct in the near future. An RLI value of zero indicates that all species have gone Extinct.



A comparison of the RLIs for migrant birds and mammals shows that overall, migrant mammals are more threatened overall than other species (their RLI values are lower), and that they have deteriorated in status during recent years faster than migrant birds. Both groups are suffering from human impacts, but for mammals the situation is worse.

Figure 3. Red List Index of species survival for migrant birds (n=826 non-Data Deficient species) and for migrant mammals (those listed on CMS Appendices; n=137 non-Data Deficient species), showing the proportion of species expected to remain extant in the near future without additional conservation action. An RLI value of 1.0 equates to all species being categorised as Least Concern, and hence that none are expected to go extinct in the near future. An RLI value of zero indicates that all species have gone Extinct.



Further work

The mammal data used here were produced by the Global Mammal Assessment, but require further checking and validation before they are released in the 2008 IUCN Red List later in 2008. While some details may change, the overall picture is unlikely to differ from that presented here. Completion of coding of migratory status for all mammals will allow an RLI to be produced that is more comparable with the bird one shown here, rather than just relying on the list of species on the CMS appendices.

Repeated assessments of birds and mammals in future will allow trends in their status to be tracked over time using the RLI. Other taxonomic groups containing migrants are being assessed regionally – fish, dragonflies and various other groups, but it will be some time before two datapoints will be available for all species in any of these groups globally.

While the RLI is not highly sensitive to small-scale changes in the status of species (as picked up by population trend-based indicators), it has global scope and coverage, and hence is not biased geographically in the way that population trend-based indicators are. The results presented here demonstrate the utility of the RLI in tracking trends in the status of species relevant to the CMS.

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Appendix 1.

Table of bird species undergoing genuine status changes during 1988-2008.

Common name	Period	Inferred category at start of period	Inferred category at end of period	Notes
Red-breasted Goose <i>Branta ruficollis</i>	2000-2004	VU	EN	The population increased from the late 1970s to a peak of 88,425 individuals in 2000. Since then it declined to 32,100 individuals in 2005, with the 5-year average decline exceeding 50% during 2000-2004, qualifying the species for uplisting to Endangered under criterion A2. During 1988-2000 it would have qualified as Vulnerable under criterion B2. Drivers of declines are a combination of hunting, habitat loss and other threats.
Philippine Duck <i>Anas luzonica</i>	1994-2000	NT	VU	The population of this species has been declining for several decades, and underwent a further rapid population decline during the 1990s, falling from 10,000-100,000 individuals in 1993 to <10,000 by 2002. The rate of decline is suspected to have exceeded 30% over ten years during 1994-2000, qualifying the species for uplisting from Near Threatened to Vulnerable under criterion A2 by 2000.
Meller's Duck <i>Anas melleri</i>	1988-1994	VU	EN	The population size of this species is suspected to have declined to below 2,500 mature individuals during 1988-1994 owing to hunting and habitat loss, qualifying the species for uplisting from Vulnerable to Endangered under criterion C2a _{ii} by 1994.
Eaton's Pintail <i>Anas eatoni</i>	1994-2000	NT	VU	This species was projected to undergo a rapid decline in the 1990s as a result of cat predation, owing to the staple prey of cats on Kerguelen island (petrels) reaching low levels and consequent prey-switching being predicted. The decline rate was projected to exceed 30% over ten years during 1994-2000, qualifying the species for uplisting from Near Threatened to Vulnerable under criterion A3 by 2000.
Baer's Pochard <i>Aythya baeri</i>	2004-2008	VU	EN	Widespread evidence suggests that the rate of decline exceeded 50% over ten years by 2008, leading to uplisting from Vulnerable to Endangered under criteria A2 and A3. The year that the threshold was crossed is difficult to quantify, but is placed in the period 2004-2008, as by 2008 numbers were said to have 'very sharply declined in the last 10 years' (M. Barter in litt. 2007).
Steller's Eider <i>Polysticta stelleri</i>	2000-2004	NT	VU	Alaskan populations of this species declined from 137,904 individuals in 1992 to 77,329 individuals in 2003. Given the proportion of the global population they form, the global population decline rate would have exceeded 30% over three generations (12 years) in 2000, qualifying the species for uplisting from Near Threatened to Vulnerable under criterion A2 in 2000.
White-headed Duck <i>Oxyura leucocephala</i>	1994-2000	VU	EN	The population of this species underwent a rapid population decline during 1991-2001 in Turkey (10,927 birds in 1991 to 653 in 2001) and further east (eg Turkmenistan), outweighing increases in Spain (in particular) plus Israel, Syria, Greece, Bulgaria and Romania. The overall trend is negative, and the decline

