IUCN
The World Conservation Union

The Status and Distribution of European Mammals

Compiled by Helen J. Temple and Andrew Terry

IUCN Red List of Threatened Species™ — Regional Assessment

SSC
Species Survival Commission

The Status and Distribution of European Mammals

Compiled by Helen J. Temple and Andrew Terry

IUCN Species Programme

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Foreword

Europe is a continent rich in natural and cultural heritage, with a diverse range of habitat conditions from dry Mediterranean maquis in the south to the Arctic tundra of the far north. Possibly more than anywhere else in the world we, the mammal species *Homo sapiens*, have shaped European landscapes so that now the continent is covered with a mosaic of natural and semi-natural habitats still surrounding urbanized areas. Although bringing higher diversity, this modification has obviously also placed great pressures on our wildlife and natural areas.

Numerous scientific studies show that biodiversity in Europe has been declining rapidly for some time and that this pattern has been matched by the great periods of expansion and intensification of land use. This first assessment of the Red List status of Europe's and the European Union's mammals shows us that some 15% of our species are threatened with extinction. This compares with 13% of birds, the only other vertebrate group comprehensively assessed, identified by BirdLife International as threatened. Furthermore this assessment shows that 27% of the species were identified as declining and another 33% had an unknown population trend. Unfortunately, the drivers for these declines are mostly still in place and decline of biodiversity still occurs.

Biologically speaking, mammals are our closest relatives and represent a very diverse taxonomic group. They include our charismatic species such as the brown bear and wolf that, in their need for large wild spaces, have come to represent flagships for nature conservation. But they also include some of our rarest and most secretive species including the Bavarian pine vole that was thought to be extinct until being re-discovered in Austria in 2000. This species is now restricted to just one known site. Surprisingly our continent is also home to the world's most threatened cat species, the Iberian lynx, which through the combined impacts of declines in its prey, habitat change and persecution is identified as Critically Endangered.

What can we as Europeans do about this? Recognising the threats to biodiversity, the European Community implemented the Birds and Habitats Directives, which provided the basis for both species conservation in the EU and the establishment of the Natura 2000 network. Natura 2000 sites in both the terrestrial and marine environments will certainly provide the most important refuges for species and we are developing methodologies to assist Member States to provide the connectivity that is required for species to disperse through their landscapes, to make Natura 2000 a real, functional network.

In 2001, Member States made the commitment to halt the loss of biodiversity within the EU by 2010. The results of this study indicate that without concerted and rapid action, this target is unlikely to be met. Together we need to strive to ensure that this target can be met within the EU and through this work we hope to develop a new vision for species and habitat conservation in the future.

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IUCN SSC Bear Specialist Group
IUCN SSC Bison Specialist Group
IUCN SSC Canid Specialist Group
IUCN SSC Caprinae Specialist Group
IUCN SSC Cat Specialist Group
IUCN SSC Cetacean Specialist Group
IUCN SSC Chiroptera Specialist Group
IUCN SSC Deer Specialist Group
IUCN SSC Lagomorph Specialist Group
IUCN SSC Otter Specialist Group
IUCN SSC Pinniped Specialist Group
IUCN SSC Polar Bear Specialist Group
IUCN SSC Primate Specialist Group
IUCN SSC Small Carnivore Specialist Group
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European mammal experts reviewing the species assessments at the European Mammal Assessment workshop, 18–22 May 2006, Illmitz, Austria. © *Craig Hilton-Taylor*

Executive summary

Aim

The European Mammal Assessment (EMA) is the first review of the conservation status of all wild mammals in Europe according to IUCN regional Red Listing guidelines. It identifies those species that are threatened with extinction at the regional level – in order that appropriate conservation action can be taken to improve their status.

Scope

All terrestrial and marine mammal species native to Europe or naturalized in Europe before 1500 A.D. are included. For terrestrial species, the geographical scope is continent-wide, extending from Iceland in the west to the Urals in the east, and from Franz Josef Land in the north to the Canary Islands in the south. In the southeast, where definitions of Europe are most contentious, the Caucasus region is not included. Red List assessments were made at two regional levels for terrestrial species: for geographical Europe, and for the 25 Member States of the European Union when the EMA was initiated in 2005. The marine area covered by the EMA encompasses the continental shelf seas of Europe (excluding Arctic waters), along with adjacent parts of the open seas. The whole of the Mediterranean Sea and the Black Sea is included. It corresponds to the region covered by the ACCOBAMS[1] and ASCOBANS[2] agreements plus the portion of Norway's Exclusive Economic Zone that lies south of the Arctic Circle. For marine species, a single regional assessment was made.

Status assessment

The status of all species was assessed using the IUCN Red List Criteria (IUCN 2001), which are the world's most widely accepted system for measuring relative extinction risk. All assessments followed the *Guidelines for Application of IUCN Red List Criteria at Regional Levels* (IUCN 2003). Information on each species was compiled by a small team, in collaboration with IUCN Specialist Groups and other experts. Regional assessments were carried out at an assessment workshop and through correspondence with relevant experts. More than 150 mammal experts from over 40 countries in Europe and adjacent regions actively participated in the assessment and review process. Assessments are available on the European Mammal Assessment website:
http://ec.europa.eu/environment/nature/conservation/species/ema/

Results

Nearly one in six (15%) of Europe's 231[3] mammal species are threatened, and a further 9% are close to qualifying for threatened status. By comparison, 13% of European birds are threatened (BirdLife International 2004a). No other groups have yet been comprehensively assessed at the European level using the IUCN regional Red List guidelines. A higher proportion of marine mammals are threatened than terrestrial mammals (22% of 27 species versus 14% of 204 species). Two European mammal species, the aurochs *Bos primigenius* and the Sardinian pika *Prolagus sardus* have become globally extinct since 1500 A.D., and a third species, the grey whale *Eschrichtius robustus*, is regionally extinct. More than a quarter (27%) of European mammals have declining populations. A further 32% are stable, and 33% are of unknown population trend. Only 8% of species populations are increasing. A number of these increases are due to successful species-specific conservation action.

Terrestrial mammal biodiversity is greatest in south-eastern Europe (the Balkan Peninsula, Hungary, and Romania) and in the mountainous regions of Mediterranean and temperate Europe. Habitat loss and degradation is the greatest threat to terrestrial mammals in Europe. Human disturbance, pollution, accidental mortality (e.g., secondary poisoning, vehicle collisions), overexploitation and invasive species are also important threats. The main threats to marine mammals are accidental mortality (e.g., fisheries bycatch), pollution, and overexploitation.

1 The Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area; see www.accobams.org

2 The Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas; see www.ascobans.org

3 This total does not include 27 native or naturalized species that were considered Not Applicable because they were of marginal occurrence in the study region and two species that were considered Not Applicable because they were considered to be descended from ancient domestic livestock; see Section 2.3 and Appendix 2.

Conclusions

- **Mammals in Europe require greater action to improve their status**. While many species already receive some conservation attention, others do not.
- **Species can be, and some already have been, saved from extinction**. However, this requires a combination of sound research, careful coordination of efforts, and, in some cases, intensive management.
- **EU Member States have committed to halt biodiversity loss by 2010.** Urgent action is needed to meet this target, and better monitoring capacity is required to even be able to tell if we have met this target. The European Mammal Assessment will provide a baseline against which progress can be measured, but it must be kept up-to-date, and similar initiatives are required for other taxonomic groups.
- **Considerable conservation investment is needed** from all European countries to move towards meeting the 2010 target and to ensure that the status of European mammals improves in the longer term.

The Arctic fox *Alopex lagopus* is considered to be Critically Endangered in the EU. It was originally driven close to extinction by hunting and trapping for its valuable fur. Despite over 75 years of protection, the Fennoscandian population remains at a dangerously low level. © *Vilda - Rollin Verlinde*

The European mink *Mustela lutreola* is found only in Europe, and is one of the region's most threatened species, having suffered massive population declines and range contractions. It is categorized by IUCN as Endangered at the European level and Critically Endangered within the European Union. © *Tiit Maran*

1. Background

1.1 The European context

Europe is one of the seven traditional continents of the Earth. Physically and geologically, Europe is the westernmost peninsula of Eurasia. It is bounded to the north by the Arctic Ocean, to the west by the Atlantic Ocean, to the south by the Mediterranean Sea, and to the southeast by the Black Sea and the Caucasus Mountains. In the east, Europe is separated from Asia by the Ural Mountains and by the Caspian Sea (see Figure 1, page 6).

Europe is the second-smallest continent in the world in terms of area, covering approximately 10,400,000 square kilometres (4,010,000 square miles) or 2% of the Earth's surface. The only continent smaller than Europe is Australia. In terms of human population, it is the third-largest continent (after Asia and Africa) with a population of some 710,000,000 or about 11% of the world's population. Europe is the most urbanized and, together with Asia, the most densely populated continent in the world.

The European Union, comprising 27 Member States, is Europe's largest political and economic entity by area and population; while the Russian Federation (excluding the portion in Asia), a country, is the second largest entity. The European Union has the world's largest economy with an estimated nominal GDP in 2006 of 14.2 trillion US dollars. The EU's 27 Member States stretch from the Arctic Circle in the north to the Mediterranean in the south, and from the Atlantic coast in the west to the Pannonnian steppes in the east. This area encompasses a great diversity of natural habitats and a wealth of flora and fauna, including several thousand types of habitats, 448 species of birds (in the EU 25: BirdLife International 2004b), and over 180 species of reptiles and amphibians, 150 species of fishes, 10,000 plant species and 100,000 species of invertebrates (Wieringa 1995). Yet, in comparison with other regions of the world, these numbers are relatively small.

Although improved conservation policies have been introduced in the Member States (see Sections 4.3 and 4.4), the EU's biodiversity continues to be under serious threat. Poor planning, indiscriminate land-use and intensive farming methods have resulted over the years in the deterioration, destruction and fragmentation of many natural habitats, and many species have been directly impacted by persecution and unsustainable exploitation (Wieringa 1995, European Environment Agency 2005).

1.2 European mammals: diversity and endemism

Mammals are a well-known class of vertebrates, including many familiar domesticated species and pets, as well as our own species *Homo sapiens*. All mammals are warm-blooded, and all female mammals possess mammary glands (mammae), which are used to suckle the young with milk. Mammals are further distinguished by the possession of hair or fur, although this is limited to early developmental stages in the Cetacea (whales and dolphins). The vast majority of mammals give birth to live young, the exception being the egg-laying Monotremata (a small group of mammals including the duck-billed platypus and the echidnas or spiny anteaters), which do not occur in Europe (Nowak 1999).

The mammal fauna of Europe is largely derived from the Eurasian and African biogeographic zones and therefore exhibits relatively low levels of endemism, as most species tend to have very wide ranges. Within the study region, there are 219 terrestrial mammal species, of which 59 species (26.9%) are endemic, and 41 species of marine mammal, of which none are endemic. Further details are given in Table 1. Terrestrial mammals native to Europe belong to seven taxonomic orders: Artiodactyla (even-toed ungulates), Carnivora (carnivores), Chiroptera (bats), Erinaceomorpha (hedgehogs and their relatives), Lagomorpha (rabbits, hares and pikas), Rodentia (rodents) and Soricomorpha (shrews and moles). Marine mammals native to Europe belong to two taxonomic orders, the Cetacea (whales and dolphins) and Carnivora (carnivores). European marine carnivores include the seals (Phocidae) and walrus *Odobenus rosmarus*. One species belonging to the order Primates, the Barbary macaque *Macaca sylvanus*, occurs on Gibraltar. Whilst there is good evidence that the Barbary macaque occurred in mainland Europe during the Pleistocene, it is generally believed that the Gibraltar population is the result of a relatively recent introduction (Hodges and Cortes 2006).

