Supporting Online Material (SOM) for:

The status of the world's land and marine mammals: diversity, threat, and knowledge

This PDF file includes:
1. Data collection (inc. Fig. S1)
2. Analyzed data
3. Methods (inc. Figs. S2, S3)
4. Additional results (inc. Figs. S4 to S8; Tables S1 and S2)
5. References
6. Acknowledgements

1. Data collection: IUCN Red List Assessment of all mammals

1.1. Introduction

For over four decades, IUCN (the International Union for Conservation of Nature, formerly the World Conservation Union), mainly through its Species Survival Commission (SSC), has been assessing the conservation status of species, subspecies, and populations on a global scale in order to highlight taxa at risk of extinction, and thereby promote their conservation. Today, the IUCN remains committed to providing the world with the most objective, scientifically based information on the current status of global biodiversity. IUCN disseminates information on the taxonomy, conservation status and distribution of taxa through the *IUCN Red List of Threatened Species*[TM] (www.iucnredlist.org), currently updated on an annual basis.

As part of IUCN's efforts to rapidly expand the taxonomic coverage of the IUCN Red List, and to provide a core set of supporting documentation to underpin the IUCN Red List assessments (*1*), IUCN, in collaboration with several key partners, pioneered a series of global, comprehensive species assessments that provide an effective method for gathering, synthesizing, reviewing and disseminating the most accurate scientific data available for biodiversity conservation. To date, comprehensive species assessments have been completed for, among others, all of the world's amphibians (*2*) and hermatypic reef-building corals (*3*). Assessments are ongoing for many other taxa.

The current dataset on mammals is the product of a similar initiative to undertake a global, comprehensive assessment of the conservation status of all mammalian species. Prior to this assessment, the last time all mammals were assessed globally was in 1996 (*4*), and the majority of those assessments are out-of-date. Although the primary objective of the current initiative was to place each mammal species in a category of threat using the IUCN Red List system (*5*), the overall product includes a suite of supporting information, incorporating data on distribution, population numbers and trends, habitat,

life history, threats, conservation actions, conservation status, and utilization for each individual wild mammal species. The resulting data, covering 5488 species (includind *Homo sapiens*), are the culmination of a systematic collection and documentation process conducted over a period of nearly five years (2003-2008), involving a partnership of numerous institutions, universities and museums, reviewed at 28 workshops, and the participation of more than 1,700 experts.

1.2.Data compilation

The assessment process comprised two core components: one centered around consultation with IUCN SSC Specialist Groups and stand-alone Red List Authorities, and another involving peer-review through workshops.

The IUCN Species Survival Commission is an established knowledge network of ~8,000 volunteer members working in almost every country of the world. SSC members are deployed in more than 120 Specialist Groups and Task Forces, with some 2,000 members being part of the mammal Specialist Group network. Currently, there are 29 Specialist Groups with a taxonomic focus on mammals (*6*), and one stand-alone Red List Authority (Small Nonvolant Mammal Red List Authority).

Relative to other taxa, the existing Specialist Group structure for mammals is remarkably strong for certain groups, with many having produced at least one IUCN SSC Action Plan in the last decade (*7*). Consequently, in cases where species were within the jurisdiction of well-coordinated groups, they were, as far as possible, assessed and reviewed by the members of these groups (as part of core Specialist Group activities).

In contrast, the SSC network is somewhat less developed with regard to small mammals, given that these contribute the overwhelming diversity of species (for example, more than one-half of all mammals are rodents). In such cases, we employed a workshop methodology, to provide a platform for discussion, interaction, and group peer-review of species relationships, life-history data and distribution maps. Workshops have proven to be most productive in terms of collating the greatest amount of species-based information

within a relatively short time period. For the purpose of conducting careful detailed review of all mammal assessments, we conducted a series of 28 workshops in 18 countries around the world (and usually in collaboration with existing Specialist Groups):

1. Africa (Small Mammals) - January 24–30, 2004 (United Kingdom)
2. South Asia (Non-volant Small Mammals) - February 9-15, 2004 (India)
3. Southeast Asia (initial assessment workshop) - May 3-7, 2004 (Thailand)
4. Africa (Small Mammals, maps only) - August 22-26, 2004 (United Kingdom)
5. Philippines (initial assessment workshop) - November 2-3, 2004 (United States)
6. Edentates – December 17-18, 2004 (Brazil)
7. African Primates – January 26-30, 2005 (United States)
8. Madagascar – April 4-8, 2005 (Madagascar)
9. Sirenia – August 1, 2005 (Japan)
10. Japan – August 6-8, 2005 (Japan)
11. Australia/Pacific – August 15-19, 2005 (Australia)
12. Brazil and Guyanas – October 16-19, 2005 (Brazil)
13. Mongolia – October 31 - November 4, 2005 (Mongolia)
14. Southwest Asia – November 22-25, 2005 (Turkey)
15. Andes (Small Mammals) – February 6-10, 2006 (Colombia)
16. Asian Squirrels – March 27-29, 2006 (India)
17. Philippines – April 9-10, 2006 (Philippines)
18. Southeast Asia (Large Mammals and Bats) – May 2-6, 2006 (Indonesia)
19. Southeast Asia (Rodents) – May 2-5, 2006 (United States)
20. Europe – May 18-22, 2006 (Austria)
21. Old World small Carnivores – July 3-7, 2006 (Vietnam)
22. Asian Primates – September 7-12, 2006 (Cambodia)
23. Cetaceans – January 22-26, 2007 (United States)
24. Southern Cone   – October 8-12, 2006 (Brazil)
25. Cats – September 21-22, 2007 (United Kingdom)
26. Mediterranean Mammals – October 9 – November 2, 2007 (Spain)
27. Neotropical Primates – November 28 - December 02, 2007 (United States)
28. Mesoamerica and the Caribbean (Small Mammals) – January 25-30, 2008 (Honduras)

Prior to the workshops, data were collected by teams of researchers who relied on the available literature to document the current state of knowledge. In some cases, enormous amounts of information are available, but in the case of most species very little is known even about the basic ecology of a species in the literature. The documentation in the species accounts reflects this inequality.

During each workshop, invited species experts (including persons with both taxonomic knowledge as well as knowledge of threats "on the ground") were brought together to: 1) build consensus on the state of knowledge of the species; 2) fill in the knowledge gaps with both published and unpublished data; and 3) review maps of species distribution. Once complete, and under the guidance of facilitators trained in the use of the 2001 IUCN Red List Categories and Criteria (5), experts evaluated each species against a variety of thresholds for geographic range size, population size and rates of population reduction to make an assessment of extinction risk. Following each workshop, the entire set of supporting documentation was subject to final checks, while all IUCN Red List assessments were evaluated against the supporting data during a series of consistency checks (to ensure both the proper use of the categories and criteria and that supporting evidence was provided accordingly).

1.3.Data collected

For the first time, comprehensive, peer-reviewed data on the distribution, abundance, population trends, ecology, habitat preferences, threats, conservation status, utilization, and conservation actions for all 5487 currently recognized wild mammal species are available. Each species has also been coded according to the IUCN Habitats and Threats Classification Schemes, making it possible to analyze, for example, their habitat preferences and major threats. More specifically, the following data were collected on each species:

Systematics

For each species, data were was collected on species, genus, family, order, taxonomic authority, commonly used synonyms, English and other common names (if any), and taxonomic notes (if needed, normally used to clarify difficult or confusing issues).

We used the 3rd edition of *Mammal Species of the World – A Taxonomic and Geographic Reference* (*8*) as the taxonomic framework. However, as the text for this authoritative work was effectively completed in 2003, it has been necessary to depart from this standard lexicon in well-justified circumstances. In such cases, and except in very exceptional circumstances, any newly recognized species (either newly described or newly split) or any other proposed taxonomic change had to be published in a peer-reviewed journal or other authoritative taxonomic work (e.g., a major faunistic treatise). As noted later, our classification is current as of December 2007; some recently proposed changes (e.g., *9*, *10*) are not accommodated.

Although the IUCN Red List is not intended to be a definitive taxonomic source, it strives to be taxonomically coherent and consistent at all ranks. Our higher-level classification largely follows that of *Mammal Species of the World*, but again deviates in some respects. At the level of Order, for example, the primary deviation is recognition of the Cetartiodactyla, to include the previously recognized orders Cetacea (whales, dolphins and porpoises) and Artiodactyla (bovids, hippos, giraffids, deer and relatives) (e.g., *11-16*). While a case can be made for continuing use of the name Artiodactyla for this clade (*17*), we have decided to use the now established Cetartiodactyla to avoid confusion.

General information

General text information was compiled on: geographic range; population (usually a qualitative assessment of abundance or rarity in the absence of quantitative information); habitat and ecology (including, in particular, habitat preferences and ability to adapt to anthropogenic disturbance, as well as any particular biological traits that may render a

species particularly vulnerable); threats; and conservation actions (in particular noting occurrence in protected areas).

Distribution maps

As part of the minimum supporting documentation for completing an IUCN Red List assessment, we mapped the distributions of each mammal in ESRI shapefile format (ArcView GIS 3.x and ArcGIS 9.x). The maps take the form of broad polygons that join known locations. A species' distribution map can consist of more than one polygon where there is an obvious discontinuity in suitable habitat. For some range-restricted taxa, we have tried to map distribution ranges with a higher degree of accuracy, sometimes down to the level of individual subpopulations. Individual polygons are coded according to species' presence (e.g., extant, possibly present, extirpated) and origin (e.g., native, reintroduced).

Of the 5,488 mammals for which we undertook an IUCN Red List assessment, we were able to map the ranges of 5,395 species (maps are missing for Extinct species and typically for some Data Deficient species, such as those known from non-specific type localities). These spatial data used the maps collected by W. Sechrest (*18*) as a starting point for part of the species, significantly improved in accuracy and detail through expert editing.

A list of countries of occurrence is coded, noting whether or not it is native extant, extirpated, introduced or re-introduced.

Habitat preferences

Each species is coded against the IUCN Habitats Classification Scheme (*19*)

Major Threats

Each species is coded against the IUCN Threats Classification Scheme (*20*).

Conservation Actions

Each species is coded against the IUCN Conservation Actions Classification Scheme (*21*).

Utilization

Each species is coded against the IUCN Utilization Classification Scheme (*22*) (focusing on the purpose/type of use, the primary forms removed from the wild, and the source of specimens in commercial trade). Species that are listed on any of the CITES appendices are also indicated.

2008 IUCN Red List Assessment

Based on the information above, we used the 2001 IUCN Red List Categories and Criteria (Version 3.1) (*5*), to undertake an assessment of extinction risk for each mammal species. The IUCN Red List Categories and Criteria are the most widely accepted system for classifying extinction risk at the species level (*1*, *23-25*), and as noted above have already been used in several other global assessments to date (*2, 3*). The IUCN Red List Categories include eight different categories of threat (Fig. S1): Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC) and Data Deficient (DD). A species qualifies for one of the three threatened categories (CR, EN, or VU) by meeting a critical threshold for that category in one of the five different available criteria (A-E). The criteria are designed to be objective, quantitative, repeatable, and to handle uncertainty.
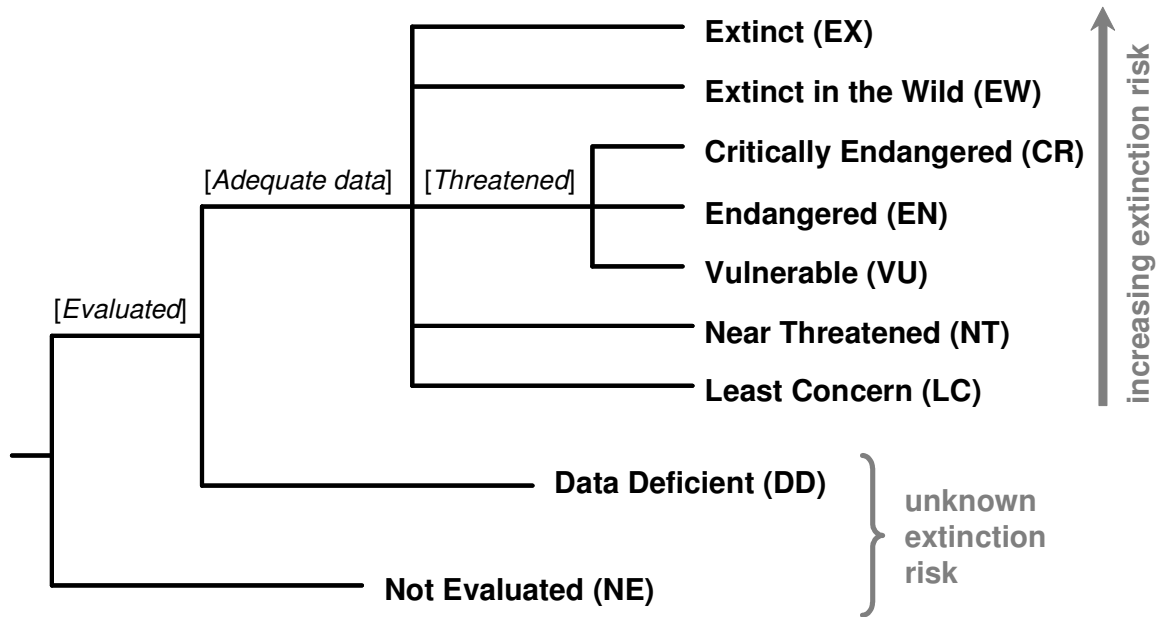
Fig. S1. The IUCN Red List categories. Adapted, with permission, from (*5*).

Each IUCN Red List assessment is accompanied by a rationale that explains how it was justified, the reason for any change from previous assessments (i.e., genuine change in species' status, or non-genuine due to new or better information available, incorrect information used previously, taxonomic change affecting the species, previously incorrect application of the IUCN Red List Criteria), the current population trend (i.e., increasing, decreasing, stable, unknown), date of assessment, names of assessors and evaluators, and any notes relating to IUCN Red Listing (e.g., any important issues in deciding the category).

Assessments are done at the species level, integrating the information across all populations and/or subspecies. Threat categories therefore reflect the overall conservation

status of the species, which may for example be of Least Concern despite particular populations/sub-species being highly threatened. In some cases subspecies and/or populations are also assessed individually, but these results are not included in the statistics and analyses presented in this paper.

Bibliography

A list of important references used to compile the information for each species assessment was recorded for each species.