				is suspected to have exceeded 50% over ten years during 1994-2000, qualifying the species for uplisting from Vulnerable to Endangered under criterion A2 by 2000.
Alaotra Grebe <i>Tachybaptus rufolavatus</i>	1988-1994	CR	CR(PE)	The last record was in 1988, since when the species is likely to have gone extinct; hence this species qualified as Possibly Extinct by 1994.
Titicaca Grebe <i>Rollandia microptera</i>	2000-2004	LC	EN	The population declined from 2,000-10,000 individuals in the 1980s to 197-700 individuals in the early 2000s, with the rate of decline believed to have exceeded 50% over ten years and the population size believed to have fallen below 1,000 mature individuals since 2000, hence qualifying the species for uplisting to Endangered under criteria A2 and D1 by 2004.
Chilean Flamingo <i>Phoenicopterus chilensis</i>	1988-1994	LC	NT	The rate of population decline of this species is suspected to have approached 30% over ten years during 1988-1994 owing to intensification of several different threats, including hunting, egg-collecting and habitat loss, qualifying the species for uplisting from Least Concern to Near Threatened under criterion A2 by 1994.
Puna Flamingo <i>Phoenicoparrus jamesi</i>	1994-2000	VU	NT	Following an historical decline, this species's population is now increasing owing to successful conservation programmes, with a particularly good breeding season in 1999-2000. The overall trend over three generations (assumed to be 48 years in this species) is still negative however. The decline is suspected to have fallen below 30% during 1994-2000, qualifying the species for downlisting from Vulnerable to Near Threatened under criterion A2 by 2000.
White-shouldered Ibis <i>Pseudibis davisoni</i>	1994-2000	EN	CR	The population size of this species is suspected to have fallen below 250 mature individuals during 1994-2000, qualifying the species for uplisting from Endangered to Critically Endangered under criterion C2aii by 2000. Note that a 1997 population estimate of <2,500 individuals is considered to be unrealistically high.
Asian Crested Ibis <i>Nipponia nippon</i>	1994-2000	CR	EN	The population size is increasing from 7 individuals in 1981 to 66 in 1998 and 360 in 2006, passing the threshold of 50 mature individuals during 1994-2000 and hence qualifying the species for downlisting from Critically Endangered to Endangered under criterion D1 by 2000.
Black-faced Spoonbill <i>Platalea minor</i>	1994-2000	CR	EN	This species's population was projected to undergo an 80% decline over ten years in 1994 owing to a number of threats. However, the implementation of a Species Action Plan from 1995 onwards raised awareness and helped to mitigate some of the threats leading to a much reduced rate of decline (30% over ten years) by 2000, qualifying the species for downlisting from Critically Endangered to Endangered under criterion A3. Note that the population estimate of <250 individuals in 1994 was an underestimate, and it should have been closer to the 1,480 estimated in 2005, which qualifies the species as Endangered under criterion C2ai.
Japanese Night-heron <i>Gorsachius goisagi</i>	1988-1994	VU	EN	The population size is suspected to have fallen below 1,000 mature individuals by 1994 following declines in 1980s and early 1990s, qualifying the species for uplisting from Vulnerable to Endangered under criterion C2 by 1994.
Madagascar Pond-	1988-	VU	EN	This species's population has been in long-term decline,