The majority of European terrestrial mammal species are small volant and non-volant mammals belonging to the orders Chiroptera (bats), Rodentia (rodents), and Soricomorpha (shrews and moles) (see Table 1). The largest mammal families in the region are the Cricetidae (hamsters, voles and lemmings – 40 species), Vespertilionidae (evening bats and vesper bats – 35 species) and Soricidae (shrews – 23 species). Approximately one quarter of terrestrial mammals is endemic to Europe. Endemism is particularly high in the

Table 1. Diversity and endemism in terrestrial mammal orders and families in Europe

		Europe		EU 25	
Order	Family	Number of species	Number of endemic species (% endemic)	Number of species	Number of endemic species (% endemic)
Artiodactyla	Bovidae	9	3 (33.3%)	8	2 (25.0%)
	Cervidae	6	0 (0%)	5	0 (0%)
	Suidae	1	0 (0%)	1	0 (0%)
Carnivora	Canidae	5	0 (0%)	4	0 (0%)
	Felidae	4	1 (25.0%)	3	1 (33.3%)
	Herpestidae	1	0 (0%)	1	0 (0%)
	Mustelidae	13	0 (0%)	11	0 (0%)
	Ursidae	2	0 (0%)	1	0 (0%)
	Viverridae	1	0 (0%)	1	0 (0%)
Chiroptera	Molossidae	1	0 (0%)	1	0 (0%)
	Pteropodidae	1	0 (0%)	1	0 (0%)
	Rhinolophidae	5	0 (0%)	5	0 (0%)
	Vespertilionidae	35	7 (20.0%)	35	7 (20.0%)
Erinaceomorpha	Erinaceidae	5	1 (20.0%)	4	1 (25.0%)
Lagomorpha	Leporidae	7	3 (42.9%)	7	3 (42.9%)
	Prolagidae	1	1 (100%)	1	1 (100%)
Rodentia	Castoridae	1	0 (0%)	1	0 (0%)
	Cricetidae	40	16 (40.0%)	29	8 (27.6%)
	Dipodidae	9	1 (11.1%)	2	0 (0%)
	Gliridae	5	1 (20%)	5	0 (0%)
	Hystricidae	1	0 (0%)	1	0 (0%)
	Muridae	17	4 (23.5%)	17	1 (5.9%)
	Sciuridae	11	3 (27.3%)	6	0 (0%)
	Spalacidae	7	4 (57.1%)	2	0 (0%)
Soricomorpha	Soricidae	23	9 (39.1%)	21	6 (28.6%)
	Talpidae	8	5 (62.5%)	6	3 (50%)
Total – terrestrial		**219**	**59 (26.9%)**	**179**	**33 (18.4%)**
Carnivora	Odobenidae	1	0 (0%)	1	0 (0%)
	Phocidae	7	0 (0%)	7	0 (0%)
Cetacea	Balaenidae	2	0 (0%)	2	0 (0%)
	Balaenopteridae	5	0 (0%)	5	0 (0%)
	Delphinidae	13	0 (0%)	13	0 (0%)
	Eschrichtidae	1	0 (0%)	1	0 (0%)
	Monodontidae	2	0 (0%)	2	0 (0%)
	Phocoenidae	1	0 (0%)	1	0 (0%)
	Physeteridae	3	0 (0%)	3	0 (0%)
	Ziphiidae	6	0 (0%)	6	0 (0%)
Total – marine		**41**	**0 (0%)**	**41**	**0 (0%)**
Total – terrestrial and marine		**260**		**220**	

1 This table includes species that are native or naturalized since before 1500 A.D.; species introduced after this date are not included. Species that went Extinct or Regionally Extinct after 1500 A.D. are included. Species of marginal occurrence are included, as are the agrimi *Capra hircus* and mouflon *Ovis aries* (see see Section 2.3 and Appendix 2.). For a definition of the marine and terrestrial areas considered by the European Mammal Assessment see Section 2.2.

small non-volant mammals (rodents and soricomorphs). Larger terrestrial mammals and bats tend to be more mobile and wide-ranging, and the majority of these species have ranges extending beyond Europe.

The largest marine mammal family in Europe is the Delphinidae (dolphins, killer whales, pilot whales and relatives – 15 species). Marine mammals tend to be large and highly mobile, and no marine mammal species are endemic to the European Mammal Assessment marine region (see definition in Section 2.2). Nevertheless there are a number of cetacean and pinniped subspecies that are endemic to Europe and of conservation concern, including the Black Sea subspecies of the short-beaked common dolphin *Delphinus delphis ponticus* and common bottlenose dolphin *Tursiops truncatus ponticus*, and the two freshwater lake dwelling subspecies of ringed seal *Pusa hispida saimensis* and *P.h. ladogensis*.

Although mammals are one of the better known taxonomic groups, there are still new discoveries to be made regarding mammalian diversity and endemism in Europe: two new species endemic to Mediterranean islands, the Sardinian long-eared bat *Plecotus sardus* and the Cyprus mouse *Mus cypriacus* have been described in the last five years (Mucedda *et al.* 2002, Bonhomme *et al*. 2004, Cucchi *et al*. 2006).

1.3 Species threatened status

The threatened status of plants and animals is one of the most widely used indicators for assessing the condition of ecosystems and their biodiversity. It also provides an important tool underpinning priority-setting exercises for species conservation. At the global scale the best source of information on the conservation status of plants and animals is the *IUCN Red List of Threatened Species* (see www.iucnredlist.org; IUCN 2007). The Red List provides taxonomic, conservation status, and distribution information on taxa that have been evaluated using the *IUCN Red List Categories and Criteria: Version 3.1* (IUCN 2001). This system is designed to determine the relative risk of extinction, with the main purpose of cataloguing and highlighting those taxa that are facing a higher risk of extinction (i.e., those listed as Critically Endangered, Endangered and Vulnerable). The IUCN Red List is intended to be policy-relevant, and it can be used

The Iberian lynx *Lynx pardinus* is the world's most threatened felid. It is endemic to Spain and Portugal, and is currently categorized by IUCN as Critically Endangered.
© *Programa de Conservación Ex Situ del Lince Ibérico www.lynxexsitu.es*

to inform conservation planning and priority setting processes, but it is not intended to be policy-prescriptive, and it is not in and of itself a biodiversity conservation priority-setting system.

1.4 Objectives of the assessment

The European Mammal Assessment has four main objectives:

- To assist in regional conservation planning through provision of a baseline dataset reporting the status of European mammals.
- To identify those geographic areas and habitats needing to be conserved to prevent extinctions and to ensure that European mammals achieve and maintain a favourable conservation status.
- To identify the major threats and to propose mitigating measures and conservation actions to address them.
- To strengthen the network of experts focused on mammal conservation in Europe, so that the European Mammal Assessment can be kept current, and expertise can be targeted to address the highest conservation priorities.

The assessment provides four main outputs:

- This summary report on the status of European mammals;
- A freely available database holding the baseline data for monitoring the status and distribution of European mammals;
- A website http://ec.europa.eu/environment/nature/conservation/species/ema/ showcasing this data in the form of species factsheets for all European mammals, along with background and other interpretative material;
- A booklet "Mammals in the EU", presenting the key findings of the European Mammal assessment in a format that is accessible to policymakers and the general public.

The data presented in this report and the booklet provides a snapshot based on available knowledge at the time of writing. The database will continue to be updated and made freely and widely available. IUCN will ensure wide dissemination of this data to relevant decision makers, NGOs, and scientists to inform the implementation of conservation actions on the ground.

The Mediterranean subpopulation of *Delphinus delphis* has declined by more than 50% over the last 30–45 years and is assessed as Endangered. There has been a reduction in the availability of dolphin prey in the Mediterranean through a combination of environmental changes, overfishing and habitat degradation. Competition with fisheries and bycatch directly threaten the subpopulation, while high levels of polychlorinated biphenyls (PCBs) in Mediterranean dolphins, compared to levels in dolphins from other areas, may cause immune suppression and reproductive impairment. © *Tethys - Giovanni Bearzi*

2. Assessment methodology

2.1 Global versus regional assessment

A large number of regional (i.e., sub-national, national and regional) Red Data Books and Red Data Lists have been published around the world. Europe alone is estimated to have some 3,500 different Red Data Books and Lists (Köppel *et al.* 2003). In some of these publications, the Red List assessments are based on classification systems of threat developed and adopted within the country concerned; others have used classifications based on the pre-1994 system of qualitative IUCN Red List Categories; but an ever increasing number of regional Red List assessments are based on the IUCN Red List Categories and Criteria (IUCN 1994, 2001). The IUCN Red List Categories and Criteria, however, were developed primarily for application at the global level. Hence assessments of non-endemic species at national levels based on these criteria could result in incorrect and even misleading listings (especially when linked to conservation priority setting schemes). As a result, IUCN formulated regional guidelines to guide the assessment of endemic and non-endemic species at the regional level (IUCN 2003; http://www.iucn.org/themes/ssc/redlists/regionalguidelines.htm).

The regional application guidelines are not a fixed set of rules that must be followed, but are instead a set of best-practice guidelines that indicate the preferred approaches to be followed and the issues that need to be addressed. The use of the regional guidelines helps make regional Red Lists more comparable and promotes the sharing of species information between neighbouring countries, and the better flow of information between the regional and global levels. A regional approach to identifying threatened species complements global conservation status assessments, and provides information at an appropriate scale for international conservation treaties (such as the Bern Convention) and legislation (such as the EU Habitats Directive) that have a regional focus. The information provided here will help to put national conservation priorities into an EU-wide and continental context, thus maximizing the effectiveness of local and national conservation measures, and facilitating the development of integrated regional conservation strategies.

2.2 Geographic scope

For terrestrial species, the geographical scope is continent-wide, extending from Iceland in the west to the Urals in the east (including European parts of the Russian Federation), and from Franz Josef Land in the north to the Mediterranean in the south (see Figure 1). The Canary Islands, Madeira and the Azores were also included. In the southeast, where definitions of Europe are most contentious, the Caucasus region was not included. Red List assessments were made at two regional levels for terrestrial species: for geographical Europe, and for the 25 Member States of the European Union when the European Mammal Assessment was initiated in 2005.

The marine area covered by the European Mammal Assessment is shown in Figure 1. It encompasses the continental shelf seas of Europe (excluding Arctic waters), along with adjacent parts of the open seas. The whole of the Mediterranean Sea and the Black Sea is included. The EMA marine area corresponds to the region covered by the ACCOBAMS[5] and ASCOBANS[6] agreements plus the portion of Norway's Exclusive Economic Zone that lies south of the Arctic Circle. For marine species, a single assessment was made, which applies to both geographical Europe and the EU.

2.3 Taxonomic scope

All terrestrial and marine mammal species native to Europe or naturalized in Europe before 1500 A.D. were included in the assessment. Domesticated species are not eligible for classification according to IUCN Red List Categories and Criteria, and were excluded from the assessment. Species introduced to Europe by man after 1500 A.D. were considered by the assessment, but were classed as Not Applicable. Similarly, species that are vagrant or of marginal occurrence in Europe were classed as Not Applicable. A full list of mammal species classed as Not Applicable, and the reasons for this classification, can be found in Appendix 2. The EMA uses Mammal Species of the World (Wilson and Reeder 2005) as its default taxonomy for most taxonomic groups, although it departs from this in a few justified circumstances.

5 The Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area; see www.accobams.org.
6 The Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas; see www.ascobans.org.

The first priority of the European Mammal Assessment was to assess the status of all mammal species in Europe against the IUCN Red List Criteria. However, in some cases subspecies and subpopulations were also assessed. The assessment of subspecies and subpopulations was done on an *ad hoc* basis, but primarily when participating experts indicated that there was good reason to do so. It was beyond the scope of this project to comprehensively assess all subspecies of mammals in Europe, so some subspecies of conservation concern may have been omitted. Details of subspecies and subpopulation assessments can be found on the relevant species information sheet on the IUCN European Mammal Assessment website: http://ec.europa.eu/environment/nature/conservation/species/ema/