1.4.Limitations of the Data

Although we consider the current dataset to be the most comprehensive currently available for mammals, covering all known species, there are limitations. In particular, the following should be noted:

<u>**Missing species and species coverage**</u>

Since mid-1992 (when the second edition of *Mammal Species of the World* was compiled; *26*), 373 new living mammal species were described—a rate of 24+ new descriptions per year (*27*) (this excludes species discoveries resulting from taxonomic changes). The rate of mammal descriptions remains high, with 61 species described in the years 2006 and 2007 alone. The overall number of species discoveries is much higher: Patterson (*28*) found that for every newly described species of Neotropical mammals (in the 1982 -1993 period), three others were rediscovered in Museum drawers and biochemical labs, ressurected from prior synonymy.

Although we have endeavored to trace all recently described species, it is possible one or two may have eluded our attention, especially if published in obscure media. In general, the cut-off date for including species in the present assessment was Dec 31st, 2007; however, a few species described in 2008 (*Rhynchocyon udzungwensis* [*29*], *Miniopterus*

petersoni [*30*], *Cacajao hosomi* and *C. ayresi* [*31*]) are included. A single species currently in press (*Mico* sp. nov.) has also been included.

It is worth noting that the mammal faunas in some parts of the world remain poorly known, including, for example, the Andes, most of Central Africa and parts of West Africa, Angola, parts of South and Southeast Asia, and Melanesia. In addition, many species' names, especially in the tropics, actually represent complexes of several species that have not yet been resolved. For our purposes, and pending the availability of published information to the contrary, these are treated as single species, until resolution of their taxonomic status is published.

Domestic species (e.g. Dromedary *Camelus dromedarius*; Domestic Goat *Capra hircus*; Domestic Sheep *Ovis aries*) were excluded from this assessment.

Incomplete ranges

Because of the conservative approach taken in mapping species, the ranges for many are likely to be minimum estimates of the limits of species' distributions. A rule was followed allowing interpolation of occurrence between known localities if the ecological conditions seemed appropriate, but not permitting extrapolation beyond known localities. In other words, to the best of our knowledge, maps represent current known limits within historical native range (any introductions are coded accordingly, and are excluded for the purposes of analysis), with the obvious caveat that species occurrence is not homogeneous within the polygon. Some species are therefore almost certain to occur more widely than mapped. Because of this, some regions are recorded as having lower mammal diversity than may eventually prove to be the case. On the other hand, species' ranges were mapped as generalised polygons which often include areas of unsuitable habitat, and therefore species may not occur in all of the areas where they are mapped.

Threats

The information on the relative importance of different threatening processes to mammal species is incomplete. We coded all threats that appear to have an important impact, but not their relative importance for each species.

Data Deficient species

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate (*5*).

The percentage of species assessed as Data Deficient (15%) is higher than previously indicated for mammals (7.8%) (*32*). There are three likely explanations for this. The first has to do with the large number of recently described species for which it is difficult to discern the real taxonomic and distributional limits of the taxa being assessed. This is particularly the case for many of the recently described lemurs in Madagascar, where 42 were assessed as Data Deficient. The second explanation is due to a number of species formerly erroneously listed as Least Concern moving to the category Data Deficient, particularly in the New World. The third is simply due to lack of knowledge that permits a reliable assessment. Because many Data Deficient species are likely to have small distributions or populations, or both, they are intrinsically likely to be threatened. Consequently, in accordance with IUCN guidelines, species assessed as Data Deficient should not be considered as "not threatened". With further survey work and the availablility of improved information, it is anticipated that many of these species, if indeed proven to be valid taxa, will be reassessed. This is a deliberate precautionary approach in accordance with the IUCN guidelines.

2. Analyzed data

A subset of those data collected, both tabular and spatial, was used in the present analyses.

2.1. Tabular data

The analyzed data included tabular information for 5487 species. These correspond to all evaluated, excluding *Homo sapiens*.

- <u>Taxonomy</u>: allocation of each species to genus, family and order.

- <u>Conservation status</u>: each species was classified under one of the IUCN Red List Categories – Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered (including Critically Endangered – Possibly Extinct), Extinct, Extinct in the Wild and Data Deficient.

- <u>Population trends</u>: current known or inferred trends of each species' overall population, described as *increasing*, *decreasing*, *stable*, or *unknown*.

- <u>Threats</u>: mechanisms in which species populations are negatively affected, including both those driven directly by human activities (e.g., habitat loss, pollution) and those that correspond to natural processes (which may be magnified by human activities; e.g., diseases). In these analyses we considered the following main threat types: *habitat loss and degradation, harvesting, pollution, accidental mortality, diseases* and *invasives* (*20*). Note that a species may be not threatened (*sensu* IUCN Red List, i.e. not categorized as Vulnerable, Endangered or Critically Endangered) and still be affected by a particular threat. Throughout, we consistently refer to the former as 'threatened species' and to the latter as 'species affected by threat X'. Also note that for a species to be listed as affected by a particular threat it has to be negatively affected (or potentially affected);

for example, species codded as affected by 'harvesting' are not all of those for which harvested as been recorded, but those for which harvesting has a negative effect.

- Date of description: the date when a taxon was first recognized as unique (either as a species or as a subspecies). A species' date of *description* is often not equivalent to the date of *discovery*. The overall number of species recognized increases over time as a result of both new species descriptions and taxonomic changes elevating previously described taxa to the species level.

These data represent only a subset of the information collected for each species as part of the IUCN Red List assessments (see Section 1).

2.2. Spatial data

Distribution maps were available for 5395 species. This is a subset of those species for which tabular data were available, excluding 76 Extinct, two Extinct in the Wild, and 14 Data Deficient species and for which the range is insufficiently known.

Species were mapped as generalized polygons of plausible range, encompassing areas of known current presence. For the present analyses, only those polygons where the species was both reported as native (or possibly native, including reintroduced) and currently present (or possibly present) were included, thus excluding historical and introduced ranges.

As described above, species' range maps are coarse generalizations of their distributions, generally obtained as 'envelopes' including original records (point data) and through interpolation (using, for example, habitat information) from original records. They may include relatively extensive areas from which the species is absent (e.g., terrestrial habitats within a freshwater species' range) and are therefore likely to overestimate the species' true area of occupancy (*33*). Nonetheless, at the coarse scale of the present analyses (spatial units ~ 22,300 km^2, see below) this bias is not expected to significantly affect the global spatial patterns found (*33*).

For poorly known species, particularly those considered Data Deficient and known from only a few records, the mapped range may underestimate the true distribution.

Most species' ranges were either wholly in land (including freshwater and volant species) or in the sea, but seven species were mapped across both. These include, for example, the West African Manatee (*Trichechus senegalensis*) that occupies coastal marine, estuarine, and freshwater habitats in West Africa, using coastal areas as far as 75 km offshore (*34*) and rivers as far as 2000 km inland (*35*). For these 'cross-realm' species, their ranges were split into marine and land sections (using the coastline as the boundary) and analyzed separately (see below). Overall, 5282 species were maped as land mammals and 120 species were mapped as marine mamals, with seven species in common between both lists.

The separation between land and marine species was purely based on their mapped ranges, not on the habitats that they use. As a result, some that use marine habitats were mapped completely in land. These include freshwater and/or estuarine species that occupy a marine area that is too narrow to map, for example: Eurasian Otter (*Lutra lutra*), which in some parts of its range forages within a few hundred meters offshore (*36*); Water Rat (*Hydromys chrysogaster*), a mainly freshwater and brackish water species that also uses coastal mangroves (*37*).

3. Methods

3.1. Spatial units

Data were analyzed using a geodesic discrete global grid system, defined on an icosahedron and projected to the sphere using the inverse Icosahedral Snyder Equal Area (ISEA) Projection (*38*). This corresponds to a hexagonal grid composed of individual units (cells) that retain their shape and area (~22,300 km^2) throughout the globe. These are more suitable for a range of ecological applications than the most commonly used rectangular grids (*39*). A row of cells near latitude 180°E/W was excluded (Fig. S2) as these interfered with the spatial analyses. This creates an artificial narrow band of no data around all maps (Fig. 1, 2, 4).

The range of each species was converted to the hexagonal grid for analysis purposes, with land and marine cells (and their species) analyzed separately. Coastal cells were clipped to the coastline into land and marine sections. The ranges of 'cross-realm' species were also clipped to the coastline into land and marine sections, and analyzed accordingly with land and marine cells.

The maps created in each analysis (Fig. 1, 2, 4) have patterns for marine species mapped on a blue scale, and patterns for land species mapped on a brown scale. Different numerical scales are used for land and marine, as the numbers of species differ by more than an order of magnitude.
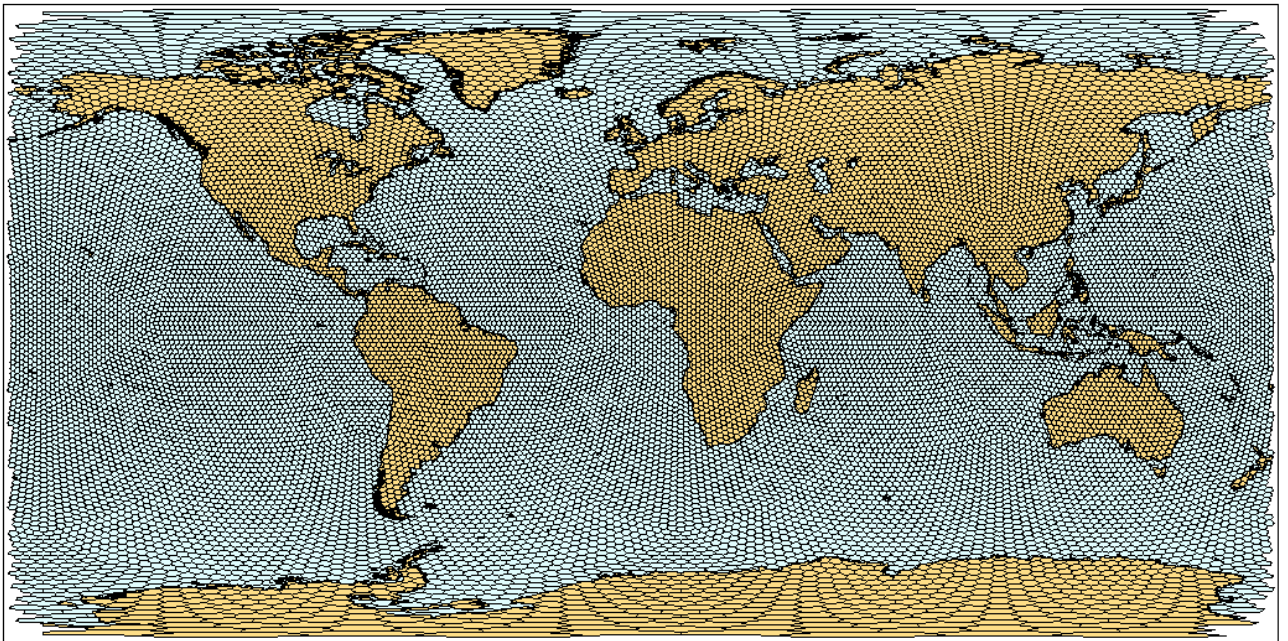
A
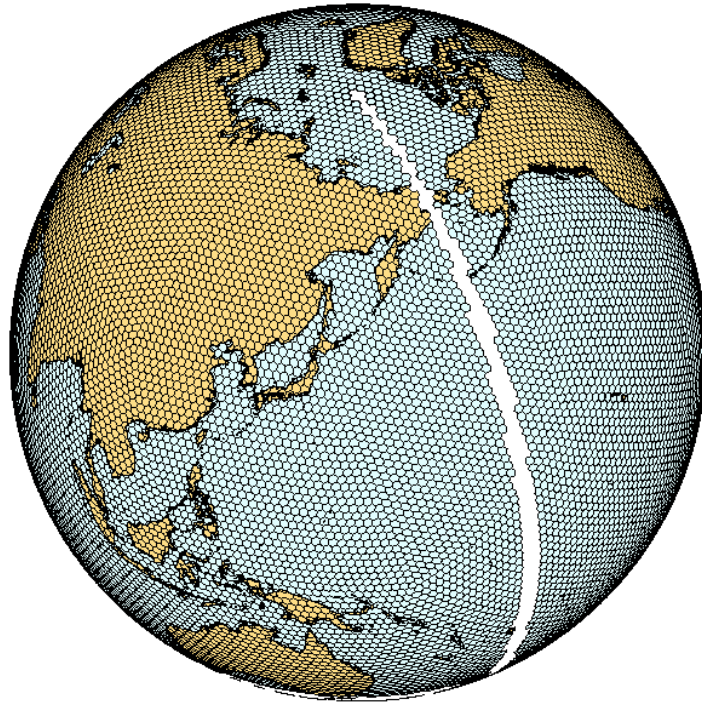
B

Fig. S2. Hexagonal grid used in the spatial analysis: A) viewed on a globe; B) on a cylindrical projection. Cells near 180°E/W were excluded.

3.2. Species richness

Patterns of species richness (Fig. 1A) were mapped by counting the number of species in each cell (or cell section, for species with a coastal distribution).

Information on the percentage of species in tropical and subtropical moist broadleaf forests was obtained using the biome coverage by Olson and colleagues (*40*).

3.3. Phylogenetic diversity

We created a phylogenetic tree encompassing all analyzed species based on a recently published mammalian super tree (*41*). The original phylogeny comprised 4510 species. Of these, 4506 were matched to a species in the current assessment (3909 matched directly; 597 matched to a synonym); the unmatched four were either extinct prior to 1500, or domestic. One hundred and fifty-five species were deleted from the original tree: 138 corresponding to taxa no longer recognized as separate species (lumped to another species already on the tree); four for which no match was found; 12 that are Extinct or Extinct in the Wild; and *Homo sapiens*. Deleting this set of species from the tree was done by removing all unique branches associated with it.

The resulting sub-tree had 4355 species. This was expanded to include all extant species assessed by adding 1054 extra species. Those were added to the tree using information on their taxonomy to infer their relative phylogenetic position. The following rules were adopted when adding a new species to the tree:

- For species that were added to existing polytypic genera (946 species), each was added as a split at the basal branch for the corresponding genera (i.e. the last branch common to all species in a given genus).

- For species that were added to existing monotypic genera (81 species), the monotypic genus was split into two species, with the position of the split given by the average split position of polytypic genera in the same family. In families composed of

18

monotypic genera only, the position was given by the average split position of polytypic genera in the same order. In one case where the order had only monotypic genera, the position was given by the average split position of polytypic genera across all mammals.