heron <i>Ardeola idae</i>	1994			with the current minimum estimate of 2,000 mature individuals qualifying the species as Endangered under criterion C2. The population is assumed to have fallen below the threshold of 2,500 mature individuals during 1988-1994, and hence would have qualified as Vulnerable in 1988.
Dalmatian Pelican <i>Pelecanus crispus</i>	1994-2000	VU	NT	During the early and mid-1990s, the global population appeared to increase, owing largely to increases in Greece as a consequence of protection of a key breeding colony (with increases also occurring in Bulgaria). The species would therefore have qualified for downlisting from Vulnerable to Near Threatened during 1994-2000. However, the status of eastern populations then deteriorated during late 1990s and early 2000s, owing to political changes and breakdown of law enforcement, and these declines outweighed increases in south-east Europe (in Montenegro to Romania and Turkey), giving a global decline that exceeded 30% over ten years (and hence qualified the species as Vulnerable again) during 2000-2004.
Dalmatian Pelican <i>Pelecanus crispus</i>	2000-2004	NT	VU	During the early and mid-1990s, the global population appeared to increase, owing largely to increases in Greece as a consequence of protection of a key breeding colony (with increases also occurring in Bulgaria). The species would therefore have qualified for downlisting from Vulnerable to Near Threatened during 1994-2000. However, the status of eastern populations then deteriorated during late 1990s and early 2000s, owing to political changes and breakdown of law enforcement, and these declines outweighed increases in south-east Europe (in Montenegro to Romania and Turkey), giving a global decline that exceeded 30% over ten years (and hence qualified the species as Vulnerable again) during 2000-2004.
Bank Cormorant <i>Phalacrocorax neglectus</i>	1994-2000	VU	EN	The rate at which the population of this species is declining is suspected to have exceeded 50% over three generations (22 years) during 1994-2000 owing to a number of threats (e.g. steep declines were recorded on Mercury and Ichaboe Islands owing to a decreased abundance of goby off central Namibia from 1994 onwards), qualifying the species for uplisting from Vulnerable to Endangered under criterion A2 by 2000.
Guanay Cormorant <i>Phalacrocorax bougainvillii</i>	1994-2000	LC	NT	Although this species has been in long term decline, the population underwent a further sharp decline during the 1998 El Nino event, and it does not appear to have recovered since, with the suspected rate of decline over three generations (33 years) approaching 30% during 1994-2000, and hence qualifying the species as Near Threatened by 2000.
Woodford's Rail <i>Nesoclopeus woodfordi</i>	2000-2004	VU	NT	This species was classified as Vulnerable under criteria B1 and C2 until 2000, owing to its small and declining range and population. However, numbers have increased since 1999 owing to neglect of plantations and mown areas during civil unrest, qualifying the species for downlisting to Near Threatened by 2004.
Black Crowned-crane <i>Balearica pavonina</i>	1988-1994	LC	NT	The rate of population decline of this species is estimated to have approached 30% over ten years during 1988-1994 owing to habitat loss, hunting and other threats, qualifying the species for uplisting from Least Concern to Near Threatened under criterion A2 by

				1994.
Hooded Crane <i>Grus monacha</i>	1994-2000	NT	VU	The number of sites at which this species is concentrated in winter fell to ten (covering an area of <2000 km ²) during 1994-2000 owing to the abandonment of one site in South Korea (Taegu) owing to greenhouse construction, and the loss of sites in the Yangtze wetlands (including Longgan Hu) owing to agricultural development. This qualified the species for uplisting from Near Threatened to Vulnerable under criterion B2 by 2000.
Sociable Lapwing <i>Vanellus gregarius</i>	2000-2004	EN	CR	The rate of population decline was suspected to have exceeded 80% over ten years during 2000-2004, on the basis of surveys showing very steep recent declines that were projected to continue, leading to uplisting from Endangered to Critically Endangered under criteria A3 and A4 by 2004.
St Helena Plover <i>Charadrius sanctaehelenae</i>	2004-2008	EN	CR	The population fell from 450 individuals in 1988-1989 to 350 in 1998-2001, and then to 200-220 in Nov 05-Jan-06. Numbers therefore fell below the threshold of 250 individuals during the period 2004-2008, triggering criterion C2a(ii) at the CR level. It previously would have qualified as Endangered during 1988-2004 (under criterion C2a(ii)).
Black-tailed Godwit <i>Limosa limosa</i>	2000-2004	LC	NT	This species declined by 14-33% between 1990 and 2005. Taking the upper value, the decline rate would have exceeded 25% (the approximate threshold for NT) during the period 2000-2004. These declines were largely driven by trends in Europe, outweighing apparently stable trends in Central Asia and increases in Iceland.
Eurasian Curlew <i>Numenius arquata</i>	1994-2000	LC	NT	The population decline of this species is suspected to have approached 30% over three generations (15 years) during 1994-2000, leading to the species qualifying as Near Threatened by 2000. This was largely driven by declines in Europe (including the key population in the UK), but also partly as a consequence of large scale habitat changes following the collapse of the Soviet Union in 1991 (e.g. a substantial decrease in state livestock numbers in Kazakhstan led to significantly higher and denser vegetation in many areas of long-grass and forest steppe).
Spoon-billed Sandpiper <i>Eurynorhynchus pygmeus</i>	1994-2000	VU	EN	The population of this species is suspected to have fallen below 2,500 mature individuals during 1994-2000, (surveys in 2000 and 2002 indicated severe recent declines, with the population estimated to number <2,500 individuals by 2002), qualifying the species for uplisting from Vulnerable to Endangered under criterion C2a(ii) by 2000. The population then declined further between 2000 and 2005, at a rate equivalent to 94-96% over three generations (15 years) qualifying the species for uplisting to Critically Endangered under criterion A2 by 2004. Declines are driven by uncertain factors, but climate change induced habitat changes on the breeding grounds and loss of coastal wetland sites used during the non-breeding season are suspected to be the drivers.
Spoon-billed Sandpiper <i>Eurynorhynchus pygmeus</i>	2004-2008	EN	CR	The population of this species is suspected to have fallen below 2,500 mature individuals during 1994-2000, (surveys in 2000 and 2002 indicated severe recent declines, with the population estimated to number