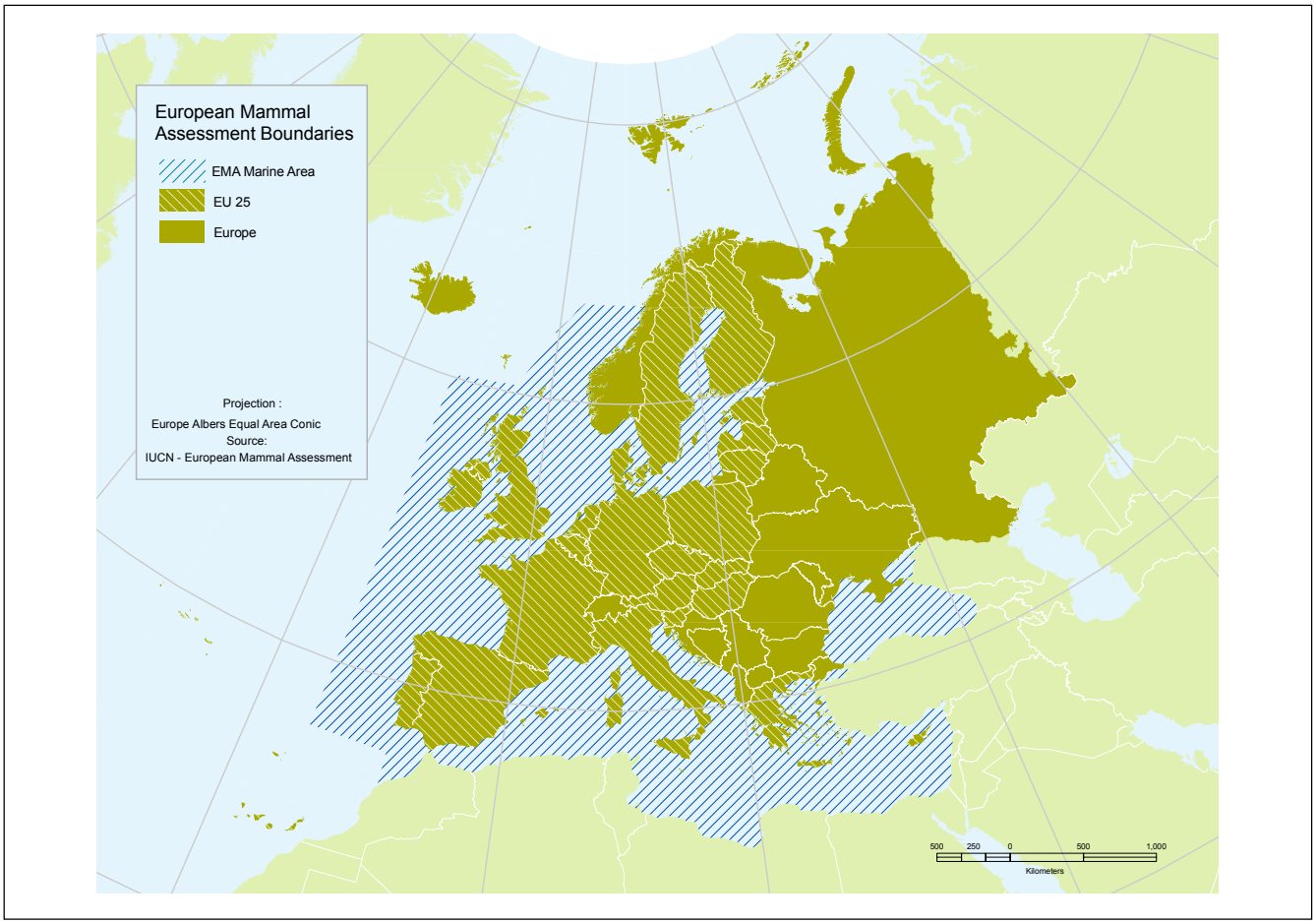
2.4 Assessment protocol

For every mammal species native to Europe or naturalized before 1500 A.D., the following data were collected.

- Species' taxonomic classification
- Geographic range (including a distribution map)
- Red List Category and Criteria
- Population information
- Habitat preferences
- Major threats
- Conservation measures
- Species utilization
- Other general information
- Key literature references.

The task of collecting the initial data was divided up geographically and taxonomically. For most terrestrial mammal species, data were initially compiled by Helen Temple, with the following main exceptions: data on mammal species whose European range is restricted to Ukraine and the Russian Federation were compiled by Katerina Tsytsulina; bat data were compiled by the IUCN SSC Chiroptera Specialist Group; and large carnivore data were compiled and reviewed by the Large Carnivore Initiative for Europe (LCIE). Preliminary data compilation

Figure 1. Regional assessments of terrestrial species were made for two areas – continental Europe and the EU 25. For marine species a single regional assessment was made



for cetaceans was carried out by Justin Cooke, Tom Jefferson, and Bill Perrin. Pinniped data were initially compiled by Tom Jefferson and Marc Webber. All data collected were entered into the IUCN SSC Species Information Service Data Entry Module (SIS DEM).

All the species had their status assessed according to the 2001 IUCN Red List Categories and Criteria: Version 3.1 (http://www.iucnredlist.org/info/categories_criteria2001) and the Guidelines for Application of IUCN Red List Criteria at Regional Levels: Version 3.0 (http://www.iucn.org/themes/ssc/redlists/regionalguidelines.htm).

2.5 Evaluation of the assessments

For most terrestrial species the preliminary data were reviewed and draft Red List assessments made at the European Mammal Assessment workshop, held on the 18–22 May 2006 at the Neusiedler-See National Park in Illmitz, Austria. Completed assessments subsequently went through two rounds of review by a larger number of experts. Cetacean assessments were carried out in conjunction with the Global Mammal Assessment (GMA) Cetacean Red Listing workshop held in La Jolla, California, on 22–26 January 2007. A small number of species were assessed by correspondence with appropriate experts. In all, more than 150 mammal experts from at least 40 different countries contributed to the assessment; a full list of participants can be found in the Acknowledgements.

Staff from the IUCN Red List Unit and Global Mammal Assessment evaluated the assessments to check they complied with the guidelines for application of the IUCN Red List Categories and Criteria and included the most up-to-date, comprehensive information. The resulting assessments are a product of scientific consensus concerning species status and are backed by relevant literature and data sources.

The lesser horseshoe bat *Rhinolophus hipposideros* is widespread in Europe, but has undergone substantial range reductions over the past 50 years as a result of habitat loss and disturbance and destruction of roost sites. It is classed as Near Threatened at both the European and EU 25 levels. © *Vilda - Rollin Verlinde*

3. Results

3.1 Threatened status of mammals

A primary goal of the European Mammal Assessment was to assess the status of European mammals with respect to the 2001 IUCN Red List Categories and Criteria (http://www.iucnredlist.org/info/categories_criteria2001) and the IUCN Guidelines for the Application of Red List Criteria at Regional levels http://www.iucn.org/themes/ssc/redlists/regionalguidelines.htm. These categories provide an explicit framework for determining a species' conservation status, with an emphasis on identifying those at highest risk of extinction. In this context, the term "threatened" refers to those species classified under the Red List Categories Vulnerable, Endangered or Critically Endangered.

The EMA assessed the status of terrestrial species at two regional levels: geographical Europe, and the EU 25. Marine species were assessed at one regional level (see Figure 1), so the European and EU 25 Red List status is the same for any given species. At the European regional level, 14.2% of terrestrial mammals are threatened, with 1.5% Critically Endangered, 3.4% Endangered, and 9.3% Vulnerable. A further 3.4% were classed as Data Deficient. Within the EU 25, the pattern is similar, with 14.4% of terrestrial mammals threatened, although a higher proportion of species are Critically Endangered (2.4%) (see Table 2 and Figures 2 and 3). A higher proportion of marine species were assessed as threatened: 22.2% in total, evenly split between the threatened categories with 7.4% Critically Endangered, 7.4% Endangered and 7.4% Vulnerable (see Figure 4). The true proportion of threatened species may be even higher, as a large proportion of marine mammals (44.4%) were assessed as Data Deficient.

Overall, considering both terrestrial and marine species at the European regional level, 15.2% of species are threatened. A further 9.1% are considered Near Threatened, and 1.3% are already regionally or globally Extinct. By comparison, 13% of European birds are threatened (BirdLife International 2004a). No other groups have yet been comprehensively assessed at the European level according to IUCN regional Red List guidelines. Species classed as threatened (Critically Endangered, Endangered and Vulnerable) at the European and EU 25 level are listed in Table 3.

A further 51 species were classed as Not Applicable (22 were introduced after 1500 A.D., 27 are of marginal occurrence in the European region, and two are feral descendants of ancient domesticated animals, see Appendix 2).

Table 2. Summary of numbers of species within each category of threat

	IUCN Red List categories	No. species (Europe terrestrial)	No. species (EU 25 terrestrial)	No. species (marine)	(Europe terrestrial and marine)
	Extinct (EX)	2	2	0	2
	Extinct in the Wild (EW)	0	0	0	0
	Regionally Extinct (RE)	0	0	1	1
Threatened categories	Critically Endangered (CR)	3	4	2	5
	Endangered (EN)	7	5	2	9
	Vulnerable (VU)	19	15	2	21
	Near Threatened (NT)	20	19	1	21
	Least Concern (LC)	146	113	7	153
	Data Deficient (DD)	7	9	12	19
	Total number of species assessed*	204	167	27	231
	Total number of extant species*	202	165	26	228

* Excluding species that are considered Not Applicable.

Figure 2. Red List status of terrestrial mammals in Europe

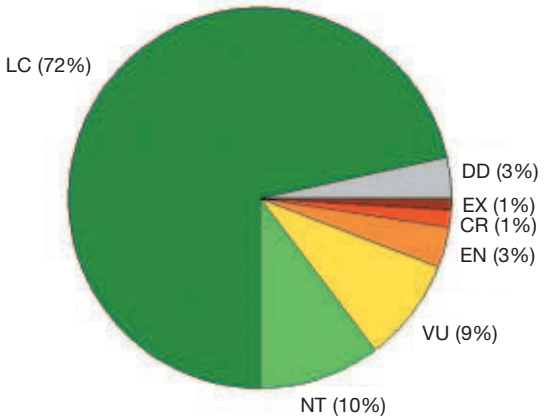
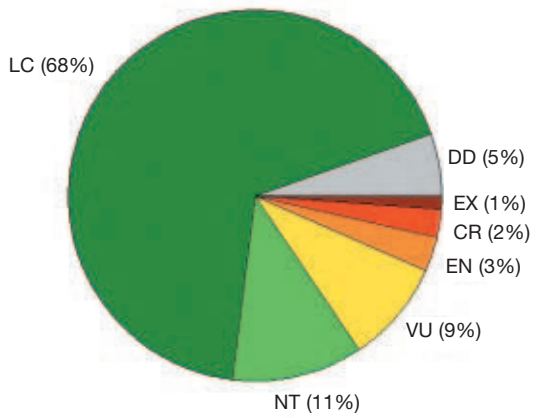


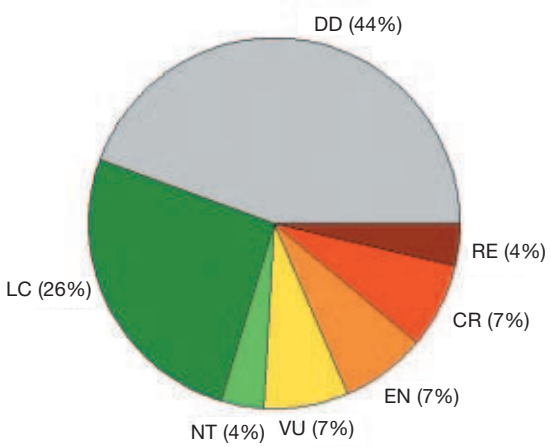
Figure 3. Red List status of terrestrial mammals in the EU 25



3.2 Status by taxonomic group

Terrestrial mammals native to Europe belong to eight major groups, or taxonomic orders: Artiodactyla (even-toed ungulates), Carnivora (carnivores), Cetacea (whales, dolphins and porpoises), Chiroptera (bats), Erinaceomorpha (hedgehogs and their relatives), Lagomorpha (rabbits, hares and pikas), Rodentia (rodents) and Soricomorpha (shrews and moles). Considerable differences exist among these groups in both species numbers as well as threatened status (see Table 4). Rodents, bats, and soricomorphs (shrews and moles) constitute the majority of European mammals. Carnivores, ungulates, bats and lagomorphs (rabbits and hares) are particularly threatened.

Figure 4. Red List status of marine mammals in Europe and the EU 25



3.3 Extinctions

Two European terrestrial mammal species (1.0% of the total number assessed) are known to have gone extinct since 1500 A.D. These two species are the aurochs *Bos primigenius* and the Sardinian pika *Prolagus sardus*. The aurochs was Extinct in the Wild, except in Jaktorowka Forest, Masovia, Poland, by the start of the 15th century. The last wild individual is reputed to have died in 1627. The aurochs is the ancestor of domestic cattle (Vuure 2005). The Sardinian pika was a pika native to the Mediterranean islands of Sardinia and Corsica until its extinction, which probably occurred in the late 1700s or early 1800s (Nowak 1999).