- For species that corresponded to new genera (26 species), a new branch was added at the basal branch for the corresponding family.

- For one species that corresponded to a new family, a new branch was added at the basal branch for the corresponding order.

The final phylogenetic tree comprised 5409 species, which includes all 5395 species for which distribution maps were available.

The phylogenetic diversity of a given site is a measure of species diversity that accounts for the phylogenetic relationship between species (*42, 43*). It is calculated as the sum total of the branch lengths for the sub-tree representing all species at the site (Fig. S3A; *42-44*). Given two sites with the same number of species, the phylogenetic diversity is higher when species are less related (Fig. S3B) than when they are clustered in the taxonomic tree (Fig. S3C). The phylogenetic diversity of a site is therefore not a measure of the phylogenetic uniqueness of the site's fauna, but a measure of the overall evolutionary history encompassed by all species at the site.

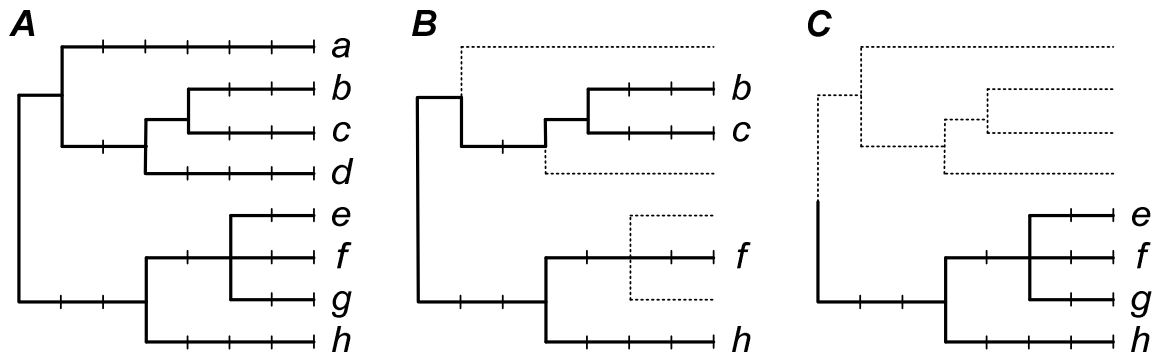The phylogenetic diversity of each cell was mapped for land and marine species (Fig. 1B).

Fig. S3. Illustration of the method for calculating the phylogenetic diversity of a set of species. A) Hypothetical phylogenetic tree with eight taxa, *a* to *h*. The length of each branch is given by the number of intervals. The phylogenetic diversity of the tree is the sum of the length of the branches; for all species, phylogenetic diversity = 35. B) Sub-tree for taxa *b*, *c*, *f*, and *h*, with phylogenetic diversity = 21. C) Sub-tree for taxa *e*, *f*, *g*, and *h*, with phylogenetic diversity = 15. Adapted from (*44*).

3.4.Restricted-range species

Restricted-range species were defined as those 25% of species with the smallest range sizes (*45-47*). Range sizes were calculated in GIS, directly from the species' polygons on an equal-area projection. Restricted-range species were defined separately for land (n=1321) and for marine (*n*=30) species. For cross-realm species, the value used was that of the entire range (not just the land or marine sections). Richness in restricted-range species was mapped to identify areas that are global centers of endemism for land and marine species (Fig. 1C).

3.5.Median range size

The spatial pattern of variation in species' range sizes was investigated by calculating, for each cell, the median area of the range of all species present (Fig. 1D). A similar approach was applied to birds in previous studies (*48-49*). For cross-realm species, the range size was that of the entire range (not just the land or marine sections).

3.6. Threat levels

Threat levels (percentage of threatened species within a group) cannot be determined exactly given that for Data Deficient species the threat status could not be determined. Threat levels are therefore presented as an estimated mid-point, and a range between a lower bound and an upper bound. These are defined as:

-       Mid-point: percentage of threatened species amongst those for which threat status could be determined (number of threatened species divided by the number of non-Data Deficient species). This corresponds to the assumption that Data Deficient species have the same fraction of threatened species as the other species.

-       Lower bound: percentage of threatened species amongst all species assessed (number of threatened species divided by the total number of species assessed). This corresponds to the assumption that none of the Data Deficient species are threatened.

-       Upper bound: percentage of threatened or Data Deficient species amongst those assessed (number of threatened or Data Deficient species divided by the total number of species assessed). This corresponds to the assumption that all of the Data Deficient species are threatened.

Threat levels obtained in the 2008 Red List Assessment are not directly comparable with those from 1996 (*4*), because the categories and criteria employed to allocate species to threat classes have changed (*50*), and because more than 850 new species have since been described or revalidated.

The number of threatened species in each cell was mapped (Fig. 2A) by counting the number of species in IUCN Categories Vulnerable, Endangered or Critically Endangered. The number of species affected by habitat loss and degradation (Fig. 2B), harvesting (Fig. 2C), accidental mortality (Fig. 2D) and pollution (Fig. 2E) was obtained by counting those species in each cell that are affected by such a threat. As described above, these species are not necessarily threatened, and a species may be affected by more than one

threat. These four threat categories were chosen to be mapped as they include the two main threats for land species (habitat loss, harvesting) and the two main threats for marine species (accidental mortality, pollution). Note that harvesting does not include direct persecution (e.g. for pest control) or accidental mortality (e.g. fisheries by-catch), which are coded separately. Pollution includes noise pollution and global warming (*20*).

Given that no information has been compiled on which threats are most important for each species, we use the number of species affected by each threat as a measure of the relative importance of different threats.

One-tailed binomial tests were used to investigate which mammalian families have higher or lower than expected percentages of threatened or extinct species (Figure 3). Three families (Neobalaenidae, Notoryctidae and Odobenidae) are not represented in Figure 3 because all of their species are Data Deficient. Care is needed in interpreting these results. That a given family has a significantly lower proportion of threatened or extinct species than the average across mammals does not necessarily mean that it is at low risk of threat in absolute terms. Species extinctions are relatively rare events in geological time (*51*), and therefore most taxa are highly threatened in relation to what would be expected in the absence of human activities.

3.7.Knowledge

The number of species that have been described since 1992 was obtained as the difference between the date of species included in the current assessment and those recognized in the second edition of *Mammal Species of the World* (*26*) (with a cut off date of July 1992 for the inclusion of species). The number of newly described species in the 1992-2008 period has been obtained from the original year of description. The ranges of newly described species were mapped to illustrate areas where new knowledge of mammalian diversity has recently emerged (Fig. 4A). The number of Data Deficient species per cell has been mapped to illustrate areas in need of future research (Fig. 4B).

4. Additional results

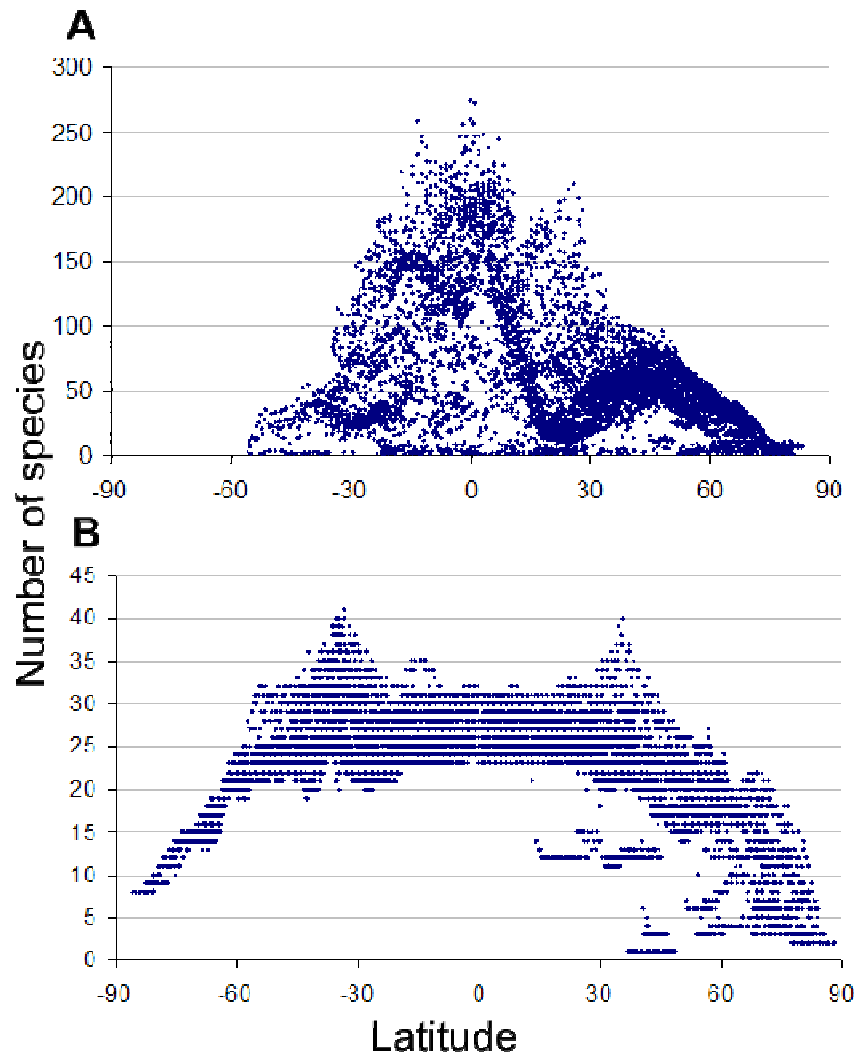## 4.1. Relationship between latitude and species richnees

Fig. S4. Relationship between latitude and species richness per cell for: A) land species; B) marine species. Northern latitudes positive, southern latitudes negative.

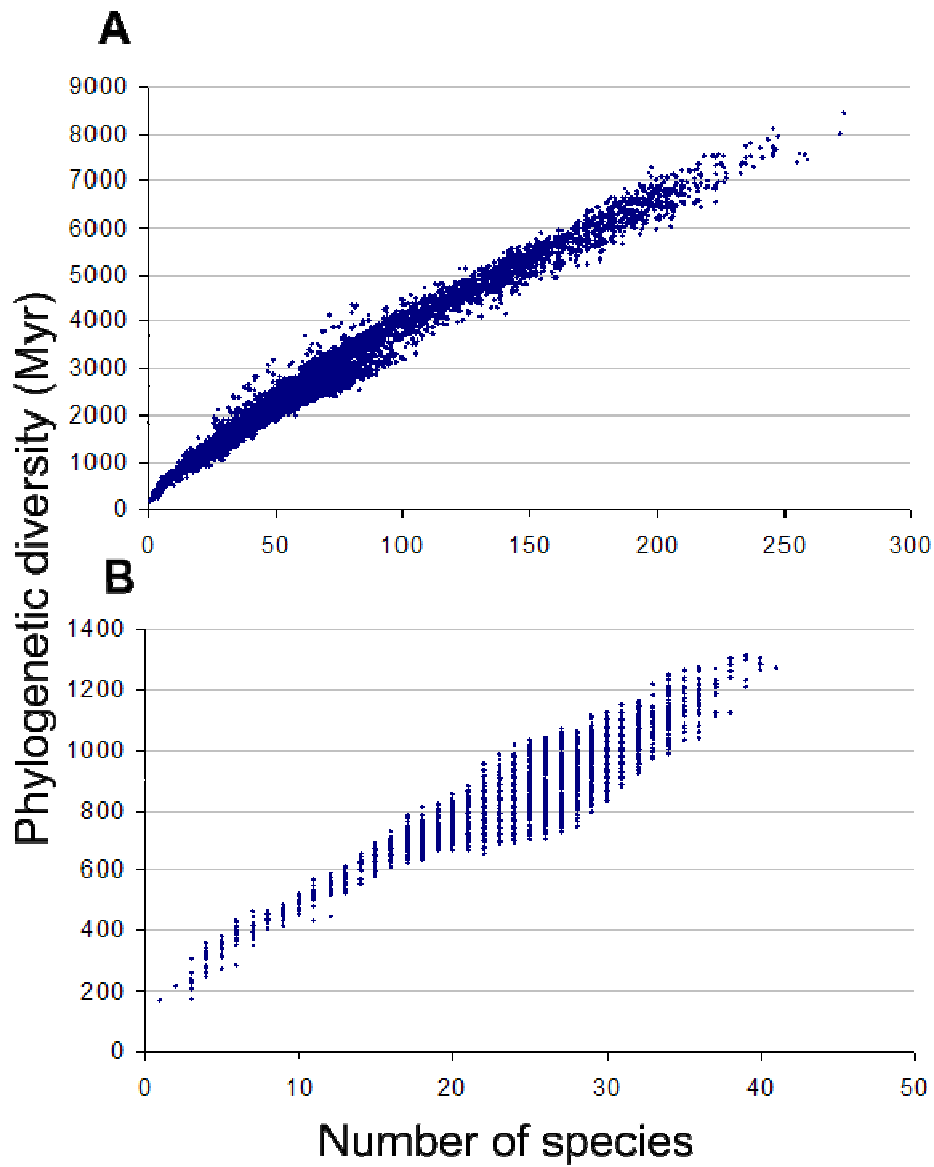## 4.2. Relationship between species richness and phylogenetic diversity

Fig. S5. Relationship between species richness and phylogenetic diversity across: A) land species ($r^2 = 0.98$); B) marine species ($r^2 = 0.73$).
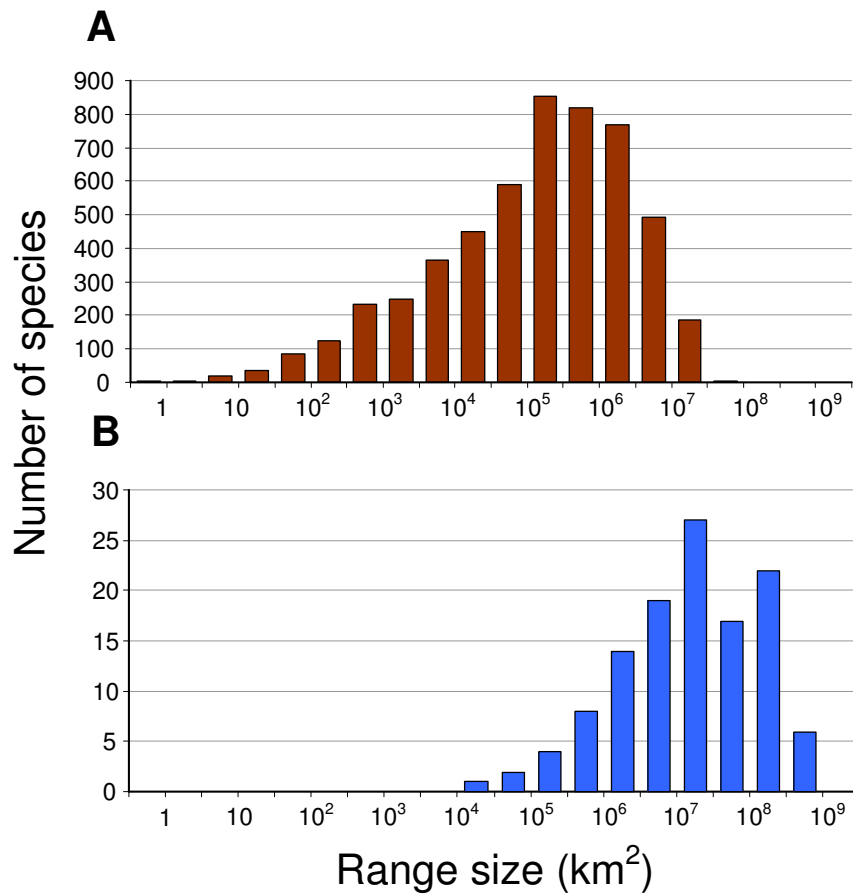
4.3. Range size distribution

A

B

Fig. S6. Frequency distribution of range sizes for (A) land mammals (*n*=5282; first quartile ~ 17,700 km^2; median ~ 193.6 km^2; three species range smaller than 1 km^2 are lumped with the first class) and (B) marine mammals (*n*=120; first quartile ~ 3.8 million km^2; median ~ 14.5 million km^2).