				<2,500 individuals by 2002), qualifying the species for uplisting from Vulnerable to Endangered under criterion C2a(ii) by 2000. The population then declined further between 2000 and 2005, at a rate equivalent to 94-96% over three generations (15 years) qualifying the species for uplisting to Critically Endangered under criterion A2 by 2004. Declines are driven by uncertain factors, but climate change induced habitat changes on the breeding grounds and loss of coastal wetland sites used during the non-breeding season are suspected to be the drivers.
Black-billed Gull <i>Larus bulleri</i>	1988-1994	VU	EN	This species is declining at a rate of >50% over three generations (32 years), qualifying it as Endangered under criterion A2. Although the data on the timing of declines is patchy, the rate is suspected to have exceeded 50% during 1988-1994, hence the species would have qualified as Vulnerable under criterion A2 in 1988.
Relict Gull <i>Larus relictus</i>	1994-2000	NT	VU	The population size of this species is suspected to have declined below 10,000 mature individuals during 1994-2000, qualifying the species for uplisting from Near Threatened to Vulnerable under criterion C2a(ii) by 2000.
Fairy Tern <i>Sterna nereis</i>	2004-2008	NT	VU	The population of this species fell below 10,000 mature individuals, and the decline rate exceeded 10% over three generations (30 years) during 2004-2008, owing in particular to the collapse of the population at Coorong, South Australia (where, for example <5% of the birds counted were juveniles each year during 2003-2007 despite most individuals attempting to breed each year), owing to inappropriate water level management (and hence collapsed fish stocks) plus predation by introduced foxes. This qualified the species for uplisting to Vulnerable by 2008. It would previously have qualified as Near Threatened.
Black-fronted Tern <i>Sterna albobriata</i>	1988-1994	VU	EN	The rate of population decline of this species is suspected to have exceeded 50% over ten years during 1988-1994 (e.g. numbers declined 73% during 1981-1990 on the Ashburton river, and by 53% during 1980-2005 on the Ashley river), qualifying the species for uplisting from Vulnerable to Endangered under criterion A2 by 1994.
African Skimmer <i>Rynchops flavirostris</i>	1988-1994	LC	NT	The population size of this species is suspected to have declined during 1988-1994 to 15,000-25,000 birds (and hence approaching the thresholds for Vulnerable under criteria C1 and C2) owing to a number of threats, qualifying the species for uplisting from Least Concern to Near Threatened by 1994.

Appendix 2.

Table of CMS-listed mammal species undergoing genuine status changes during 1996-2008.

Species	Inferred category at start of period	Category at end of period
<i>Oryx dammah</i>	CR	EW
<i>Camelus ferus</i>	EN	CR
<i>Gorilla gorilla</i>	EN	CR
<i>Addax nasomaculatus</i>	EN	CR
<i>Balaena mysticetus</i>	NT	LC
<i>Balaenoptera musculus</i>	CR	EN
<i>Eubalaena australis</i>	NT	LC
<i>Megaptera novaeangliae</i>	VU	LC
<i>Rhinolophus sedulus</i>	LC	NT
<i>Rhinolophus hillorum</i>	NT	VU
<i>Eidolon helvum</i>	LC	NT
<i>Rhinolophus ruwenzorii</i>	NT	VU
<i>Lontra provocax</i>	VU	EN
<i>Rhinolophus canuti</i>	NT	VU
<i>Panthera uncia</i>	VU	EN
<i>Equus hemionus</i>	NT	EN
<i>Saiga tatarica</i>	VU	CR
<i>Loxodonta africana</i>	VU	NT