One marine mammal, the grey whale *Eschrichtius robustus*, is Regionally Extinct. It formerly occurred in the North Atlantic and adjacent waters, but was extirpated by hunting. Sub-fossil remains, the most recent dated at around 1675 A.D., have been found on the eastern seaboard of North America from Florida to new Jersey,

The grey whale *Eschrichtius robustus* is extinct in the North Atlantic. This photograph is of a grey whale from the Critically Endangered Northwest Pacific subpopulation. © *David W. Weller*

Table 3. The threatened species at the European and EU 25 level*

Order	Genus	Species	Common Name	Red List status	
				Europe	EU 25
ARTIODACTYLA	*Saiga*	*tatarica*	Saiga	CR	NE
CARNIVORA	*Lynx*	*pardinus*	Iberian lynx	CR	CR
CARNIVORA	*Monachus*	*monachus*	Mediterranean monk seal	CR	CR
CETACEA	*Eubalaena*	*glacialis*	North Atlantic right whale	CR	CR
RODENTIA	*Microtus*	*bavaricus*	Bavarian pine vole	CR	CR
CARNIVORA	*Mustela*	*lutreola*	European mink	EN	CR
CETACEA	*Balaenoptera*	*borealis*	Sei whale	EN	EN
CETACEA	*Balaenoptera*	*musculus*	Blue whale	EN	EN
CHIROPTERA	*Nyctalus*	*azoreum*	Azores noctule	EN	EN
CHIROPTERA	*Pipistrellus*	*maderensis*	Madeira pipistrelle	EN	EN
CHIROPTERA	*Plecotus*	*teneriffae*	Canary long-eared bat	EN	EN
RODENTIA	*Myomimus*	*roachi*	Roach's mouse-tailed dormouse	EN	DD
RODENTIA	*Spalax*	*arenarius*	Sandy mole rat	EN	NE
SORICOMORPHA	*Crocidura*	*canariensis*	Canary shrew	EN	EN
ARTIODACTYLA	*Bison*	*bonasus*	European bison	VU	VU
CARNIVORA	*Gulo*	*gulo*	Wolverine	VU	VU
CARNIVORA	*Ursus*	*maritimus*	Polar bear	VU	NE
CARNIVORA	*Vormela*	*peregusna*	Marbled polecat	VU	NA
CETACEA	*Phocoena*	*phocoena*	Harbour porpoise	VU	VU
CETACEA	*Physeter*	*catodon*	Sperm whale	VU	VU
CHIROPTERA	*Barbastella*	*barbastellus*	Western barbastelle	VU	VU
CHIROPTERA	*Myotis*	*bechsteinii*	Bechstein's myotis	VU	VU
CHIROPTERA	*Myotis*	*capaccinii*	Long-fingered bat	VU	VU
CHIROPTERA	*Plecotus*	*sardus*	Sardinian long-eared bat	VU	VU
CHIROPTERA	*Rhinolophus*	*blasii*	Blasius' horseshoe bat	VU	DD
CHIROPTERA	*Rhinolophus*	*euryale*	Mediterranean horseshoe bat	VU	VU
CHIROPTERA	*Rhinolophus*	*mehelyi*	Mehely's horseshoe bat	VU	VU
LAGOMORPHA	*Lepus*	*castroviejoi*	Broom hare	VU	VU
LAGOMORPHA	*Lepus*	*corsicanus*	Corsican hare	VU	VU
RODENTIA	*Microtus*	*cabrerae*	Cabrera's vole	VU	VU
RODENTIA	*Spalax*	*giganteus*	Giant mole rat	VU	NE
RODENTIA	*Spalax*	*zemni*	Podolsk mole rat	VU	NE
RODENTIA	*Spermophilus*	*citellus*	European souslik	VU	VU
SORICOMORPHA	*Crocidura*	*zimmermanni*	Cretan white-toothed shrew	VU	VU
SORICOMORPHA	*Desmana*	*moschata*	Russian desman	VU	NE
CHIROPTERA	*Plecotus*	*macrobullaris*	Mountain long-eared bat	NT	VU
RODENTIA	*Sicista*	*subtilis*	Severtzov's birch mouse	NT	VU
CARNIVORA	*Alopex*	*lagopus*	Arctic fox	LC	CR
CARNIVORA	*Mustela*	*eversmanii*	Steppe polecat	LC	EN

* Species listed as NA (Not Applicable) in the EU 25 are of marginal occurrence, and species listed as NE (Not Evaluated) do not occur in the region.

Table 4. Red List Status (European Regional level) by Taxonomic Order

Order	Total*	EX	EW	RE	CR	EN	VU	NT	LC	DD	% Threatened or Extinct
Artiodactyla	14	1	0	0	1	0	1	0	11	0	21.4%
Carnivora	27	0	0	0	2	1	3	1	20	0	22.2%
Cetacea	23	0	0	1	1	2	2	1	4	12	21.7%
Chiroptera	40	0	0	0	0	3	7	8	20	2	25.0%
Erinaceomorpha	4	0	0	0	0	0	0	0	4	0	0%
Lagomorpha	8	1	0	0	0	0	2	1	4	0	37.5%
Rodentia	85	0	0	0	1	2	4	8	69	1	8.2%
Soricomorpha	30	0	0	0	0	1	2	2	21	4	10%
Total	**231**	**2**	**0**	**1**	**5**	**9**	**21**	**21**	**153**	**19**	**16.5%**

* Does not include species classed as Not Applicable (NA).

and on the coasts of the English Channel and the North and Baltic seas. There are historical accounts of living grey whales from Iceland in the early 1600s and possibly off New England in the early 1700s (Rice 1998). The species now survives only in the North Pacific and adjacent waters.

3.4 Spatial distribution of species

3.4.1 Species richness

Information on the species richness of mammals within orders and families has already been given in Section 1.2 and Table 1. The geographic distribution of mammal species richness in Europe is presented in Figure 5. The mountainous regions of temperate and Mediterranean Europe (including the Cantabrian mountains, Pyrenees, Massif Central, Alps, Apennines, Carpathians, and the mountains of the Balkan peninsula) clearly stand out as areas of high species richness. The whole Balkan peninsula emerges as a hotspot of mammalian diversity, highlighting the importance of the new Member States Bulgaria and Romania for biodiversity conservation in the EU. There is a marked latitudinal gradient in species richness, with southern Europe (especially south-eastern Europe) containing a greater diversity of mammal species than the north. In the marine realm, species richness is higher in the open Atlantic ocean than it is in the enclosed Baltic, Mediterranean and Black Seas.

Looking at mammalian diversity from a country perspective, the top five EU countries in terms of species richness are (in descending order): France, Spain, Italy, Germany and Greece (see Table 5).

3.4.2 Threatened species richness

A map showing the distribution of threatened mammals in Europe (Figure 6) reveals somewhat different patterns from depictions of overall species diversity. The greatest concentration of threatened species is found in the Balkan Peninsula, especially Bulgaria. This again illustrates the importance of the Balkan region for mammal conservation in Europe. The Mediterranean islands of Corsica and Sardinia are also highlighted as having a high number of threatened mammal species, as well as parts of Iberia, the Pyrenees, and the Apennines. The distribution of threatened marine mammals correlates with overall marine mammal species richness – there is a higher number of threatened species in the Atlantic than in the Mediterranean, Black and Baltic Seas.

3.4.3 Endemic species richness

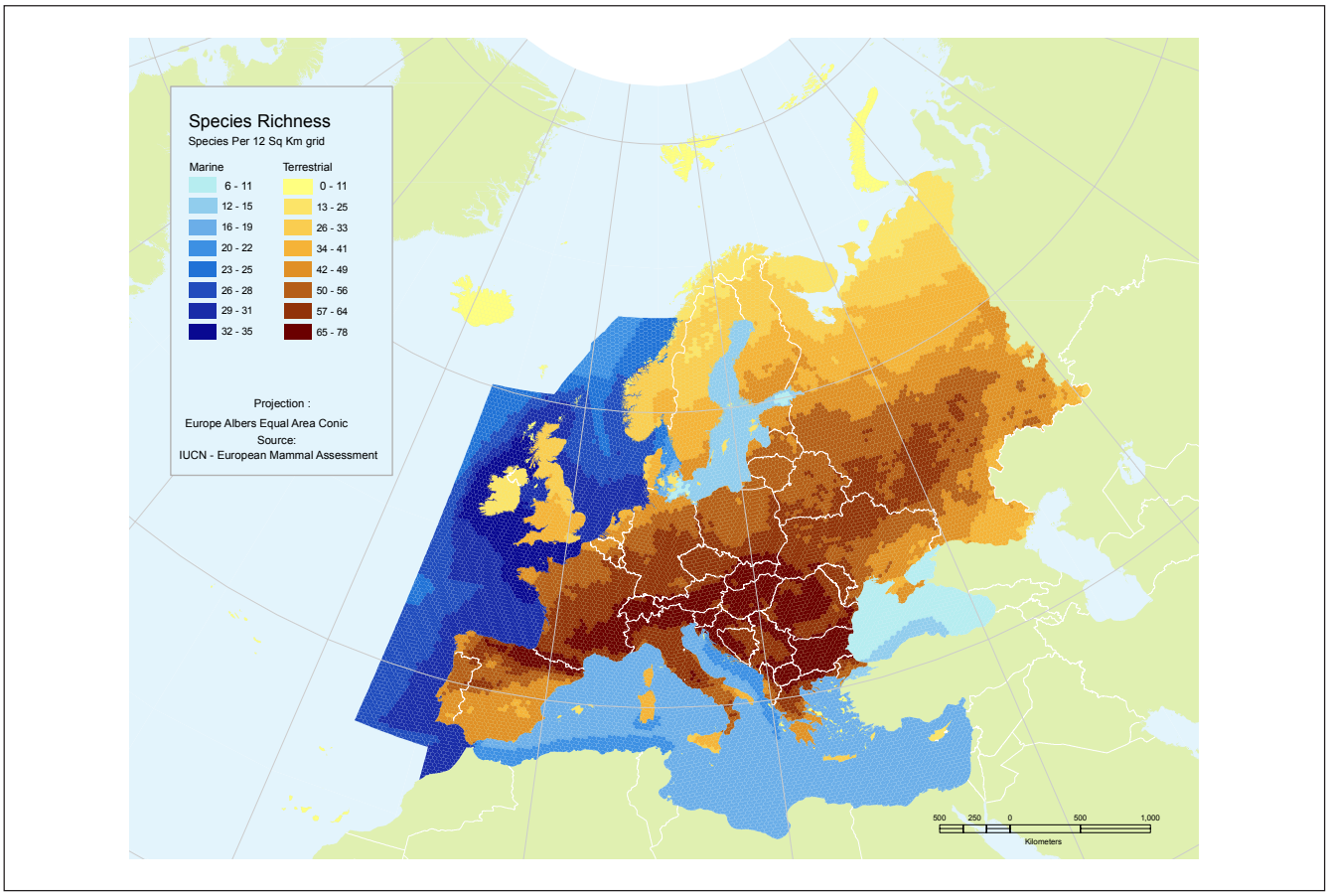
Figure 7 shows the distribution of endemic mammal species (e.g., those that are unique to Europe and are found nowhere else in the world). Endemism is particularly high in a number of mountainous regions including the Pyrenees, the Cantabrian mountains, the Alps, and the Apennines. The Italian and Iberian peninsulas also hold important concentrations of endemic mammal species. There are no marine species endemic to the EMA marine area.

3.5 Major threats to terrestrial mammals in Europe

The major threats to each species were coded using the IUCN Major Threats Authority File. A summary of the relative importance of the different threatening processes is shown in Figure 8.

Habitat loss and degradation have by far the largest impact on both threatened and non-threatened species, affecting 27 of the 29 threatened species, and 94 species in total. The number of species impacted by habitat loss and degradation is nearly three times greater than the next most common threat, pollution (including global climate change, see Box 1). Human disturbance, accidental

Figure 5. Species richness of European mammals



The Bavarian pine vole *Microtus bavaricus* is endemic to a small area in the Tyrolean Alps of Austria. It was formerly also found in the Bavarian Alps of Germany, but is now extinct there. It is currently categorized by IUCN as Critically Endangered. © *Edmund Weiss*