4.4. Relationship between range size and latitude
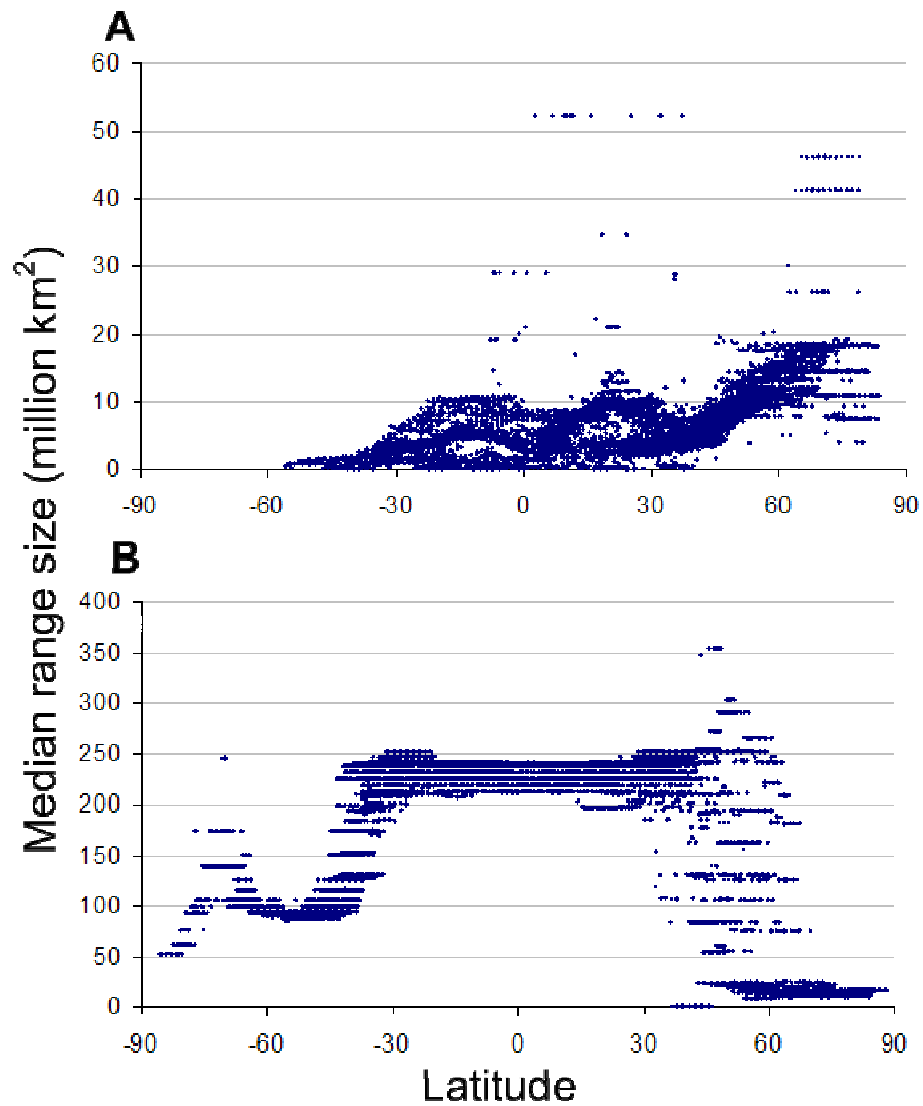
Fig. S7. Variation in median range size of species in each cell according to cell latitude, for: A) land mammals and B) marine mammals. Northern latitudes positive, southern latitudes negative.

4.5. Threat levels across families

Table S1: Number of species in each IUCN Red List Category (EX – Extinct; EW – Extinct in the Wild; CR – Critically Endangered; VU – Vulnerable; EN – Endangered; LC – Least Concern; DD – Data Deficient) for all mammals and for those in each order (grey rows) and each family. For each order or family, we present the significance level from a binomial test comparing the corresponding percentage of threatened or extinct species (amongst non-DD species) with the overall percentage across all species (26%; Figure 3).

FAMILY	EX	EW	Subtotal extinct	CR	EN	VU	Subtotal threatened	NT	LC	DD	Total assessed
ALL MAMMALS	79	2	81	188	448	505	1141	323	3109	835	**5489**
MONOTREMATA (ns)											
Ornithorhynchidae (ns)	0	0	0	0	0	0	0	0	1	0	**1**
Tachyglossidae (ns)	0	0	0	3	0	0	3	0	1	0	**4**
Total Monotremata	**0**	**0**	**0**	**3**	**0**	**0**	**3**	**0**	**2**	**0**	**5**
DIDELPHIMORPHIA [&&]											
Didelphidae[&&]	1	0	1	1	0	7	8	2	67	17	**95**
PAUCITUBERCULATA (ns)											
Caenolestidae (ns)	0	0	0	0	0	2	2	2	2	0	**6**
MICROBIOTHERIA (ns)											
Microbiotheriidae (ns)	0	0	0	0	0	0	0	1	0	0	**1**
NOTORYCTEMORPHIA [2]											
Notoryctidae[2]	0	0	0	0	0	0	0	0	0	2	**2**
DASYUROMORPHIA (ns)											
Dasyuridae[&]	0	0	0	1	5	5	11	10	47	4	**72**
Myrmecobiidae (ns)	0	0	0	0	1	0	1	0	0	0	**1**
Thylacinidae (ns)	1	0	1	0	0	0	0	0	0	0	**1**
Total Dasyurmorphia	**1**	**0**	**1**	**1**	**6**	**5**	**12**	**10**	**47**	**4**	**74**
PERAMELEMORPHIA *											
Chaeropodidae (ns)	1	0	1	0	0	0	0	0	0	0	**1**
Peramelidae (ns)	1	0	1	0	4	1	5	1	9	3	**19**
Thylacomyidae (ns)	1	0	1	0	0	1	1	0	0	0	**2**
Total Peramelemorphia	**3**	**0**	**3**	**0**	**4**	**2**	**6**	**1**	**9**	**3**	**22**

FAMILY	EX	EW	Subtotal extinct	CR	EN	VU	Subtotal threatened	NT	LC	DD	Total assessed
DIPROTODONTIA **											
Acrobatidae (ns)	0	0	0	0	0	0	0	0	2	0	**2**
Burramyidae (ns)	0	0	0	1	0	0	1	0	4	0	**5**
Hypsiprymnodontidae(ns)	0	0	0	0	0	0	0	0	1	0	**1**
Macropodidae*	4	0	4	5	8	9	22	10	30	1	**67**
Petauridae (ns)	0	0	0	1	3	0	4	0	7	0	**11**
Phalangeridae (ns)	0	0	0	4	2	4	10	1	14	1	**26**
Phascolarctidae (ns)	0	0	0	0	0	0	0	0	1	0	**1**
Potoroidae**	3	0	3	2	2	0	4	2	2	0	**11**
Pseudocheiridae (ns)	0	0	0	0	0	3	3	3	12	0	**18**
Tarsipedidae (ns)	0	0	0	0	0	0	0	0	1	0	**1**
Vombatidae (ns)	0	0	0	1	0	0	1	0	2	0	**3**
Total Diprotodontia	**7**	**0**	**7**	**14**	**15**	**16**	**45**	**16**	**76**	**2**	**146**
TUBULIDENTATA (ns)											
Orycteropodidae (ns)	0	0	0	0	0	0	0	**0**	1	0	1
SIRENIA **											
Dugongidae (ns)	1	0	1	0	0	1	1	0	0	0	**2**
Trichechidae*	0	0	0	0	0	3	3	0	0	0	**3**
Total Sirenia	**1**	**0**	**1**	**0**	**0**	**4**	**4**	**0**	**0**	**0**	**5**
AFROSORICIDA (ns)											
Chrysochloridae**	0	0	0	1	4	5	10	2	6	3	**21**
Tenrecidae (ns)	0	0	0	0	3	4	7	1	24	1	**33**
Total Afrosoricida	**0**	**0**	**0**	**1**	**7**	**9**	**17**	**3**	**30**	**4**	**54**
MACROSCELIDEA (ns)											
Macroscelididae (ns)	0	0	0	0	1	2	3	1	9	3	**16**
HYRACOIDEA (ns)											
Procaviidae (ns)	0	0	0	0	0	0	0	0	5	0	**5**
PROBOSCIDEA (ns)											
Elephantidae (ns)	0	0	0	0	1	0	1	1	0	0	**2**
CINGULATA (ns)											
Dasypodidae (ns)	0	0	0	0	0	4	4	5	9	3	**21**

FAMILY	EX	EW	Subtotal extinct	CR	EN	VU	Subtotal threatened	NT	LC	DD	Total assessed
PILOSA (ns)											
Bradypodidae (ns)	0	0	0	1	1	0	2	0	2	0	**4**
Cyclopedidae (ns)	0	0	0	0	0	0	0	0	1	0	**1**
Megalonychidae (ns)	0	0	0	0	0	0	0	0	2	0	**2**
Myrmecophagidae (ns)	0	0	0	0	0	0	0	1	2	0	**3**
Total Pilosa	**0**	**0**	**0**	**1**	**1**	**0**	**2**	**1**	**7**	**0**	**10**
SCANDENTIA (ns)											
Ptilocercidae (ns)	0	0	0	0	0	0	0	0	1	0	**1**
Tupaiidae (ns)	0	0	0	0	2	0	2	0	14	3	**19**
Total Scandentia	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**0**	**15**	**3**	**20**
DERMOPTERA (ns)											
Cynocephalidae (ns)	0	0	0	0	0	0	0	0	2	0	**2**
PRIMATES ***											
Aotidae (ns)	0	0	0	0	0	4	4	0	5	2	**11**
Atelidae***	0	0	0	5	8	5	18	0	10	0	**28**
Callitrichidae (ns)	0	0	0	2	6	6	14	2	20	6	**42**
Cebidae (ns)	0	0	0	3	1	2	6	2	9	0	**17**
Cercopithecidae***	0	0	0	12	29	31	72	11	37	2	**122**
Cheirogaleidae (ns)	0	0	0	0	4	2	6	1	7	15	**29**
Daubentoniidae (ns)	0	0	0	0	0	0	0	1	0	0	**1**
Galagidae$^{\&}$	0	0	0	1	0	0	1	1	15	1	**18**
Hominidae***	0	0	0	2	4	0	6	0	0	0	**6**
Hylobatidae***	0	0	0	4	11	1	16	0	0	0	**16**
Indriidae***	0	0	0	2	8	2	12	0	1	5	**18**
Lemuridae***	0	0	0	3	4	9	16	3	0	1	**20**
Lepilemuridae*	0	0	0	1	1	1	3	0	0	21	**24**
Lorisidae*	0	0	0	0	2	4	6	0	4	0	**10**
Palaeopropithecidae (ns)	1	0	1	0	0	0	0	0	0	0	**1**
Pitheciidae*	1	0	1	2	6	8	16	1	24	1	**43**
Tarsiidae**	0	0	0	0	2	3	5	1	0	2	**8**
Total Primates	**2**	**0**	**2**	**37**	**86**	**78**	**201**	**23**	**132**	**56**	**414**

FAMILY	EX	EW	Subtotal extinct	CR	EN	VU	Subtotal threatened	NT	LC	DD	Total assessed
RODENTIA [&&&]											
Abrocomidae (ns)	1	0	1	1	0	0	1	0	2	6	**10**
Anomaluridae (ns)	0	0	0	0	0	0	0	0	6	1	**7**
Aplodontiidae (ns)	0	0	0	0	0	0	0	0	1	0	**1**
Bathyergidae (ns)	0	0	0	0	0	1	1	1	12	1	**15**
Calomyscidae (ns)	0	0	0	0	0	0	0	0	6	2	**8**
Capromyidae[***]	6	0	6	4	4	3	11	1	1	0	**19**
Castoridae (ns)	0	0	0	0	0	0	0	0	2	0	**2**
Caviidae (ns)	0	0	0	1	0	0	1	2	12	3	**18**
Chinchillidae (ns)	1	0	1	2	0	0	2	0	3	1	**7**
Cricetidae[&&&]	15	0	15	21	31	44	96	34	468	85	**698**
Ctenodactylidae (ns)	0	0	0	0	0	0	0	0	3	2	**5**
Ctenomyidae[*]	0	0	0	3	6	6	15	5	16	24	**60**
Cuniculidae (ns)	0	0	0	0	0	0	0	1	1	0	**2**
Dasyproctidae (ns)	0	0	0	1	1	1	3	1	6	3	**13**
Diatomyidae (ns)	0	0	0	0	1	0	1	0	0	0	**1**
Dinomyidae (ns)	0	0	0	0	0	1	1	0	0	0	**1**
Dipodidae[&&]	0	0	0	0	2	2	4	4	34	8	**50**
Echimyidae (ns)	4	0	4	2	7	4	13	0	47	25	**89**
Erethizontidae (ns)	0	0	0	0	0	1	1	0	11	6	**18**
Geomyidae[&]	0	0	0	3	1	0	4	1	33	1	**39**
Gliridae (ns)	0	0	0	0	0	2	2	1	15	10	**28**
Heteromyidae (ns)	0	0	0	3	6	5	14	1	46	1	**62**
Hystricidae (ns)	0	0	0	0	0	1	1	0	10	0	**11**
Muridae (ns)	10	0	10	17	62	55	134	24	409	134	**711**
Myocastoridae (ns)	0	0	0	0	0	0	0	0	1	0	**1**
Nesomyidae (ns)	0	0	0	1	6	3	10	0	40	9	**59**
Octodontidae (ns)	0	0	0	3	0	2	5	1	5	2	**13**
Pedetidae (ns)	0	0	0	0	0	0	0	0	2	0	**2**
Petromuridae (ns)	0	0	0	0	0	0	0	0	1	0	**1**
Platacanthomyidae (ns)	0	0	0	0	0	1	1	0	1	0	**2**
Sciuridae[&&&]	0	0	0	2	15	16	33	24	181	41	**279**