Figure 6. Distribution of threatened mammals in Europe

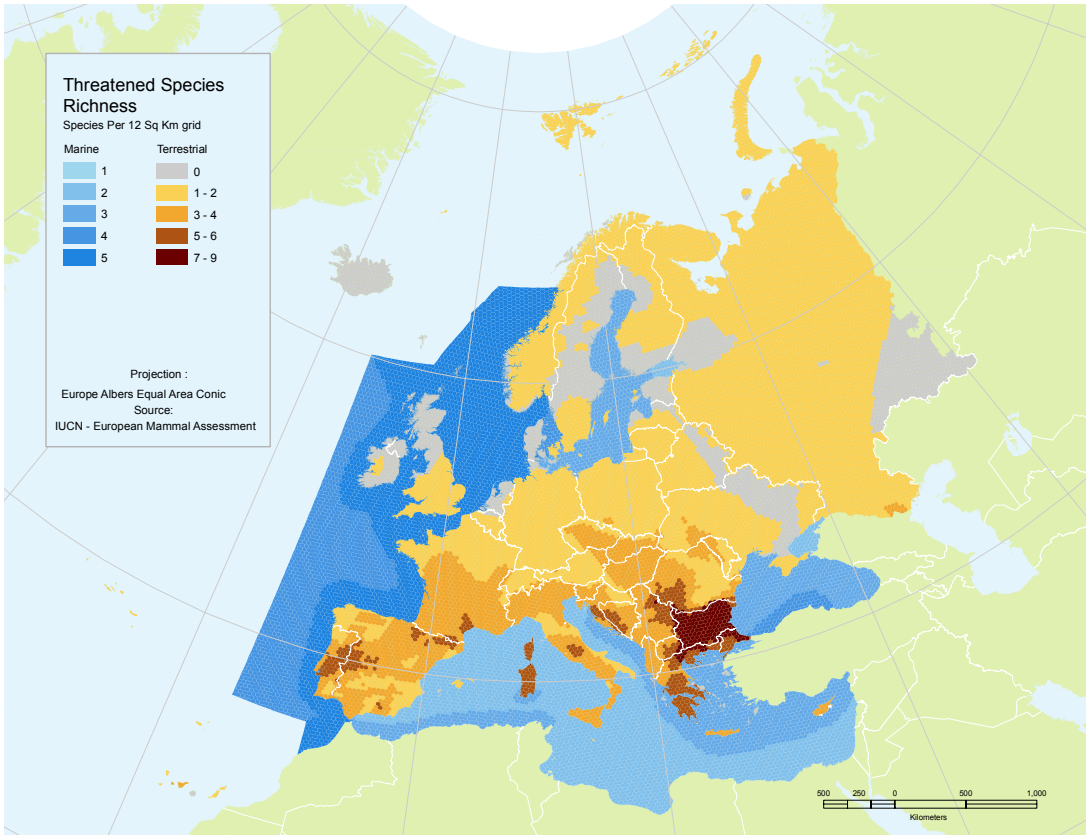


Figure 7. Endemic species richness

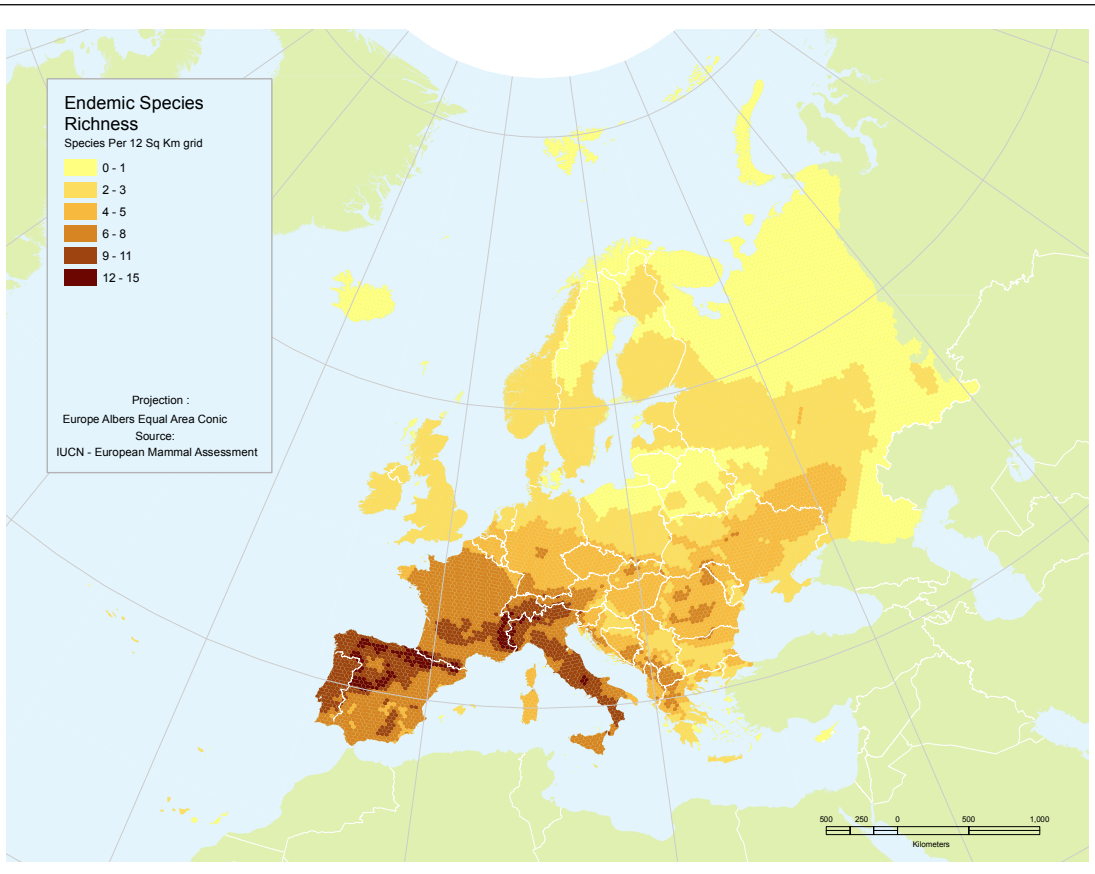


Table 5. Number of mammal species in the 27 current EU member states (excluding species introduced since 1500 A.D.)

Country	Total number of species (terrestrial and marine)
Austria	100
Belgium	79
Bulgaria	101
Cyprus	33
Czech Republic	82
Denmark	74
Estonia	63
Finland	69
France	142
Germany	117
Greece	106
Hungary	82
Ireland	60
Italy	123
Latvia	63
Lithuania	66
Luxembourg	55
Malta	26
Netherlands	88
Poland	99
Portugal	104
Romania	101
Slovakia	87
Slovenia	97
Spain	128
Sweden	81
United Kingdom	90

mortality (e.g., bycatch or vehicle collisions), invasive alien species and overharvesting were also identified as significant threats.

Information has not been collected during the EMA on the relative importance of one threat compared to another for a particular species. Development of such information in the future is a priority for the assessment and will enable a more complete analysis of significant threats to mammals.

3.6 Major threats to marine mammals in Europe

The two most frequently recorded major threats to marine species were accidental mortality (e.g., entanglement in fishing gear and ship strikes) and pollution (see Figure 9). These threats are particularly severe in the enclosed seas of the continent such as the Mediterranean, the Black Sea, and the Baltic. Although harvesting (e.g., overexploitation through unregulated commercial whaling) only ranked third overall when looking at both threatened and non-threatened species, it was shown to be a highly significant threat to threatened species. All Vulnerable, Endangered, Critically Endangered, and Regionally Extinct species had harvesting listed as a major threat. For a number of these species, historic overexploitation is the main reason why they are currently listed as threatened; some species have failed to recover even though their harvest has now ceased.

Figure 8. Major Threats to Terrestrial Mammals in Europe

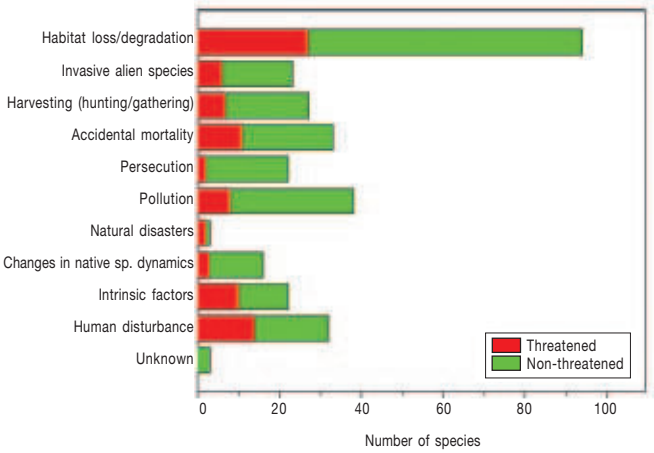
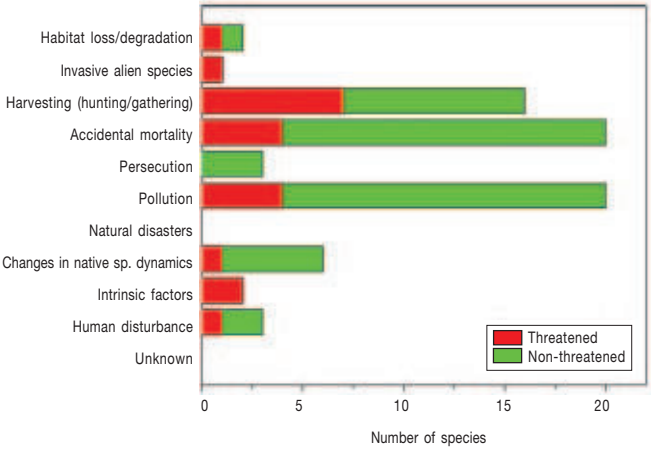


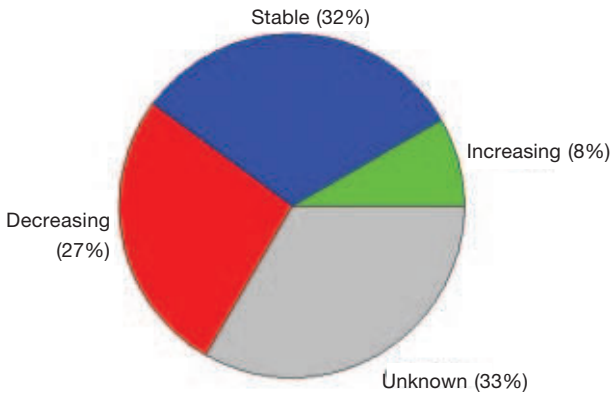
Figure 9. Major Threats to Marine Mammals in Europe



3.7 Demographic trends

Documenting population trends is a key to assessing species status, and a special effort was made to determine which species are declining, stable, or increasing. More than a quarter (27%) of European mammals are declining in population. A further 32% are stable, and only 8% are increasing (see Figure 10). A number of these increases are due to successful species-based conservation action. Because trend information is not available for 33% of species, however, the percentage of species in decline may actually be considerably higher.

Figure 10. Population trends of European mammals



The lesser white-toothed shrew *Crocidura suaveolens* is widespread and abundant in Europe. It is currently classed by IUCN as Least Concern. © *Vilda - Rollin Verlinde*

Box 1. The polar bear – a symbol of climate change

Polar bears are set to become one of the most notable casualties of global warming. The impact of climate change is increasingly felt in polar regions, where summer sea ice is expected to decrease by 50–100% over the next 50–100 years. In other words, within the next century the polar ice cap may completely disappear during the summer. Already, record losses of the ice cap have been observed: NASA data shows that Arctic perennial sea ice, which normally survives the summer melt season and remains year-round, shrunk abruptly by 14% between 2004 and 2005. According to researchers, the loss of perennial ice in the East Arctic Ocean (above Europe and Asia) neared 50% during that time. Dependent upon Arctic ice-floes for hunting seals and highly specialized for life in the Arctic marine environment, polar bears are predicted to suffer a population decline greater than 30% in the next 45 years. Because polar bears feed almost exclusively on ice-associated seals, changes in the sea ice that affect access to prey will have a negative effect on the bears. With less food, polar bears will fail to reproduce more often and give birth to smaller young that have higher mortality rates.

Polar bear *Ursus maritimus* © *Robert and Carolyn Buchanan*

Polar bears are totally reliant on the sea ice as their primary habitat. If climate change alters the period of ice cover, bears may be driven on shore for extended periods and forced to rely on stored fat. If these periods become excessively long, mortality will increase. Further, as ice melts and the distance between floes increases, leaving more open water, young cubs which are unable to swim long distances may suffer greater mortality. In the last few years scientists have seen the first evidence of polar bears drowning, and in the same period surveys have shown a marked increase in the number of polar bears that are seen swimming in the open sea as opposed to near the ice shelf. Sea ice is also used for access to den areas and if ice patterns change, existing den areas may be unreachable. Another factor is that in some areas, warmer temperatures and higher winds may reduce ice thickness and increase ice drift. Because polar bears must walk against the moving ice (like walking the wrong way on an escalator) increased ice movements will increase energy use and reduce growth and reproduction. Another problem is unusual warm spells during the period that females are on land in dens. If severe rain events occur during the den period, it is possible that snow banks slump and can kill mothers and their cubs. Such an event was observed in northern Canada and unusual rain events have been noted in western Hudson Bay and Svalbard with unknown consequences.

Previously listed by IUCN as a conservation dependent species, the polar bear moves into the threatened categories and has been classified as Vulnerable at both the global and European regional level. Polar bears are a keystone species in ice-covered Arctic marine ecosystems and alterations to the distribution, density or abundance of this top predator will likely have impacts throughout the arctic ecosystem.