FAMILY	EX	EW	Subtotal extinct	CR	EN	VU	Subtotal threatened	NT	LC	DD	Total assessed
Spalacidae (ns)	0	0	0	0	2	2	4	2	12	3	**21**
Thryonomyidae (ns)	0	0	0	0	0	0	0	0	2	0	**2**
Total Rodentia	**37**	**0**	**37**	**64**	**144**	**150**	**358**	**103**	**1389**	**368**	**2255**
LAGOMORPHA (ns)											
Leporidae (ns)	0	0	0	1	7	5	13	6	38	5	**62**
Ochotonidae (ns)	0	0	0	1	3	0	4	0	23	3	**30**
Prolagidae (ns)	1	0	1	0	0	0	0	0	0	0	**1**
Total Lagomorpha	**1**	**0**	**1**	**2**	**10**	**5**	**17**	**6**	**61**	**8**	**93**
EULIPOTYPHLA (ns)											
Erinaceidae (ns)	0	0	0	0	2	1	3	0	20	1	**24**
Nesophontidae***	6	0	6	0	0	0	0	0	0	0	**6**
Solenodontidae*	1	0	1	0	2	0	2	0	0	0	**3**
Soricidae (ns)	0	0	0	12	36	28	76	12	217	71	**376**
Talpidae&&	0	0	0	0	1	2	3	1	32	5	**41**
Total Eulipotyphla	**7**	**0**	**7**	**12**	**41**	**31**	**84**	**13**	**269**	**77**	**450**
CHIROPTERA &&&											
Craseonycteridae (ns)	0	0	0	0	0	1	1	0	0	0	**1**
Emballonuridae&	0	0	0	1	2	2	5	1	38	8	**52**
Furipteridae (ns)	0	0	0	0	1	0	1	0	1	0	**2**
Hipposideridae (ns)	0	0	0	1	4	10	15	7	44	18	**84**
Megadermatidae (ns)	0	0	0	0	0	1	1	0	4	0	**5**
Molossidae&&	0	0	0	1	2	8	11	2	67	20	**100**
Mormoopidae (ns)	0	0	0	1	0	0	1	0	8	0	**9**
Mystacinidae (ns)	0	0	0	1	0	1	2	0	0	0	**2**
Myzopodidae (ns)	0	0	0	0	0	0	0	0	2	0	**2**
Natalidae (ns)	0	0	0	2	0	0	2	4	5	0	**11**
Noctilionidae (ns)	0	0	0	0	0	0	0	0	2	0	**2**
Nycteridae (ns)	0	0	0	0	0	1	1	1	10	4	**16**
Phyllostomidae&&&	3	0	3	1	5	12	18	12	121	22	**176**
Pteropodidae***	4	0	4	9	18	38	65	14	82	22	**187**
Rhinolophidae&	0	0	0	1	4	5	10	6	47	11	**74**
Rhinopomatidae (ns)	0	0	0	0	0	0	0	0	3	1	**4**

FAMILY	EX	EW	Subtotal extinct	CR	EN	VU	Subtotal threatened	NT	LC	DD	Total assessed
Thyropteridae (ns)	0	0	0	0	0	0	0	0	2	2	**4**
Vespertilionidae[&&&]	0	0	0	7	17	20	44	30	251	96	**421**
Total Chiroptera	**7**	**0**	**7**	**25**	**53**	**99**	**177**	**77**	**687**	**204**	**1152**
PHOLIDOTA (ns)											
Manidae (ns)	0	0	0	0	2	0	2	4	2	0	**8**
CARNIVORA (ns)											
Ailuridae (ns)	0	0	0	0	0	1	1	0	0	0	**1**
Canidae (ns)	1	0	1	3	3	0	6	4	24	1	**36**
Eupleridae (ns)	1	0	1	0	1	3	4	3	1	0	**9**
Felidae[*]	0	0	0	1	6	9	16	9	11	0	**36**
Herpestidae[&]	0	0	0	0	0	3	3	1	27	3	**34**
Hyaenidae (ns)	0	0	0	0	0	0	0	2	2	0	**4**
Mephitidae (ns)	0	0	0	0	0	1	1	0	11	0	**12**
Mustelidae (ns)	1	0	1	0	7	5	12	4	36	6	**59**
Nandiniidae (ns)	0	0	0	0	0	0	0	0	1	0	**1**
Odobenidae[2]	0	0	0	0	0	0	0	0	0	1	**1**
Otariidae (ns)	1	0	1	0	4	2	6	2	7	0	**16**
Phocidae (ns)	1	0	1	2	1	1	4	0	12	2	**19**
Prionodontidae (ns)	0	0	0	0	0	0	0	0	2	0	**2**
Procyonidae (ns)	0	0	0	1	0	0	1	0	10	3	**14**
Ursidae**	0	0	0	0	1	5	6	0	2	0	**8**
Viverridae (ns)	0	0	0	1	1	9	11	2	17	3	**33**
Total Carnivora	**5**	**0**	**5**	**8**	**24**	**39**	**71**	**27**	**163**	**19**	**285**
PERISSODACTYLA ***											
Equidae*	0	0	0	2	2	1	5	0	2	0	**7**
Rhinocerotidae*	0	0	0	3	0	1	4	1	0	0	**5**
Tapiridae**	0	0	0	0	3	1	4	0	0	0	**4**
Total Perissodactyla	**0**	**0**	**0**	**5**	**5**	**3**	**13**	**1**	**2**	**0**	**16**

FAMILY	EX	EW	Subtotal extinct	CR	EN	VU	Subtotal threatened	NT	LC	DD	Total assessed
CETARTIODACTYLA ***											
Antilocapridae (ns)	0	0	0	0	0	0	0	0	1	0	**1**
Balaenidae (ns)	0	0	0	0	2	0	2	0	2	0	**4**
Balaenopteridae (ns)	0	0	0	0	3	0	3	0	2	3	**8**
Bovidae***	4	1	5	8	20	21	49	16	67	3	**140**
Camelidae (ns)	0	0	0	1	0	0	1	0	2	0	**3**
Cervidae***	1	1	2	1	7	16	24	2	17	10	**55**
Delphinidae (ns)	0	0	0	0	1	2	3	3	13	16	**35**
Eschrichtiidae (ns)	0	0	0	0	0	0	0	0	1	0	**1**
Giraffidae (ns)	0	0	0	0	0	0	0	1	1	0	**2**
Hippopotamidae**	2	0	2	0	1	1	2	0	0	0	**4**
Iniidae (ns)	0	0	0	1	0	1	2	0	0	1	**3**
Monodontidae (ns)	0	0	0	0	0	0	0	2	0	0	**2**
Moschidae***	0	0	0	0	6	1	7	0	0	0	**7**
Neobalaenidae[2]	0	0	0	0	0	0	0	0	0	1	**1**
Phocoenidae (ns)	0	0	0	1	0	1	2	0	2	2	**6**
Physeteridae (ns)	0	0	0	0	0	1	1	0	0	2	**3**
Platanistidae (ns)	0	0	0	0	1	0	1	0	0	0	**1**
Suidae**	0	0	0	2	3	5	10	1	6	1	**18**
Tayassuidae (ns)	0	0	0	0	1	0	1	1	1	1	**4**
Tragulidae (ns)	0	0	0	0	1	0	1	0	6	3	**10**
Ziphiidae (ns)	0	0	0	0	0	0	0	0	2	19	**21**
Total Cetartiodactyla	**7**	**2**	**9**	**14**	**46**	**49**	**109**	**26**	**123**	**62**	**329**

Significantly more threatened than expected: *** $p < 0.001$; ** $p < 0.01$ * $p < 0.5$.

Significantly less threatened than expected: &&& $p < 0.001$; && $p < 0.01$; & $p < 0.5$.

(ns) – non significant; [1] all species Extinct; [2] all species Data Deficient.

4.6. Main types of threat

Table S2: Number and percentage of species affected by each of six main threat categories. Species can be affected by more than one threat category; being affected by a threat does not necessarily imply that the species is globally threatened (Vulnerable, Endangered, or Critically Endangered). Land and marine species are those mapped in Fig. 1, and exclude 78 extinct and 14 Data Deficient species; seven species are mapped as both land and marine.

| | All assessed/ mapped | **Threat** | | | | | |
		Habitat loss (%)	Utilisation (%)	Accidental mortality (%)	Pollution (%)	Invasive species (%)	Disease (%)
All mammals	5,487	2,030 (37)	926 (17)	284 (5)	219 (4)	309 (6)	117 (2)
Land mammals	5,282	2,016 (38)	872 (17)	193 (4)	151 (3)	306 (6)	102 (2)
Marine mammals	120	2 (2)	61 (51)	98 (82)	75 (63)	3 (3)	16 (13)

4.7. New species descriptions
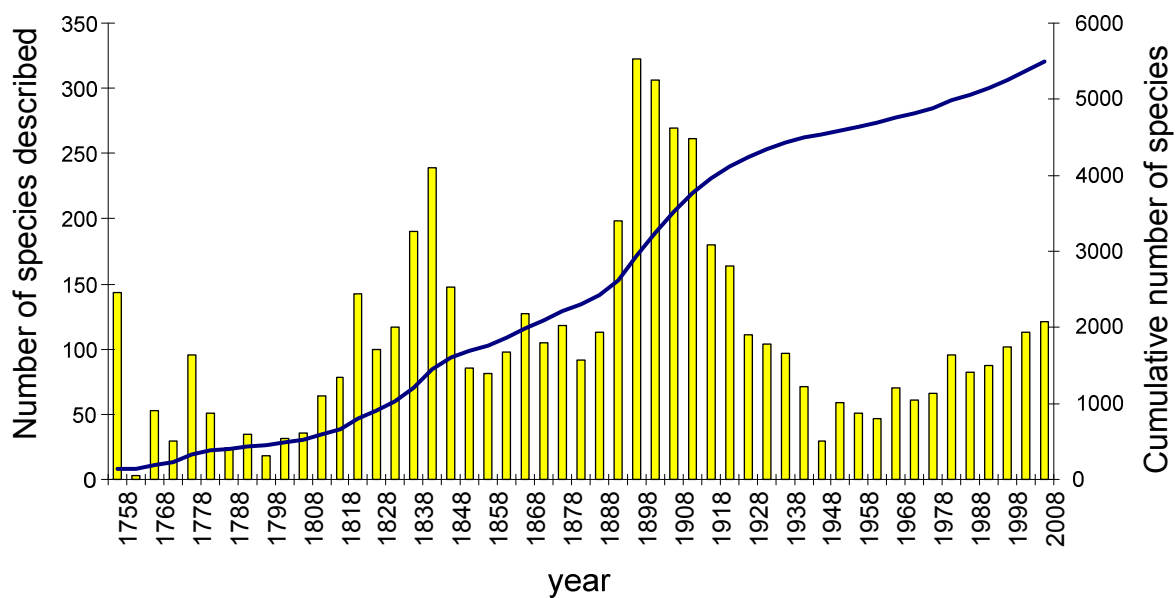
Fig. S8. Number of species described per five-year interval (yellow bars) and cumulative total number of species currently recognized as taxonomically valid (blue line) (adapted from ref. *27*). The first column corresponds to all species recognised up to 1758.

References and notes

1. A. S. L. Rodrigues *et al*., *Trends Ecol. Evol.* **21**, 71–76 (2006).

2. S. N. Stuart *et al.*, *Science* **306**, 1783-1786 (2004).

3. K. Carpenter *et al.*, *Science* **321**, 560-563 (2008).

4. IUCN *1996 IUCN Red List of Threatened Animals* (IUCN Gland, Switzerland, 1996).

5. IUCN, *IUCN Red List Categories & Criteria (version 3.1)* (IUCN, Gland, Switzerland, 2001) http://www.iucnredlist.org/info/categories_criteria2001.

6. For a list of Specialist Groups and Chairs, and links to action plans, see: http://cms.iucn.org/about/work/programmes/species/working_together/specialist_groups/directory_specialist_groups/directory_sg_mammals/index.cfm.

7. For a list of published actions plans, see: http://cms.iucn.org/about/work/programmes/species/resources/publications/species_actions_plans/index.cfm.

8. D.E. Wilson, D.A. Reeder, *Mammal Species of the World: A Taxonomic and Geographic Reference*, 3rd edn (Johns Hopkins Univ. Press, Baltimore, 2005).

9. K.P. Koepfli *et al*., *BMC Biology* **6**, 10 (2008).

10. U. Radespiel *et al*., *Am. J. Primatol*. **70**, 1-14 (2008).

11. J. Gatesy *et al.*, *Mol. Biol. & Evol.* **13**, 954-963 (1996).

12. M. Nikaido *et al.*, *Proc. Natl. Acad. Sci. U.S.A.* **96**, 10261-10266 (1999).

13. W.J. Murphy *et al.*, *Science* **294**, 2348-2351 (2001).

14. H. Amrine-Madsen *et al.*, *Mol. Phylog. & Evol.* **28**, 225-240 (2003).

15. U. Arnason *et al.*, *Gene* **333**, 27-34 (2004).

16. J.H. Geisler, M.D. Uhen, *J. Mamm. Evol.* **12**, 145-160 (2005).

17. J.D. Archibald, *Mol. Phylog. & Evol.* **28**, 350-359 (2003).

18. W. W. Sechrest, *Global Diversity, Endemism and Conservation of Mammals, Thesis.* University of Virginia, Charlottesville, USA (2003).