4. Discussion

4.1 Status and population trends of European mammals

The EMA assessed the status of terrestrial species at two regional levels: geographical Europe, and the EU 25. Marine species were assessed at one regional level (see Section 2.2 and Figure 1), so the European and EU 25 Red List status is the same for any given species. Patterns of terrestrial species status were similar at the European and EU 25 level, although there were some interesting differences. At the European regional level, 14.2% of terrestrial mammals are threatened, with 1.5% Critically Endangered, 3.4% Endangered, and 9.3% Vulnerable. A further 3.4% were classed as Data Deficient. Within the EU 25, the pattern is similar, with 14.4% of terrestrial mammals threatened, although a higher proportion of species are Critically Endangered (2.4%). Proportions of Endangered and Vulnerable species were similar but slightly lower to those found at the European level, at 3.0% and 9.0% respectively (see Table 2 and Figures 2 and 3). Two terrestrial mammal species qualified as Critically Endangered at the EU 25 level, although they were considered less threatened at the European regional level. These were the European mink *Mustela lutreola* (considered CR in the EU 25 but EN in Europe) and the Arctic fox *Alopex lagopus* (considered CR in the EU 25 but LC in Europe). The European mink qualified as threatened at both levels because of very rapid population declines throughout its range; better information from the eastern part of its range might result in a future uplisting to Critically Endangered at the European regional level too. By contrast, the Arctic fox has a tiny and severely threatened population in the European Union (Sweden and Finland), but is not considered threatened at the European regional level because of the presence of large populations in the Russian Federation that are not believed to be declining at a rate approaching the IUCN Red List thresholds.

Birds are the only other taxonomic group that has been subject to a status assessment at both the European and the EU 25 level. A higher proportion of bird species have Unfavourable conservation status at the EU 25 level than at the pan-European level (BirdLife International 2004b, see Section 4.7 for a discussion of the important differences between Unfavourable conservation status *sensu* the EU Habitats Directive and threatened status *sensu* IUCN Red List Criteria). Almost half (48%) of the EU 25's 448 species were assessed as having Unfavourable conservation status, whereas only 43% of 524 European species had Unfavourable conservation status (BirdLife International 2004b).

Marine mammals showed a notably high proportion of Data Deficient species. This was driven in part by the inclusion in the assessment of six species of the family Ziphiidae (beaked whales). These rarely-recorded and inconspicuous deepwater species are the most poorly known of cetaceans; they tend to remain well out to sea, avoid ships, and dive to great depths and are consequently often missed in surveys (Barlow 1999, Nowak 1999). All six of these species were classed as Data Deficient.

The European Mammal Assessment showed that more than a quarter (27%) of European mammals have declining populations. A further 32% are stable, and 33% are of unknown population trend. Only 8% of species populations are increasing. These results are approximately comparable with population trends recorded for birds in Europe: from 1990 to 2000, 23% of European bird species showed population declines, 51% were stable, 9% were increasing and 17% were of unknown population trend (BirdLife 2004a). The status assessment of European bird species benefited from quantitative population trend data from a well established monitoring network covering the majority of species and countries in Europe. By contrast, comprehensive and reliable population trend data are available for very few mammal species. The population trend analysis in this report is based in many cases on survey data from a small and potentially non-representative part of the species' range, or on a subjective assessment of population trend based on known threats. A challenge for the future is to strengthen capacity for monitoring mammal populations in Europe, especially those of threatened, Near Threatened and Data Deficient species.

4.2 Protection of habitats and species in Europe

At the international level, European countries and the EU have signed up to a number of important conventions aimed at conserving biodiversity that have particular relevance for mammals, including the 1979 Bern Convention on the Conservation of European Wildlife and Natural Habitats, the 1979 Bonn Convention on Migratory Species, the 1991 Convention on the Protection of the Alps and, most importantly, the 1992 Rio Convention which enshrines the principle of sustainable development.

The Bern Convention supports the conservation and sustainable use of European species and habitats. The Convention is a binding legal treaty covering all European countries and some African states. Considerable work has been undertaken within the Convention for the protection of mammal species, especially large carnivores. Apart from numerous workshops and seminars, the Convention has adopted recommendations and developed Action Plans for certain species (e.g., all large carnivores, European bison, several bat species etc.) and also established the Large Carnivores Initiative for Europe (LCIE) as an expert body, now incorporated as a working group of the IUCN Species Survival Commission (see Box 2).

Under the framework of the Convention on Migratory Species (CMS), there are three key regional agreements for mammals:

- Conservation of populations of European Bats (EUROBATS)
- Cetaceans of the Mediterranean Sea, Black Sea and Contiguous Atlantic Area (ACCOBAMS)
- Small Cetaceans of the Baltic and North Seas (ASCOBANS)
- Seals in the Wadden Sea.

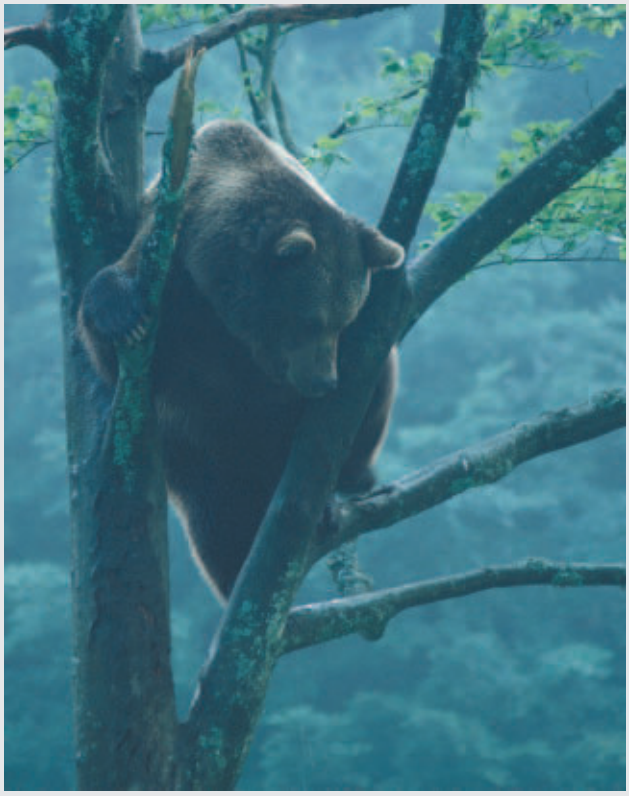
An important commitment made by European countries and the EU was to halt the loss of biodiversity within Europe by 2010. This means that population declines should be stopped and ideally reversed. This assessment has shown that a large number of species show a long term decline with a proportion of threatened species that matches levels identified for European birds (BirdLife International 2004a). Reversing this trend before 2010 will be extremely difficult and requires considerable conservation investment from all European countries.

The Alpine ibex *Capra ibex* came close to extinction at the beginning of the 19th century, when overexploitation reduced the population to about 100 individuals restricted to Italy's Gran Paradiso massif. However, as a result of intensive conservation management (including reintroductions and introductions, hunting restrictions, and the establishment of protected areas) the species is now recovering, and has an expanding population of over 30,000 individuals. It is classed as Least Concern in Europe and the EU. © *Vilda - Rollin Verlinde*

The garden dormouse *Eliomys quercinus* is endemic to Europe, and is classed by IUCN as Near Threatened. This species has declined more than almost any other rodent in Europe, and may have disappeared from as much as 50% of its former range during the last 30 years. © *Vilda - Rollin Verlinde*

Box 2. Population Level Management Plans for Large Carnivores in Europe

Continental Europe is home to five species of large carnivore – the wolf *Canis lupus*, the wolverine *Gulo gulo*, the brown bear *Ursus arctos*, the Eurasian lynx *Lynx lynx* and the Iberian lynx *Lynx pardinus*. Conserving these animals is a significant challenge in landscapes which are as densely populated and heavily modified as those found in much of Europe. The main conservation challenges stem from the most fundamental characteristic of these species: as top predators they require a lot of space. Home range sizes of individual large carnivores in Europe tend to vary between 100 and 1,000 km^2 (Herfindal *et al*. 2005, Nilsen *et al*. 2005), and dispersing juveniles may travel hundreds of kilometres. Large carnivores never reach very high densities – figures of 0.1 to 3 individuals per 100 km^2 are typical – and consequently very few European protected areas are large enough to embrace the home ranges of more than a few individuals (Linnell *et al*. 2001). Successful conservation depends upon the continued presence of these species not only in protected areas, but also in the matrix of habitat that surrounds these protected areas and constitutes the majority of the European landscape. However, the presence of large carnivores in these multi-use landscapes leads to a number of conflicts with human interests (Thirgood *et al*. 2005, Woodroffe *et al*. 2005). A further consequence of their low densities and wide ranging behaviour is that very few administrative units are large enough to contain a viable population of any large carnivore species on their own. It is therefore vital that conservation planning for large carnivores occurs in a coordinated and cooperative manner between all the administrative units (protected areas, municipalities, counties, states, countries, and even super-national entities like the European Union) that share populations. A first step towards a coordinated management strategy for large carnivores in Europe occurred in 1999 when the Bern Convention endorsed a series of action plans for bears, wolves, Eurasian lynx and wolverines (Boitani 2000, Breitenmoser *et al*. 2000, Landa *et al*. 2000, Swenson *et al*. 2000) produced by the Large Carnivore Initiative for Europe (www.lcie.org). A second step was made in 2005, when the European Commission launched a call for tenders (ENV.B.2/SER/2005/0085r) for the development of "Guidelines for population level management plans for large carnivores in Europe". The Iberian lynx was not covered in either of these initiatives, because its distribution is very limited and the conservation issues differ greatly from the other four species. The contract was won by the Istituto di Ecologia Applicata (Italy) in cooperation with the Norwegian Institute for Nature Research (Norway), Callisto (Greece) and KORA (Switzerland). These institutions are working together with a wide range of experts from across Europe, including many members of the IUCN SSC Large Carnivore Initiative for Europe Working Group and the IUCN SSC Wolf, Bear and Cat Specialist Groups to develop a large carnivore management strategy that will be integrated into the Habitats Directive and will fulfill two fundamental requirements. The first is that the unit for conservation planning should not be just the portion of a population that falls within a given state or country's boundaries. Rather it should be the entire biological unit, involving all administrative units within its distribution. The second is that large carnivore conservation requires their integration with human activities in human-dominated landscapes. Coexistence between large carnivores and humans is not always easy to achieve, and almost always requires active management (such as reintroduction, translocation, hunting, lethal control) and coordinated planning with conflicting land-uses and activities. The need for (and the acceptance of) different management options varies greatly throughout Europe (Boitani 2003), necessitating a conservation system which is both coordinated and flexible – to permit local adaptation of the means needed to achieve a global vision.



Brown bear *Ursus arctos*. © *Vilda - Rollin Verlinde*

4.3 Protection of habitats and species in the EU

EU nature conservation policy is based on two main pieces of legislation – the Birds Directive[7] and the Habitats Directive[8] – and until 2006 benefited from a specific financial instrument – the LIFE-Nature fund (see Section 4.4). The main aim of this nature conservation policy is to ensure the favourable conservation status (see Box 3) of the habitats and species found in the EU. One of the main tools to enhance and maintain this status is the Natura 2000 network of protected areas. EU nature conservation policy also foresees the integration of its protection requirements into other EU sectoral policies such as agriculture, regional development and transport. The Habitats Directive, which aims to protect other wildlife species and habitats, applies to both terrestrial and marine regions. Each Member State is required to identify sites of European importance and encouraged to put in place a special management plan to protect them, combining long-term conservation with economic and social activities as part of a sustainable development strategy. These sites, together with those of the Birds Directive, make up the Natura 2000 network – the cornerstone of EU nature protection policy. The Natura 2000 network comprises 20,862 sites under the Habitats Directive (December 2006), which includes 1,248 marine sites and covers 12% of the EU's surface area and 4,617 sites under the Birds Directive including 484 marine sites or 10% of the EU's surface area. The Habitats Directive contains a series of Annexes that mostly identify habitats and species of European Community concern. Member States are required to designate Natura 2000 sites for the species listed on Annex II and Annex IV species are subject to a strict protection system. Table 6 shows those mammals identified as threatened by the assessment and their inclusion in the protected species Annexes of the Habitats Directive and Appendices of the Bern Convention. A notable absence from the Annexes is the Bavarian pine vole *Microtus bavaricus*, which was re-discovered in 2000 after having thought to be extinct, and is now classed as Critically Endangered. Three more species that are endemic to the EU and listed as threatened according to IUCN Red List Criteria (the Cretan white-toothed shrew *Crocidura zimmermanni*, the broom hare *Lepus castroviejoi* and the Corsican hare *L. corsicanus*) do not appear on Annexes II or IV of the Habitats Directive.