19. See http://www.iucnredlist.org/info/major_habitats.

20. See http://www.iucnredlist.org/info/major_threats.

21. See http://www.iucnredlist.org/info/conservation_actions.

22. See http://www.iucn.org/themes/ssc/sis/authority.htm.

23. S. H. M. Butchart *et al.*, *Phil. Trans. Soc. B* **360**, 255-268 (2005).

24. M. Hoffmann *et al., Endanger. Species Res.* 7 May 2008 (10.3354/esr00087).

25. P. C. De Grammont, A. D. Cuarón, *Conserv. Biol.* **20**, 14-27 (2006).

26. D. E. Wilson & D.A. Reeder, *Mammal Species of the World: A Taxonomic and Geographic Reference*, 2nd edn (Smithsonian Institution Press, Washington, DC., 1993).

27. D. M. Reeder, K. M. Helgen, D. E. Wilson, *Occas. Pap. Museum Texas Tech Univ.* **269**, 1-35 (2007).

28. B. D. Patterson *Nature* **380**, 589 (1996).

29. F. Rovero *et al.*, *J. Zool.* **274**, 126-133 (2008).

30. S. M. Goodman *et al.*, *Mamm. Biol.* **73**, 199-213 (2008).

31. J. P. Boubli *et al.*, *Int. J. Primatol.* **29**, 723-741 (2008).

32. J. E.M. Baillie *et al.*, *Global Species Assessment* (IUCN, Gland, Switzerland, 2004).

33. A. H. Hulbert, W. Jetz, *Proc. Natl. Acad. Sci. U.S.A.* **104**, 13384-13389 (2007).

34. J. Powell, *Manatees in the Bijagos Archipelago: Recommendations for Their Conservation* (IUCN Wetland Programme., Gland, Switzerland, 1990).

35. M. Kienta, *Preliminary Investigations on the manatee (*Trichechus senegalensis*) at Lac Deb, Mali, West Africa* (1985).

36. H. Kruuk, *Wild Otters* (Oxford Univ. Press, Oxford, UK, 1995).

37. T. Flannery, *Mammals of New Guinea* (Reed Books, Chatswood, NSW, Australia, 1995).

38. K. Sahr, D. White, A. J. Kimerling, *Cartography and Geographic Information Science.* **30**, 121-134 (2003).

39. C. P. Birch, S. P. Oom, J. A. Beecham, *Ecol. Model.* **206**, 347-359 (2007).

40. D. M. Olson *et al.*, *BioScience.* **51**, 933–938 (2001).

41. O. R. P. Bininda-Emonds *et al.*, *Nature.* **446**, 507-512 (2007).

42. D. Faith, *Biol. Conserv.* **61**, 1-10 (1992).

43. D. P. Faith, *Philos. Trans. R. Soc. London B*. **345**, 45-58 (1994).

44. A. S. L. Rodrigues, K. J. Gaston, *Biol. Conserv.* **105**, 103-111 (2002).

45. A. J. Stattersfield, M. J. Crosby, A. J. Long, D. C. Wege, *Endemic Bird Areas of World: Priorities for Biodiversity Conservation* (BirdLife International, Cambridge, UK, 1998).

46. C. D. L. Orme *et al.*, *Nature*. **436**, 1016-1019 (2005).

47. R. Grenyer *et al.*, *Nature*. **444**, 93-96 (2006).

48. B. A. Hawkins, J. A. F. Diniz-Filho, *Global Ecol. Biogeogr.* **15**, 461-469 (2006).

49. C. D. L. Orme *et al.*, *PLoS Biology*. **4**, e208 (2006).

50. G. M. Mace et al., *Conserv. Biol*. (in press).

51. S. L. Pimm, G. J. Russell, J. L. Gittleman, T. M. Brooks, *Science*. **269**, 347-350 (1995).

5. Acknowledgements

5.1. Institutional Support

Conservation Partners

Tabangay, Peter Widmann (Philippines); Harison Randrianasolo (Madagascar); Cyndi Taylor (Sirenia); Yasushi Hibi, Wakako Ichikawa, Hiromi Tada (Japan); John Pilgrim (Australia/Pacific); Güven Eken, Kerem Boyla (Southwest Asia); Darrin Lunde (Southeast Asia rodents); Scott Roberton, Tran Quang Phuong (small carnivores); Olivia Bittencourt, Gláucia Drummond, Eduardo Du Figueiredo, Maria Aparecida da Costa, Helder Galvão Pereira (South American small mammals); Martua Sinaga, Maria Elisa Hobbelink (large mammals and bats of Southeast Asia); Jake Brunner, Anthony Simms, Un Nalene (Asian primates); Sarah Mesnick, Autumn-Lynn Harrison, Suzanne Livingstone (cetaceans); Richard Mercer, Andrew Loveridge, Alexandra Zimmermann (cats); and Jorge Ivan Restrepo and Suyapa Triminio Meyer (Mesoamerican, Mexican and Caribbean small mammals).

In addition to the workshops, maps and information provided by the Chinese Species Information Service were instrumental in constructing accounts of many, if not most, of the Chinese mammals.

The concept of this project, formerly referred to as the Global Mammal Assessment (GMA), and the partnerships that resulted, arose from a working group and workshop hosted by the National Center for Ecological Analysis and Synthesis (University of California, Santa Barbara) entitled "Towards a Global Database of Terrestrial Vertebrate Distributions, Mammals Subgroup", February 4-7, 2002.

5.2. Contributing Scientists

Extraordinary, voluntary commitment from leading experts is the backbone of IUCN's species assessment process. The assessment of the mammals is no exception, being entirely due to extraordnarily generous contributions of the time and expertise of more than 1,700 mammalogists from over 130 countries, many of them members of IUCN/SSC Specialist Groups. It is impossible to overstate the importance of these dedicated individuals—without them the current summary of conservation status for this major class of animals would not have been possible. We have tried to record their information faithfully, and we take full responsibility for errors contained within the assessments. It is

our hope that the information will be refined, consolidated and updated over time. We express our gratitude to the following people, asking for forgiveness from anyone whose name has been inadvertently omitted:

Abba, A.

Abdel-Rahman, E.H.

Abe, H.

Abramov, A.

Abril, V.

Abu Baker, M.A.

Acosta, G.

Aguiar, L.M.S.

Aguilar, A.

Aguilera, M.

Aguirre, L.

Agwanda, B.

Ahlmann, V.

Ahmed, B.

Ahrestani, F.

Akhtar, N.

Al Dosary, M.

Al Habhani, H.M.

Al Khaldi, A.

Al Mutairi, M.S.

Al Nuaimi, A.

Alava, M.

Albuja, L.

Alburo, H.

Alcala, E.

Alcaldé, J.

Ali, A.

Ali, R.

Alkon, P.

Allison, A.

Altıparmak, A.

Altrichter, M.

Alvarez, R.

Álvarez, S.

Álvarez-Castañeda, S.T.

Alves de Oliveira, J.

Alves, P.

Alviola, P.

Amano, M.

Amanzo, J.

Ambal, R.G.

Ambrose, L.

Amgalanbaatar, S.

Amir, O.

Amr, Z.

Anacleto, T.

Ancrenaz, M.

Andayani, N.

Andelt, W.

Anderson, J.

Anderson, M.

Anderson, P.

Anderson, R.

Andrainarivo, C.

Andrews, H.

Andriafidison, D.

Andriaholinirina, V.

Andriamanana, R.

Andriamaro, L.

Andriambololona, M.

Andriamialison, H.

Andriamifidison, D.

Andriamihaja, B.

Andrianarisata, M.

Andrianjakarivelo, V.

Andriantsilavo, F.

Angelici, F.

Angerbjörn, A.

Aplin, K.

Appleton, B.

Arboleda, I.

Ario, A.

Arison, R.

Ariunbold, J.

Armstrong, K.

Arroyo-Cabrales, J.

Arumugam, R.

Asa, C.

Ashenafi, Z.

Assogbadjo, A.

Astua de Moraes, D.

Atickem, A.

Atkinson, R.

Aulagnier, S.

Aune, K.

Aurioles, D.

Avirmed, D.

Azlan, A.

Azlan, M.J.

Babon, M.

Baigún, R.

Baird, R.

Baker, C.

Baker, J.

Baker, L.

Balangcod, T.

Baldwin, R.

Balete, D.

Balfour, D.

Ballesteros, F.

Balmforth, Z.

Baloyan, S.

Banks, P.

Bannister, J.

Bantel, C.

Baoanan

Baral, H.S.

Barashkova, A.

Bargali, H.

Barış, S.

Barlow, J.

Barnett, A.

Barney, L.

Barquez, R.

Barrio, J.

Barry, R.

Bartels, P.

Barua, M.

Batbold, J.

Bates, P.J.J.

Batin, G.

Batsaikhan, N.

Bauer, H.

Baxter, R.

Bayarkhuu, S.

Bayarmaa

Bayartoghtokh, B.

Bazardorj, D.

Bearder, S.

Bearzi, G.

Beauvais, G.

Beccaceci, M.

Beck, H.

Beckmann, J.

Beever, E.

Begg, C.

Begg, K.

Bekoff, M.

Belant, J.

Belant, L.

Belbachir, F.

Bello, J.

Benda, P.

Benishay, J.

Bennett, D.

Benshemesh, J.

Berducou, C.

Bergallo, H.

Berggren, P.

Bergl, R.

Bergmans, W.

Bergstrom, B.

Bernal, N.

Bernard, E.

Bertolino, S.

Best, P.

Bestelmeyer, S.

Beyer, A.

Bhat, H.R.

Bhatnagar, Y.

Bhatta, T.

Bhattacharyya, T.

Bidau, C.

Biggins, D.

Bila-Isia, I.

Birkun, A.

Bist, S.

Bisther, M.

Biswas, J.

Bittencourt, O.

Bivash P.

Bjørge, A.

Bleisch, W.

Blois, J.

Blom, A.

Bloomer, P.

Boada, C.

Bocian, C.

Boeadi

Boesch, C.

Boisserie, J-R.

Bold, A.

Bonaccorso, F.

Bonal, B.

Bonvicino, C.

Boonratana, R.

Born, E.

Borroto-Paez, R.

Bose, J.

Bosworth, W.

Botello, J.

Boubli, J.P.

Bóveda-Penalba, A.

Bowler, M.

Boyd, C.

Boyd, L.

Boyer, A.

Boyla, K.

Bozdogan, M.

Brandle, R.

Brandon-Jones, D.

Braulik, G.

Breed, W.

Breitenmoser, U.

Breitenmoser-Würsten, C.

Brescia, F.

Brickle, N.

Brito, D.

Brockelman, W.

Bronner, G.

Brooke, A.

Brooks, D.

Broome, L.

Brown, D.

Brown, M.

Brownell Jr., R.L.

Buden, D.

Budsuren, D.

Bukhnikashvili, A.

Bumrungsri, S.

Burbidge, A.

Burdin, A.

Burkanov, V.

Burneo, S.

Burnett, S.

Butterworth, D.

Buuveibaatar, V.

Byers, J.

Cadena, A.

Cajas, J.

Camancho, J.

Camara, C.

Campagna, C.

Camperio-Ciani, A.

Can, Ö.

Cañadas, A.

Cannings, S.

Canty, P.

Carbyn, L.

Cardiff, S.

Carey, C.

Cariño, A.

Carino, P.

Carpenter, K.

Carraway, L.

Carrick, F.

Carrillo, O.

Carthew, S.

Caso, A.

Cassinello, J.

Castellanos, A.

Castro-Arellano, I.

Catling, P.

Catzeflis, F.

Causado, J.

Cavallini, P.

Ceballos, N.

Cerqueira, R.

Cervancia, M.

Cervantes, F.

Chaiyarat, R.

Chakraborty, S.

Chakravarthy, A.K.

Chakravarthy, B.

Chalise, M.

Chalukian, S.

Chan, B.

Changappa, K.N.

Chantrapornsyl, S.

Chardonnet, P.

Charles-Dominique, P.

Chauhan, N.

Chaves, P.

Chetry, D.

Chhangani, A.K.

Chiang, P.

Chiarello, A.

Chimeddorj, B.

Chimed-Ochir, B.

Chitaukali, W.

Choudhury, A.

Christoff, A.

Chundawat, R.

Cianfrani, C.

Cilliers, S.

Clapham, P.

Clara, M.

Clark, C.

Clark, E.

Clausen, M.

Coetzee, C.G.

Çolak, E.

Collins, K.

Collins, T.

Constantino, E.

Cooper, N.

Copley, P.

Corbett, L.

Cordero, H.R.

Cornejo, F.

Coroiu, I.

Cortes, J.

Cortés-Ortiz, L.

Corti, M.

Corti, P.

Cossíos, D.

Costa, D.

Cotterill, F.P.D.

Courtenay, J.

Courtenay, O.

Covert, B.

Cox, D.

Coxe, S.

Craig, C.

Craul, M.

Crawford-Cabral, J.

Creel, S.

Crespo, E.

Crider, D.

Crowley, H.

Cruz-Aldan, E.

Csorba, G.

Cuarón, A.

Cuéllar, E.

Cumming, D.

Custodio, C.

Cuzin, F.

Cypher, B.

da Cruz Neto, A.

Da Silva, V.

Dabek, L.

Dalebout, M.

Dalponte, J.

Dalton, R.

Damdin, T.

Damon, F.

Dang, N.

Daniel, B.A.

Daniel, J.C.

Daniels, R.J.R.

Dans, S.

Daouda, H.

Darman, Y.

Darmaraj, M.

Darria, J.

Das, J.

Dávalos, L.

Davenport, T.

David, J.

Dawson, S.

de A. Goonatilake, W.L.D.P.T.S.

de Boer, H.

de Bustos, S.

de Freitas Netto, R.

De Fretes, Y.

de Gonzalez-Maya, J.

DE Grammont, P.

de Iongh, H.

De Jong, Y.A.

de la Sancha, N.

de la Torre, S.

de Leon, J.

De Luca, D.

de Oliveira, L.

de Oliveira, M.M.

de Silva, P.

de Smet, K.

de Souza Aguiar, M.

de Thoisy, B.

de Tores, P.

de Vries, T.

Decher, J.

Deka, P.

del Pilar Rivas, M.

Dela, J.

Delgado, C.

D'Elia, G.

Dell, J.

DeLuycker, A.

DeMaster, D.

Demirtaş, S.

Denny, M.

Desai, A.

Deutsch, C.

D'Huart, J.

Di fiore, A.

Diaz, A.

Díaz, J.

Diaz, M.

Dickman, C.

Diesmos, A.

Dieterlen, F.