4.4 Conservation management of mammals in the EU

The main financial instrument for *in situ* conservation in the EU has been the LIFE programme (L'Instrument Financier pour l'Environnement), which ran from 1992 to 2006. In total approximately 1.8 billion EUR has been allocated to the three separate strands, LIFE-Nature, LIFE-Environment and LIFE-Third Countries, for the implementation of projects to support the European Communities environmental policy. LIFE-Nature specifically aims to support the implementation of the Birds and Habitats Directives and establish the Natura 2000 network. Projects involve a variety of actions including habitat restoration, site purchases, communication and awareness-raising, protected area infrastructure and conservation planning.

Based on a search of the LIFE Nature project database that lists all past and current LIFE projects, 137 projects link their actions to mammal conservation (approximately 14% of the 970 LIFE Nature projects) and 72 target specific species. Table 7 shows the taxonomic breakdown of these projects, highlighting the prevalence of projects aimed towards the conservation of large carnivores in Europe. Examples of actions taken within these projects include the development of species action plans, habitat restoration, habitat conservation and re-introductions.

The LIFE Programme has been a very important tool for the conservation of mammals in Europe. One of the possible constraints of the programme has been that projects were usually focused on existing or potential Natura 2000 sites. This means that actions to support the connectivity between sites were limited. Such actions are very important for mammals with large range sizes. The LIFE Programme ended in 2006 and at the time of writing, a future programme has been announced under the name LIFE+. The new regulation, with a budget of 2.1bn EUR until 2013, has three strands: Nature and Biodiversity, Environment Policy and Governance and Information and Communication. One of the key differences with the LIFE programme is that the majority (80%) of funds will be allocated at the Member State level, rather than via the European Commission.

7 Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds.
8 Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna.

Table 6. The threatened taxa identified by the assessment and their presence on either Annexes II and IV of the Habitats Directive or Annexes II or III of the Bern Convention. An asterix indicates the species is a priority species for the Habitats Directive

Genus	Species	Red List status Europe	Habitats Directive EU 25	Bern Convention Annexes	Appendices
Saiga	*tatarica*	CR	Not present		
Lynx	*pardinus*	CR	CR	II*/IV	II
Monachus	*monachus*	CR	CR	II*/IV	II
Eubalaena	*glacialis*	CR	CR	IV	II
Microtus	*bavaricus*	CR	CR		II
Mustela	*lutreola*	EN	CR	II*/IV	II
Balaenoptera	*borealis*	EN	EN	IV	II (Med.)
Balaenoptera	*musculus*	EN	EN	IV	II
Nyctalus	*azoreum*	EN	EN	IV	II
Pipistrellus	*maderensis*	EN	EN	IV	II
Plecotus	*teneriffae*	EN	EN	IV	II
Myomimus	*roachi*	EN	DD	II/IV	II
Spalax	*arenarius*	EN	Not present		
Crocidura	*canariensis*	EN	EN	IV	II
Bison	*bonasus*	VU	VU	II*/IV	III
Gulo	*gulo*	VU	VU	II*/IV	II
Ursus	*maritimus*	VU	Not present		II
Vormela	*peregusna*	VU	NA	II/IV	II
Phocoena	*phocoena*	VU	VU	II/IV	II
Physeter	*catodon*	VU	VU	IV	II (Med.)
Barbastella	*barbastellus*	VU	VU	II/IV	II
Myotis	*bechsteinii*	VU	VU	II/IV	II
Myotis	*capaccinii*	VU	VU	II/IV	II
Plecotus	*sardus*	VU	VU	IV	II
Rhinolophus	*blasii*	VU	DD	II/IV	II
Rhinolophus	*euryale*	VU	VU	II/IV	II
Rhinolophus	*mehelyi*	VU	VU	II/IV	II
Lepus	*castroviejoi*	VU	VU		
Lepus	*corsicanus*	VU	VU		
Microtus	*cabrerae*	VU	VU	II/IV	II
Spalax	*giganteus*	VU	Not present		
Spalax	*zemni*	VU	Not present		
Spermophilus	*citellus*	VU	VU	II/IV	II
Crocidura	*zimmermanni*	VU	VU		III
Desmana	*moschata*	VU	Not present		II
Plecotus	*macrobullaris*	NT	VU	IV	II
Sicista	*subtilis*	NT	VU	II/IV	II
Alopex	*lagopus*	LC	CR	II*/IV	II
Mustela	*eversmanii*	LC	EN	II/IV	II

4.5 Contribution of new Member States to mammal conservation in the EU

The enlargement of the EU in 2004 and 2007 to include countries of Central and Eastern Europe, Cyprus and Malta has provided opportunities and challenges regarding the Community's nature and biodiversity policies. The new Member States significantly enrich the EU's biodiversity, but ensuring that these wildlife riches are conserved and sustainably managed will be a major challenge for policymakers in the years ahead. This report highlights the importance of the new Member States Romania and Bulgaria for species conservation in Europe – both of these countries have notably high mammalian biodiversity, as well as important concentrations of threatened species.

The addition of Romania and Bulgaria to the EU in 2007 has brought three new mammal species that did not previously occur in the EU (increasing the total number of terrestrial mammal species in the EU from 179 to 182). These three species are the Romanian hamster *Mesocricetus newtoni* and the Balkan mole-rat *Spalax graecus* (both assessed as Near Threatened at the European regional level), as well as the Levant mole *Talpa levantis* (assessed as Least Concern). The Romanian hamster and the Balkan mole-rat are both of conservation concern as they have very restricted ranges and are believed to be negatively affected by *inter alia* agricultural intensification. The Romanian hamster has already been listed on Annexes II and IV of the Habitats Directive, but the Balkan mole-rat is not currently listed. Romania is the global stronghold for the latter species. Although the Balkan mole-rat also occurs in natural grasslands, one of its main habitats is agricultural land, so it is very important that any changes to agricultural policies and practices implemented as a result of EU accession take into account the needs of this species.

Romania and Bulgaria also hold important populations of two species that were previously only of marginal occurrence in Europe, and which were consequently assessed as Not Applicable at the EU 25 level. These are the marbled polecat *Vormela peregusna* (assessed at the pan-European level as Vulnerable) and the grey hamster *Cricetulus migratorius* (assessed at the pan-European level as Least Concern). *V. peregusna* has been listed on Annexes II and IV of the Habitats Directive.

Table 7. The number of LIFE-Nature projects targeted either towards specific species or broader taxonomic groups. This review is based on a search for mammal species on the LIFE Nature database which identified 72 projects (some projects target more than one species). Species based projects were not included in the count for taxonomic group projects

Species	Projects
Brown bear	14
Iberian lynx	7
European mink	7
Wolf	7
Mediterranean monk seal	4
Otter	3
Tursiops spp.	3
Root vole *Microtus oeconomus arenicola*	2
Chamois *Rupicapra pyrenaica ornata* and *Rupicapra ornata*	2
Arctic fox	2
Beaver	1
Reindeer *Rangifer tarandus fennicus*	1
European bison	1
Corsican mouflon	1
Flying squirrel	1
Taxonomic Group	
Cetaceans	5
Large carnivores	5
Chiroptera	10

4.6 Anthropochorous taxa and conservation priorities

Anthropochorous taxa have been defined as "introduced populations that have been formally described taxonomically" (Gippoliti and Amori 2002). The Mediterranean Basin, one of the 25 global biodiversity hotspots recognized by Myers *et al*. (2000), probably has more anthropochorous taxa than any other part of the world (Gippoliti and Amori 2006). Human civilizations have been continually present in this region for at least 9,000 years, causing widespread damage and destruction of natural habitats, and intentionally or unintentionally transporting animals and plants between different island and mainland locations. Mediterranean islands once were home to an array of unique endemic mammals, including dwarf elephants and hippos (Kotsakis 1990, Vigne 1992, Palombo 1996), but in part as a result of human activities almost all of these endemic mammal species are now extinct (Vigne *et al*. 1997, Simmons 1999, Gippoliti and Amori 2006), and it has been contended that as few as three ancient endemic species still survive (two shrews and one mouse: Gippoliti and Amori 2006). The modern mammal fauna of Mediterranean islands consists largely of populations introduced in ancient or modern times by man, although some of these populations have been isolated for so long that they are phenotypically distinct from mainland forms and have been recognized at the subspecific or even specific level. Two examples of anthropochorous taxa found on Mediterranean islands are the agrimi and the mouflon. These taxa are listed on Annexes II and IV of the Habitats Directive as "*Capra*

aegagrus (natural populations)" and "*Ovis gmelini musimon* (*Ovis ammon musimon*) (natural populations – Corsica and Sardinia)", respectively (see Appendix 3). Genetic and archaeozoological studies suggest that they are feral populations of ancient domestic livestock (e.g., Groves 1989, Vigne 1994, Hiendleder *et al*. 1998, Manceau *et al*. 1999, Kahila bar-Gal *et al*. 2002), and should be included in the respective domestic species (Gentry *et al*. 1996, Gentry *et al*. 2004). By contrast, two out of the three Mediterranean island species identified as genuine palaeoendemics by Gippoliti and Amori (2006), namely *Crocidura zimmermanni* and *Mus cypriacus*, are not listed on the Habitats Directive Annexes.

There has been a historical tendency in Europe and worldwide for conservation interventions to focus on large mammals and birds. In some areas, including the Mediterranean (which, it should be remembered, qualifies as a hotspot largely as a consequence of the diversity and endemism of its vascular plants), there is evidence to suggest that a disproportionate focus on large mammal conservation may have a detrimental effect on other biodiversity values (see Gippoliti and Amori 2004, 2006 and references therein for examples). For example, mouflon continue to be introduced to Mediterranean islands (including protected areas) because they are considered typical of the region (Gippoliti and Amori 2006), even though there is evidence that overgrazing has a significant negative impact on native plants (Fabbri 1966, Greuter 1979, Gippoliti and Amori 2004), and many small Mediterranean islands are regarded as conservation priorities because of the lack of anti-grazing adaptations in the endemic plants (Greuter 2001). It is important that any conservation strategy aimed at maintaining biodiversity and its evolutionary potential takes into account the history (including recent history) of the regional biota, and makes an effort: (1) to identify and direct attention towards ancient endemic species that escaped previous extinction events and are the repository of unique phylogenetic information; and (2) to strike an appropriate balance between conserving large, charismatic mammals (that may in some cases be relatively recent additions to the regional fauna) and protecting other forms of native biodiversity.

4.7 Extinction risk versus conservation status

The IUCN Red List Criteria classify species solely on the basis of their relative extinction risk (IUCN 2001). However, Unfavourable conservation status according to the EU Habitats Directive has a much broader definition. This is identified clearly in Article 1 of the Directive (see Box 3). No species meeting the IUCN Red List Criteria at a regional level can be considered to have a Favourable conservation status in the EU. To be classified as Vulnerable (the lowest of the three IUCN threatened categories) a species must undergo a reduction in population size of at least 30% over 10 years or three generations (or have a very small or small and declining population or geographic range; see the 2001 IUCN Red List Categories and Criteria version 3.1 http://www.iucnredlist.org/info/categories_criteria2001). It is difficult to claim that a species experiencing a decline of this magnitude is maintaining its population, that its range is stable, and that it remains a viable component of its habitat. Crucially, however, this does not mean that the opposite is true: species that are not threatened as defined by IUCN Red List Criteria do not necessarily have a Favourable conservation status. Recent guidelines issued by the European Commission on the protection of animal species under the Habitats Directive reinforce this message that "the fact that a habitat or species is not threatened (i.e. not faced by any direct extinction risk) does not necessarily mean that it has a favourable conservation status" (Anon. 2007).

Many mammal species remain widely distributed in Europe, although their populations and ranges have suffered significant long-term decline, mainly owing to habitat loss or degradation although a number of other threats have also played a significant role (see Sections 3.5 and 3.6). The European Mammal Assessment has highlighted the fact that currently more than a quarter (27%) of European mammal species are declining, while 32% are stable, 8% are increasing, and 33% are of unknown population trend (see Figure 10). Additionally, some species experienced dramatic population declines during the last few centuries (often

Box 3. Selected provisions of the EU Habitats Directive (92/43/EEC).

Article 1(i) defines the conservation status of a species as "the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations in the European territory of the Member States". It states that a species' conservation status will be taken as Favourable when:

- Population dynamics data on the species concerned suggests that it is maintaining itself on a long-term basis as a viable component of its natural habitats; and
- The natural range of the species is neither being reduced nor is likely to be reduced for the considerable future; and
- There is, and probably will continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

as a result of overexploitation or persecution), and now persist only at very depleted levels. Typically these species have declined at a rate that does not exceed 30% over the last 10 years or three generations, and thus does not trigger IUCN Red List Criterion A. In many cases, these declines continue to the present day, albeit often at a reduced rate because of the heavy losses already suffered. In other cases, populations are now stable or increasing, but still cannot be said to be secure because past losses have left fragmented subpopulations that are so small that their long-term viability is questionable. Examples include Europe's large carnivore species such as the wolf, European lynx, and brown bear. Under the IUCN Red List Criteria, these species qualify as Least Concern at the European regional level, because of the existence of relatively large and secure populations in eastern Europe. In much of western Europe, however, these species persist only in tiny and isolated subpopulations that in many cases qualify as Critically Endangered.