Digana, P.M.C.B.

Dinh Thong, V.

Dirrigl, F.J.

Disotell, T.

Ditchfield, A.D.

Dittus, W.

Dixon, R.

Do Tuoc

Doggart, N.

Dolar, M.

Dollar, L.

Domning, D.

Donovan, G.

Dorjderem, S.

Dorjgotov, B.

Dorjraa, O.

Doroff, A.

Doss, D.P.S.

Dowler, R.

Downer, C.

Drew, C.

Driessen, M.

Driscoll, C.

Drummond, G.

Duarte, J.M.B.

Dulamtseren, S.

Duncan, J.

Dunham, A.

Dunlop, R.

Dunn, A.

Dunnum, J.

Dupain, J.

Duplaix, N.

Durant, P.

Durant, S.

Durbin, J.

Durbin, L.

Duvall, C.

Duya, A.

Duya, M.

Dwiyahreni, D.

Easa, P.

East, R.

Eby, P.

Echenique-Diaz, L.

Eeley, H.

Ehardt, C.

Eizirik, E.

Eken, G.

Ekué, M.

Elangovan, V.

Elena Kreuzberg, E.

Ellis, C.

Ellis, M.

Ellis, S.

Engstrom, M.

Enkhbat, A.

Ermayanti

Española, C.

Espino Castellanos, L.A.

Esselstyn, J.

Eudey, A.

Evans, T.

Ewel, K.

Eyre, T.

Fa, J.

Fagundes, V.

Fahr, J.

Falanruw, M.

Faria, D.

Farías, V.

Farida, W.

Farmer, K.

Fashing, P.

Fasola, L.

Faulhaber, C.

Faulkes, C.

Feeroz, M.M.

Feh, C.

Feistner, A.

Felix, T.

Fellers, G.

Fellowes, J.

Fennessy, J.

Ferguson, M.

Fernandes, M.

Fernandez-Duque, E.

Fernando, P.

Ferrari, S.

Ferreira, D.

Ferreyra, N.

Fine, A.

Finnie, D.

Finoana, R.

Fiore, A.

Firestone, K.

Fisher, D.

FitzGibbon, C.

Flander, M.

Flannery, T.

Flueck, W.

Foerester, C.

Forbes, T.

Forchhammer, M.

Ford, F.

Ford, J.

Formozov, N.

Forney, K.

Fortuna, C.

Foulkes, J.

Fragoso, J.

Francis, C.

Francis, N.

Franco, M.

Frantzis, A.

Fredriksson, G.

Frey, J.

Friend, T.

Frost, A.

Fruth, B.

Fuller, T.

Funakoshi, K.

Funes, M.

Furey, N.

Furuichi, T.

Gaikhorst, G.

Galat, G.

Galat-Luong, A.

Gales, N.

Gallina Tessaro, S.A.

Gallina, S.

Gamarra de Fox, I.

Ganapathiappan, S.

Ganbaatar, O.

Ganbold, D.

Gankhuyag, P.

Gantulga, J.

Ganzhorn, J.

Garbutt, N.

Garcia, H.

Garcia, J.

Garcia-Rangel, S.

Gardner, A.

Garibaldi, A.

Gates, J.

Gatti, S.

Gaubert, P.

Gautier, J.-P.

Gautier-Hion, A.

Gaylord, L.

Geberemedhin, B.

Geffen, E.

G. de S. Wijeyeratne

Geise, L.

Geissmann, T.

Geist, V.

Gelatt, T.

Geraldine, V.

Gerlach, J.

Gese, E.

Ghimire, M.K.

Ghimire, S.C.

Giannatos, G.

Gil y Carbó, G.

Gill, R.

Giman, B.

Ginsberg, J.

Gippoliti, S.

Girish, A.C.

Girish, D.V.

Gizejewski, Z.

Glowacinski, Z.

Gober, P.

Golden, C.

Goldingay, R.

Goldman, C.

Goldstein, I.

Goldsworthy, S.

Gomez, H.

Gomez, R.

Gómez-Laverde, M.

Gondek, A.

Gongora, J.

Gonzales, A.

Gonzales, J.

González, B.

González, E.

González, J.

Gonzalez, T.

Goodall, R.

Goodman, S.

Goossens, B.

Gopukumar, N.

Gordon, G.

Gordon, J.

Gottelli, D.

Granjon, L.

Grant, T.

Grassman, L.

Gray, M.

Greengrass, E.

Gregorin, R.

Griffin, J.

Griffin, M.

Griffiths, M.

Groenedijk, J.

Groves, C.

Grubb, P.

Guevara, M.

Guineo, G.

Guinet, C.

Guissamulo, A.

Gumal, M.

Gunatilake, S.

Gunawardena, M.

Gunn, A.

Gürsoy, A.

Guttierrez, T.

Habib, B.

Hack, M.

Hadjisterkotis, E.

Hafner, D.

Hafner, M.

Hai Yin, W.

Hajkova, P.

Hall, J.

Hall, L.

Hamilton, S.

Hammer, S.

Han, K.

Handasyde, K.

Hanski, I.

Harding, A.

Harding, L.

Härkönen, T.

Harrison, A.

Hart, J.

Hart, T.

Hashim Abdel Rahman, E.

Hashimoto, C.

Hashimoto, T.

Hawkins, A.

Hawkins, F.

Hays, D.

Head, D.

Hearn, A.

Heckel, J.-O.

Hefner, R.

Heide-Joergensen, M.

Heinrich, S.

Henry, J.

Henschel, P.

Henttonen, H.

Herbinger, I.

Herrero, J.

Hersteinsson, P.

Heymann, E.

Hicks, C.

Hill, D.

Hill, R.

Hobbelink, M.

Hoces, D.

Hocking, G.

Hoeck, H.

Hofmeyr, G.

Hohmann, G.

Holden, J.

Holdsworth, M.

Holekamp, K.

Hon, J.

Honer, O.

Honess, P.

Horner, P.

Horsup, A.

How, R.

Howard, J.

Howell, K.

Hoye, G.

Hoyt, E.

Hrabar, H.

Htun, S.

Huber, D.

Hucke-Gaete, R.

Huibin, Z.

Humle, T.

Hunt, K.

Hunter, C.

Hunter, L.

Hurley, M.

Hutson, A.

Hutterer, R.

Ibuna, M.

Ilambu, O.

Ilangakoon, A.

Immanuel, K.

Incháustegui, S.

Indrawan, M.

Ingle, N.

Insall, D.

Irwin, N.

İsfendiyaroğlu, S.

Is-haquou Daouda, H.

Islam, A.

Islam, M.A.

Isnan, W.

Izawa, M.

J. bin Abd. Gulam Azad, A.

Jackson, D.R.

Jackson, P.

Jackson, R.

Jacobs, D.

Jakosalem, P.

James, D.

James, R.

Jansa, S.

Jaramillo-Legorreta, A.

Jargal, J.

Jayat, J.P.

Jdeidi, T.

Jefferson, J.

Jenkins, P.

Jennings, A.

Jerusalinsky, L.

Jhala, Y.V.

Jiang, Z.

Jiménez, J.

Jimenez, R.

Johnsingh, A.

Johnson, K.

Johnson, P.

Jolly, C.

Jones, G.

Jones, M.

Jones, T.

Jordan, M.

Jordan, R.

Joseph, G.K.

Joshi, A.

Joshi, D.S.

Joshua, J.

Jowkar, H.

Julien-Laferriere, D.

Juškaitis, R.

Juste, J.

Kaariye, X.

Kahn, B.

Kamenya, S.

Kanchanasaka, B.

Kandula, S.

Kaneko, Y.

Kappeler, P.

Karanth, U.

Karataş, A.

Karczmarski, L.

Karki, J.B.

Kasuya, T.

Kato, H.

Katuala, P.

Kauhala, K.

Kawada, S.

Kawanishi, K.

Kays, R.

Kebede, F.

Kefelioğlu, H.

Kelly, B.

Kelly, M.

Kelt, D.

Kemper, C.

Kemper, K.

Kendrick, P.

Kerbis Peterhans, J.

Kerle, A.

Keuroghlian, A.

Khac Quyet, L.

Khan, A.

Khan, J.A.

Khan, M.K.M.

Khorozyan, I.

Kierulff, M.C.M.

King, S.

Kingston, T.

Kinnaird, M.

Kinoshita, R.

Kinze, C.

Kitchener, D.

Kittle, A.

Klingel, H.

Knowlton, F.

Kock, D.

Kodithuwakku, N.K.

Koenig, K.

Kofoky, A.

Koilraj, A.J.

Koli, G.H.

Konstant, B.

Koprowski, J.L.

Korad, V.S.

Kouadio, A.

Kozlowski, A.

Krajewski, C.

Kranz, A.

Kraus, F.

Kreb, D.

Krishnamani, R.

Kryger, U.

Kryštufek, B.

Kukherjee, S.

Kumar Chhangani, A.

Kumar, A.

Kumar, H.R.

Kumar, S.

Kümpel, N.

Künzel, T.

Kuroda, S.

Kurt, F.

Kurtonur, C.

Kutt, A.

Lahiri Choudhury, D.

Laidre, K.

Laker, J.

Lamarque, F.

Lammertink, M.

Langguth, A.

Langrand, O.

Lanjouw, A.

Lara-Ruiz, P.

Lastica, E.

Latch, P.

Lau, M.

Launch, A.

Laurenson, M.

Lavrenchenko, L.

Lawes, M.

Lazell, J.

Le T.T.

Leary, T.

Leasor, H.

Lee, B.

Lehmann, T.

Lehn, C.

Leirs, H.

Leite, Y.

Leite-Pitman, M.R.P.

Lenain, D.

Leslie, D.

Lessa, E.

Lew, D.

Lewis, D.

Lewison, R.

Lhagvasuren, B.

Li, S.

Li, W.

Libois, R.

Lidicker Jr., W.

Lillo, E.

Lim, B.K.

Lindenmayer, D.

Linder, J.

Lindsey, P.

Link, A.

Linkie, M.

Linzey, A.

Lippold, L.

Lira-Torres, I.

Lissovsky, A.

List, R.

Lister, A.

Litvaitis, J.

Liu, A.

Livingstone, S.

Liyanage, K.R.

Lizcano, D.

Lkhagvasuren, B.

Lkhagvasuren, D.

Lloyd, P.

Long, B.

Lopez-Arevalo, H.

Lopez-Gonzalez, C.

Lorenzen, E.

Lorenzo, C.

Lorica, M.

Lorica, R.

Loucks, C.

Louis Jr., E.

Lovari, S.

Loveridge, A.

Low, B.

Low, T.

Lowrey, C.

Loy, A.

Lu, W.

Lü, Z.

Lucherini, M.

Lumsden, L.

Luna, L.

Lunde, D.

Lundie-Jenkins, G.

Lunn, N.

Lunney, D.

Lyenga, A.

Lynam, A.

Lynam, T.

Maas, B.

Mabee, T.

Macdonald, A.

Macdonald, D.

MacKinnon, J.

MacLeod, C.

MacPhee, R.

Madhavan, A.

Maeda, K.

Maffei, L.

Maharadatunkamsi, D.

Maheswaran, G.

Maisels, F.

Malakar, M.

Malcolm, J.

Malpica, F.J.R.

Mancina, C.

Manh Ha, N.

Mann de Toledo, P.

Mannullang, B.

Manoharan, N.S.

Mantilla, H.

Manullang, M.O.

Maran, T.

Maree, S.

Marimuthu, G.

Marinho-Filho, J.

Marini-Filho, O.

Marino, J.

Marker, L.

Marmontel, M.

Marsh, H.

Marsh, L.

Marshall, A.

Marthy Rombang, W.

Martin, A.

Martin, E.

Martin, R.

Martinez, J.

Martínková, N.

Martins da Silva Júnior, J.

Martyr, D.

Maryanto, I.

Marzetti, I.

Masoud, T.

Masseti, M.

Master, L.

Masters, P.

Matillano, J.

Matola, S.

Matson, J.

Matsumura, S.

Matthee, C.

Maude, G.

Mawson, P.

Maxwell, A.

Mc Shea, B.

McCallum, H.

McCarthy, T.

McCreery, K.

McDonald, R.

McGraw, S.

McGuire, T.

McKenzie, G.

McKenzie, N.

McKinnon, J.

McLellan, B.

McNutt, J.

McShea, W.

Mead, J.

Mech, L.

Medhi, R.

Medina, A.

Medina, C.

Medina-Vogel, G.

Medlin, G.

Meegaskumbura, S.

Meena, V.

Mehlman, P.

Meijaard, E.

Meinig, H.

Menard, N.

Mendes, S.

Menkhorst, P.

Menon, V.

Menzies, J.

Merino, M.

Meritt, D.

Meritt, M.

Merker, S.

Mertzanidou, D.

Mesnick, S.

Meyers, D.

Mickleburgh, S.

Mignucci-Giannoni, A.

Mijiddorj, B.

Mildenstein, T.

Miller, B.

Miller, J.

Milne, D.

Milner-Gulland, E.

Miquelle, D.

Mira, A.

Miranda, F.

Misra, M.K.	Mulavwa, M.	Noble, A.
Mistry, S.	Muni, M.	Noblet, J.
Mitani, J.	Munkhzul, Ts.	Nolan, B.
Mitra, S.	Munks, S.	Nomao, A.
Mitsain, G.	Munny, P.	Noronha, M.
Miura, S.	Muñoz, A.	Norris, S.
Mix, H.	Muñoz, L.	Northridge, S.
Moehrenschlager, A.	Muñoz, Y.	Noss, A.
Mohammed, O.	Murakami, O.	Notarbartolo di Sciara, G.
Molinari, J.	Murdoch, J.	Novarino, W.
Monadjem, A.	Murray, D.	Novaro, A.
Monkhbat, J.	Musser, G.	Novellie, P.
Monkhtoghtokh, O.	Mustari, A.	Nurul Huda
Monkhtsog, B.	Nader, I.	Nusalawo, M.
Monkhtuya, B.	Nadler, T.	Nyambayar, B.
Monkhzul, T.	Nagorsen, D.	Nyberg, D.
Montenegro, O.	Nagy, Z.	Nyhus, P.
Mooney, N.	Nakamura, M.	O'Corry-Crowe, G.
Moore, J.	Nameer, P.O.	Oakwood, M.
Moore, L.	Nandintsetseg, D.	Obradovitch, M.
Moores, N.	Naranbaatar, G.	Ochoa Graterol, J.
Morales-Jiménez, A.L.	Naranjo, E.	Ochoa, J.
Morefield, J.	Narayan, G.	Odhiambo, C.
Morgan, B.	Nash, S.	O'Donnell, C.
Morgan, D.	Nathan, P.T.	O'Donovan, D.
Morris, K.	Nathar, K.	Oguge, N.
Morrison, M.	Natoli, A.	Ohdachi, S.
Moseby, K.E.	Naveda, A.	Ojeda, R.
Mostafa Feeroz, M.	Ndunda, M.	Oliveira, J.A.
Motokawa, M.	Neelakantan, K.S.	Oliveira, T.G. de
Mouna, M.	Nekaris, A.	Olivieri, G.
Moura, R.	Nel, J.	Olsen, K.
Moyer, D.	Newby, J.	Olson, A.
Mudappa, D.	Newton, P.	Olson, L.
Mugisha, A.	Ngoc Thanh, V.	Olsson, A.
Mukherjee, S.	Nijman, V.	Omasombo, V.
Mukherji, S.	Nixon, S.	Ong, P.

Onon, Y.

Ordóñez Delgado, L.

Oshida, T.

Osokhjargal, D.

Otgonbaatar, M.

Ovsyanikov, N.

Oyuna, S.

Oyungerel, E.

Özkan, B.

Pacheco, S.

Pacheco, V.

Packer, C.

Packer, K.

Paddack, J.

Padmanabhan, P.

Paglia, A.

Paguntalan, L.M.

Paisley, S.

Palacios, E.

Palka, D.

Palmeirim, J.

Palomares, F.

Pamaong, R.

Pandaranayaka, P.J.E.

Pardiñas, U.

Parnaby, H.

Parr, J.W.K.

Parr, M.

Parra, G.

Passamani, M.

Passos, F.

Patel, E.

Pattanavibool, A.

Patton, J.

Paul, S.

Paunović, M.

Pavey, C.

Payan, E.

Payne, J.

Pearson, D.

Pedraza, S.

Pedregosa M.

Peeters, P.

Pei, K.C.J.

Pennay, M.

Percequillo, A.R.

Pereira, J.

Pérez, J.

Pérez, S.

Pergams, O.

Perico M., D.

Perieras, A.

Perkin, A.

Perrin, M.

Perzanowski, K.

Peters, S.

Pethiyagoda, R.

Phillips, M.

Phuong, T.

Pilgrim, J.

Pillai, K.

Pimley, E.

Pine, R.

Piñeda, C.

Pineda, J.

Pineda, W.

Pino, J.

Pinto, L.

Piovezan, U.

Pires Costa, L.

Pita, R.

Pitman, R.

Plowman, A.

Plumptre, A.

Pokheral, C.

Polechla, P.

Popper, K.

Porini, G.

Powell, J.

Poyarkov, A.

Pradhan, M.S.

Prasad Pokheral, C.

Princee, F.

Printes, R.

Priya, B.

Priya, K.P.

Priyono, A.

Pudyatmoko, S.

Puig, S.

Purchase, N.

Purevsuren, L.

Pushkar, K.

Qarqas, M.

Qisen, Y.

Queirolo, D.

Queiroz, H.

Querouil, S.

Qureshi, Q.

Rabarivola, J.

Rabearivelo, A.

Rabei, A.

Rabesihanaka, S.

Rabiei, A.

Rabotoarison, C.

Rachlow, J.

Radilofe, S.

Raghuram, H.

Rahajanirina, L.

Rahelison, Y.

Raheriarisena, M.

Rahmani, A.

Rainho, A.

Rajamani, N.

Rajaobelina, L.

Rajaobelina, S.

Rajaonhasoa, R.

Rajasekar, R.

Rakotoarijaona, J.

Rakotoarivelo, A.

Rakotoary, J.

Rakotobe, Z.

Rakotomanga, T.

Rakotondravony, D.

Rakotoniaina, J.

Rakotosamimanana, B.

Ralimanana, H.

Ram, S.

Ramachandran, K.K.

Ramakantha, V.

Raman, T.R.S.

Ramangason, G.

Ramanoelina, P.

Ramaromisa, L.

Ramaswamy, G.

Ramayla, S.

Ramiarinjanahary, H.

Ramiarison, C.

Ramilo, E.

Raminoarisoa, V.

Randall, D.

Randi, E.

Randriamanantsoa, H.

Randrianarisoa, F.

Randrianasolo, H.

Randrianjafy, V.

Ranivo, J.

Rasamimanana, H.

Rasamison, A.

Rasmussen, G.

Rasolonandrasana, B.

Ratnayeke, S.

Ratrimomanarivo, F.

Ratsimbazafy, J.

Ratsirarson, J.

Raveloarinoro, G.

Ravelonandro, P.

Ravichandran, B.

Ravikumar, L.G.

Ravino, J.

Rawson, B.

Ray, J.

Rayaleh, H.

Raynor, B.

Razafiarison, Z.

Razafilalao, N.

Razafimahatratra, E.

Razafimanahaka, H.J.

Razafimanantsoa, A.

Razafindrakoto, Y.

Razafindralambo, G.

Read, A.

Read, J.

Reading, R.

Reardon, T.

Reed, J.

Regidor, H.

Reichel, J.

Reid, F.

Reinartz, G.

Reis, M.

Reizl, J.

Reyna, R.

Reyna-Hurtado, R.

Reynolds, H.

Reynolds, V.

Rhind, S.

Rice, C.

Richard-Hansen, C.

Richards, G.

Richards, J.

Richards, N.

Richardson, M.

Riddle, H.

Riga, F.

Rigaux, P.

Ritchie, E.

Rivas, B.

Rivas-Pava, P.

Riveros, J.

Robbins, M.

Robbins, R.

Roberton, S.

Robichaud, W.

Robinson, T.

Rocha, N.

Rodden, M.

Rodrigues de Freitas, S.

Rodrigues, F.

Rodríguez, A.

Rodriguez, J.

Rodriguéz-Herrera, B

Rodríguez-Luna, E.

Rodríguez-Mahecha, J.

Roemer, G.

Rogan, E.

Rojas-Bracho, L.

Romero, A.

Rookmaaker, K.

Roos, A.

Roos, C.

Rosel, P.

Rosenbaum, H.

Rosmarino, N.

Ross, G.

Ross, J.

Ross, S.

Rossi, R.

Rossiter, S.

Roth, E.

Roth, L.

Rovero, F.

Rübel, A.

Rubenstein, D.

Ruedas, L.

Ruiz-Olmo, J.

Rumiz, D.

Rumpler, Y.

Runcie, M.

Russell-Smith, J.

Saeki, M.

Saha, S.S.

Sahoo, S.K.

Salas, L.

Salazar-Bravo, J.

Saleh, M.

Salim, A.

Saltz, D.

Samba Kumar, N.

Samedi

Samiya, R.

Sampaio, E.

Samudio, R.

Sanchez Rojas, G.

Sánchez, J.

Sanderson, J.

Sano, A.

Santos, S.

Sarkar, S.K.

Sarker, S.U.

Sarmiento, E.E.

Sasaki, H.

Savage, A.

Saw Htun

Saxon, M.

Schaller, G.

Scherlis, J.

Scheuering, E.

Schiavini, A.

Schliebe, S.

Schlitter, D.

Schreiber, A.

Schulz, M.

Schwitzer, C.

Schwitzer, N.

Scott, D.

Scott, M.

Sebastian, T.

Secada, L.

Secchi, E.

Sectionov

Sedlock, J.

Seedikkoya, K.

Sefass, T.

Semiadi, G.

Senacha, K.R.

Sepulveda, M.

Sequin, E.

Serena, M.

Sergelen, J.

Seri, L.

Serra, G.

Servheen, C.

Seryodkin, I.

Seydack, A.

Seyhan, G.

Shagdarsuren, O.

Shah, N.

Shank, C.

Shar, S.

Sharifi, M.

Sharma, A.K.

Shedden, A.

Sheela, J.

Sheftel, B.

Shekelle, M.

Shenbrot, G.

Shepherd, C.

Sherwin, W.

Short, J.

Shoshani, H.

Shreshtha, T.K.

Shugart, H.

Shukkur, E.A.A.

Siex, K.

Siliwal, M.

Silva Jr., J. de S.

Silva, C.

Silva, G.

Silveira, L.

Simkins, G.

Simmons, N.

Simpson, L.

Sinaga, M.H.

Singadan, R.

Singaravelan, N.

Singh, M.

Singleton, I.

Sinha, A.

Sinha, R.

Sinha, Y.P.

Sinisterra Santana, J.

Siy, S.

Sliwa, A.

Slooten, E.

Smit, H.

Smith, B.

Smith, J.

Smith, R.

Sogbohossou, E.

Solanki, G.S.

Solari, S.

Solomon, S.P.R.

Somaweera, R.K.

Soriano, P.

Sousa, M.

Southgate, R.

Southwell, C.

Sovada, M.

Soy, J.

Sözen, M.

Spelman, L.

Spironello, W.

Spitzenberger, F.

Sreepada, K.S.

Srinivasulu, B.

Srivatsava, P.

St. Louis, A.

Start, T.

Steel, L.

Steinmetz, R.

Stephenson, P.

Stevens, K.

Stier, S.

Stokes, E.

Stone, G.

Strahan, R.

Strauss, M.

Streicher, U.

Struhsaker, S.

Struhsaker, T.

Stuart, C.

Stuart, T.

Stübbe, M.

Stuebing, R.

Sturm, M.

Suárez Mejía, J.

Suarez, L.

Subbotin, A.

Subirá, R.

Sugardjito, J.

Sugimura, K.

Sukhchuluun, G.

Sukhchuluun, S.

Sukhtulga, S.

Sumardja, E.

Sunarto, S.

Sunderland-Groves, J.

Superina, M.

Supriatna, J.

Sussman, R.

Suyanto, A.

Suyanto, I.

Swanson, B.

Swarner, M.

Swe, K.M.

Tabao, M.

Tabaranza, B.

Taber, A.

Taei, S.

Taggart, D.

Takahaio, I.

Tallents, L.

Talmale, S.S.

Tanduyan, S.

Tannerfeldt, M.

Tatayah, V.

Tavares, V.

Taylor, A.

Taylor, C.

Taylor, P.

Teale, R.

Teclai, R.

Teixeira de Moura, R.

Tej Kumar Shreshtha

Tejedor, A.

Telfer, W.

Teta, P.

Thabah, A.

Thalmann, U.

Than Zaw

Thanh Hai, D.

Thapa, J.

Thompson, D.

Thompson, J.

Thomson, B.

Thouless, C.

Tikhonov, A.

Tilson, R.

Timm, R.

Ting, N.

Ting, T.

Tinnin, D.

Tizard, R.

Tokida, K.

Tooze, Z.

Torres, D.

Traeholt, C.

Traylor-Holzer, K.

Trillmich, F.

Trocchi, V.

Trujillo, F.

Truong Son, N.

Tsendjav, D.

Tsogbadrakh, M.

Tsogt, S.

Tungalagtuya, Kh.

Turvey, S.

Tutin, C.

Tuya, T.

Tyagi, P.C.

Tyson, M.

Urban, J.

Urbani, B.

Usukhjargal, D.

Valderrama, C.

Valdespino, C.

Valdez, R.

Valente, M.

Valesco, M.

Valezco, P.

Van Bressem, M.

van Daele, P.

van der Straeten, E.

Van Dyck, S.

van Gruissen, J.

van Jaarsveld, A.

van Lavieren, E.

van Manen, F.

Van Nhuan, N.

Van Rompaey, H.

Van Rompaey, J.

van Schaik, C.

Van Waerebeek, K.

van Weenen, J.

Vanitharani, J.

Varela, D.

Vargas, J.

Vaslin, M.

Vázquez, E.

Velazco, P.

Velez-Liendo, X.

Velilla, M.

Venkataraman, A.

Verheyen, W.

Vermeer, J.

Veron, G.

Vidal, O.

Viddi, F.

Vieira, E.

Vieira, M.

Vila, A.

Villalba, L.

Vivar, E.

Vizcaino, S.

Vogel, P.

Vogliotti, A.

Vohralík, V.

Volahy, A.

Vololomboahangy, R.

von Arx, M.

Voss, R.

Vu Dinh, T.

Vuthy, L.

Wacher, T.

Wade, P.

Wagner, A.

Wahl, R.

Waldemarin, H.

Walker, S.

Wallace, R.

Walsh, P.

Walston, J.

Wang, D.

Wang, J.

Wang, S.

Wang, X.

Ward, D.

Warguez, D.

Watanabe, M.

Waters, S.

Watson, A.

Watson, M.

Watts, C.

Wayne, A.

Wayne, R.

Weber, M.

Weerasinghe, A.N.

Weinberg, P.

Weksler, M.

Wells, R.

Wen, X.

Westerman, M.

Weyandt, S.

Wheeler, J.

Wheeler, P.

Whitaker Jr., J.O.

Whitehead, H.

Whittaker, D.

Wibisono, H.

Wich, S.

Widmann, I.

Widmann, P.

Wiesel, I.

Wiig, Ø.

Wijayanto, I.

Wijeyamohan, S.

Wikramanayake, E.

Wiles, G.

Wilhelmi, F.

Williams, D.

Williams, J.

Williams, R.

Williams, S.

Willig, M.

Willson, K.

Wilmé, L.

Wilmer, J.

Wilson, B.

Wilson, D.E.

Wilson, M.

Wilting, A.

Winter, J.

Woinarski, J.

Wong, G.

Wong, S.

Woodman, N.

Woodroffe, R.

Woolley, P.

Wozencraft, C.

Wright, D.

Wright, P.

Würsig, B.

Xia, W.

Xuan Canh, L.

Xuelong, J.

Yalden, D.

Yamada, F.

Yang, S.C.

Yanling, S.

Yapa, W.

Yara Ortiz, D.

Yardi, D.K.

Yeniyurt, C.

Yensen, E.

Yigit, N.

Ying, W.

Yingxiang, W.

Yohannes, H.

Yokohata, Y.

Yom-Tov, Y.

Yoneda, M.

Yongcheng, L.

Yongzu, Z.

Yonzon, P.

Yoxon, G.

Yoxon, P.

Yu, W.

Yustian, I.

Zafir, A.

Zagorodnyuk, I.

Zahler, P.

Zeballos, H.

Zeballos, N.

Zeballos, Z.

Zemanova, B.

Zerbini, A.

Zhou, K.

Ziaie, H.

Zima, J.

Zimmermann, W.

Zortea, M.

Zuercher, G.