BirdLife International has developed a three-step process for assessing the conservation status (*sensu* Habitats Directive) of species based upon Global and Regional Red List status, along with a series of additional criteria (BirdLife International 2004a,b). A similar approach could be developed for assessing the conservation status of mammals in Europe.

4.8 Red List versus priority for conservation action

Assessment of extinction risk and setting conservation priorities are two related but different processes. Assessment of extinction risk, such as the assignment of IUCN Red List Categories, generally precedes the setting of priorities. The purpose of the Red List categorization is to produce a relative estimate of the likelihood of extinction a taxon or subpopulation. Setting conservation priorities, on the other hand, which normally includes the assessment of extinction risk, also takes into account other factors such as ecological, phylogenetic, historical, or cultural preferences for some taxa over others, as well as the probability of success of conservation actions, availability of funds or personnel, cost-effectiveness, and legal frameworks for conservation of threatened taxa. In the context of regional risk assessments, a number of additional pieces of information are valuable for setting conservation priorities. For example, it is important to consider not only conditions within the region but also the status of the taxon from a global perspective and the proportion of the global population that occurs within the region. Decisions on how these three variables, as well as other factors, are used for establishing conservation priorities is a matter for the regional authorities to determine.

A fin whale *Balaenoptera physalus* surfaces in the Ligurian Sea Cetacean Sanctuary ("Pelagos") in the Mediterranean. Site protection is a key component of effective conservation strategies for both marine and terrestrial mammal species. © *Tethys - Simone Panigada*

5. Conclusions

5.1 Methodology – lessons learned

The data set, a summary of which is presented here, represents an essential resource for conservationists, policymakers, and environmental planners throughout the region. It is hoped that by presenting this data set, both regional and international research will be stimulated to provide new data and to improve on the quality of that already given. It is also hoped that, with time, the spatial resolution of the data will be improved. Geographic bias in sampling intensity has been identified as a problem in representing a true regional picture of species distributions and threatened status. The lack of data for Albania is particularly apparent, and in south-eastern Europe as a whole there are a number of threatened, endemic, and range-restricted species of which relatively little is known. As these sampling biases become apparent, such as through this study, it is hoped that researchers will be encouraged to focus their efforts on these lesser known regions and work towards eliminating this bias in sampling. The European Mammal Assessment process highlighted the importance of international cooperation, not only within the European Union but also with other countries in geographical Europe and neighbouring parts of Africa and Asia, to facilitate the transfer of relevant information and the development of coordinated initiatives to protect wide-ranging animals that cross political boundaries.

5.2 Application of project outputs

The outputs from this project can be applied at the regional scale by organizations such as IUCN to prioritize sites for inclusion in regional research programmes and for identification of internationally important sites for biodiversity. All the endemic species assessed in this project will be submitted for inclusion in the next (2008) update of the IUCN global Red List (www.iucnredlist.org). Information on the non-endemic species will contribute to global Red List assessments that are being carried out by the IUCN Global Mammal Assessment.

The large amount of data collected during the European Mammal Assessment (and freely available online at http://ec.europa.eu/environment/nature/conservation/species/ema/) will be extremely useful for further analyses, which should provide deeper insights into the conservation needs of European mammals and the impacts on their populations of land-use policies and natural resource use. These analyses could include studies at different geographical or geopolitical scales, or focusing on specific taxonomic or ecological groups.

5.3 Future work

The dynamic nature of mammal populations means their numbers can alter rapidly over relatively short periods of time. Regular updates of the status of Europe's mammals are therefore essential; both to assess the effectiveness of conservation efforts and to ensure that the species in most need of attention receive it promptly. The effective integration and long term use of the knowledge generated by this assessment requires that the data be regularly updated through ongoing collaboration with the network of European mammal experts. This assessment should form the basis for strengthening the links between regional decision makers and policy makers on the one hand, and IUCN and its members on the other to ensure that the data sets are maintained and used in the establishment and implementation of conservation priorities.

If the European Mammal Assessment is regularly updated, it will enable the changing status of European mammals to be tracked through time. This is an important action required to show whether European countries and the EU have met their commitments to halt the loss of biodiversity by 2010. Regular updates of the European Mammal Assessment will allow the development of a Red List Index for European mammals, which acts as an indicator for the changing status of species over time (Butchart *et al*. 2004, 2005, 2006, 2007). Currently such indicators exist for birds and amphibians at the global level, and are under development for birds alone at the European regional level (Burfield and Butchart in prep.). The data generated as part of this assessment and any subsequent assessments will serve as a useful contribution to the Streamlining European 2010 Biodiversity Indicators (SEBI2010) initiative, which is developing a set of headline biodiversity indicators for Europe.

5.4 Conservation priorities

Quantitative data and analysis of mammal populations and their distributions are the scientific basis for setting priorities for conservation actions at a European scale. Although the IUCN European Mammal Assessment collected this data on a species-by-species basis, IUCN recommends a comprehensive and integrated

conservation strategy that focuses not only on individual species, but also on conservation of sites and the wider environment.

5.4.1 Species conservation

Species frequently require a combination of conservation responses to ensure their continued survival. These responses include legislation, monitoring, research, management of populations, land acquisition and management, and even captive breeding and benign introductions for some of Europe's most threatened mammal species (e.g., Iberian lynx and European mink). For species threatened across their range, limited or local actions are unlikely to be sufficiently strong or coherent to prevent extinction, and coordinated action is required at the regional level. Under the Bern Convention, Action Plans have been developed for certain priority species (e.g., all large carnivores, European bison, a number of bats, etc.), outlining specific conservation measures that are urgently needed. The implementation of Action Plans is an effective means of improving the status of some of Europe's most threatened mammals, and measures (including financial incentives) to promote the development and implementation of more Action Plans should be taken.

5.4.2 Site conservation

The protection of sites plays a crucial role in any effective conservation strategy. Several international treaties call for the selection and protection of sites on the basis of their importance for biodiversity. In Europe, the primary mechanism for site protection is the Natura 2000 network of protected areas. This report identifies a number of areas within Europe that are regionally important for mammalian biodiversity and threatened species richness (see Sections 3.4 and 3.5). The spatial distribution data gathered for individual species as part of the IUCN European Mammal Assessment can be used to inform site selection at a finer scale. In particular, it is very important that Natura 2000 sites are rapidly proposed and adopted in the new Member States of Bulgaria and Romania, to protect the unusually high concentrations of threatened mammals that are found in those countries.

5.4.3 Conservation of the wider environment

Europe is one of the most highly fragmented continents in the world, where human pressure on the landscape over millennia has led to a mosaic of semi-natural habitats. Only about 1% of the surface area of Europe can be considered as wilderness, with the old growth forests of Scandinavia, Poland and Russia representing the last pristine areas. As a response to this extensive habitat modification and fragmentation, conservation planners have developed a number of tools to increase connectivity between core areas of habitat for the movement of species. These methods include planning tools such as ecological networks, which aim to identify core areas, species corridors and mixed land use zones (e.g., buffer zones), integration of ecological concerns into spatial land use planning and broader approaches to increase landscape permeability (Jongman and Pungetti 2004, Crooks and Sanjayan 2006). Providing increased connectivity is a vitally important aspect of mammal conservation in Europe and will provide a key tool to allow species to adapt to current habitat fragmentation and projected future climate change.

5.4.4 Monitoring and research

Monitoring of endangered wild mammal populations is now a statutory responsibility under EU legislation. However, many European countries have no formal schemes for monitoring even common and widespread species, let alone those that are under threat. A challenge for the future is to improve monitoring and the quality of data, so that the data and analyses presented here can be updated and improved, and conservation action can be given as solid a scientific basis as possible. National mammal population monitoring schemes have been initiated in some EU Member States, for example in the United Kingdom the Tracking Mammals Partnership www.trackingmammals.org has set up a surveillance and monitoring network that aims to deliver distribution and population trend information on all UK mammals. At the regional level, the European Union must report its progress towards the stated aim of halting biodiversity loss by 2010. As outlined in Section 5.3, if the European Mammal Assessment is periodically updated, it will enable the changing status of European mammals to be tracked through time and will provide an indicator of the changing fate of biodiversity to 2010 and beyond.

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Appendix 1. Red List status of European mammals

Order	Family	Species	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU 25)	IUCN Red List Criteria (EU 25)	Endemic to Europe? (Y/N)*
ARTIODACTYLA	BOVIDAE	*Bison bonasus*	VU	D1	VU	D1	N
ARTIODACTYLA	BOVIDAE	*Bos primigenius*	EX		EX		N
ARTIODACTYLA	BOVIDAE	*Capra ibex*	LC		LC		Y
ARTIODACTYLA	BOVIDAE	*Capra pyrenaica*	LC		LC		Y
ARTIODACTYLA	BOVIDAE	*Capra hircus*	NA		NA		N
ARTIODACTYLA	BOVIDAE	*Ovis aries*	NA		NA		N
ARTIODACTYLA	BOVIDAE	*Rupicapra pyrenaica*	LC		LC		Y
ARTIODACTYLA	BOVIDAE	*Rupicapra rupicapra*	LC		LC		N
ARTIODACTYLA	BOVIDAE	*Saiga tatarica*	CR	A2a	NE		N
ARTIODACTYLA	CERVIDAE	*Alces alces*	LC		LC		N
ARTIODACTYLA	CERVIDAE	*Capreolus pygargus*	LC		NE		N
ARTIODACTYLA	CERVIDAE	*Capreolus capreolus*	LC		LC		N
ARTIODACTYLA	CERVIDAE	*Cervus elaphus*	LC		LC		N
ARTIODACTYLA	CERVIDAE	*Dama dama*	LC		LC		N
ARTIODACTYLA	CERVIDAE	*Rangifer tarandus*	LC		LC		N
ARTIODACTYLA	SUIDAE	*Sus scrofa*	LC		LC		N
CARNIVORA	CANIDAE	*Alopex lagopus*	LC		CR	D1, C2a(i)	N
CARNIVORA	CANIDAE	*Canis aureus*	LC		NT		N
CARNIVORA	CANIDAE	*Canis lupus*	LC		LC		N
CARNIVORA	CANIDAE	*Vulpes vulpes*	LC		LC		N
CARNIVORA	CANIDAE	*Vulpes corsac*	LC		NE		N
CARNIVORA	FELIDAE	*Felis chaus*	NA		NE		N
CARNIVORA	FELIDAE	*Felis silvestris*	LC		NT		N
CARNIVORA	FELIDAE	*Lynx lynx*	LC		NT		N
CARNIVORA	FELIDAE	*Lynx pardinus*	CR	C2a(i)	CR	C2a(i)	Y
CARNIVORA	HERPESTIDAE	*Herpestes ichneumon*	LC		LC		N
CARNIVORA	MUSTELIDAE	*Gulo gulo*	VU	A2cd; C1	VU	D1	N
CARNIVORA	MUSTELIDAE	*Lutra lutra*	NT		NT		N
CARNIVORA	MUSTELIDAE	*Martes foina*	LC		LC		N
CARNIVORA	MUSTELIDAE	*Martes martes*	LC		LC		N
CARNIVORA	MUSTELIDAE	*Martes zibellina*	NA		NE		N
CARNIVORA	MUSTELIDAE	*Meles meles*	LC		LC		N
CARNIVORA	MUSTELIDAE	*Mustela putorius*	LC		NT		N
CARNIVORA	MUSTELIDAE	*Mustela sibirica*	NA		NE		N
CARNIVORA	MUSTELIDAE	*Mustela nivalis*	LC		LC		N
CARNIVORA	MUSTELIDAE	*Mustela lutreola*	EN	A2ce	CR	A2ce	N
CARNIVORA	MUSTELIDAE	Mustela erminea	LC		LC		N
CARNIVORA	MUSTELIDAE	*Mustela eversmanii*	LC		EN	C2a(i)	N
CARNIVORA	MUSTELIDAE	*Vormela peregusna*	VU	A2c	NA		N
CARNIVORA	ODOBENIDAE	*Odobenus rosmarus*	NA		NE		N
CARNIVORA	PHOCIDAE	*Cystophora cristata*	NA		NA		N
CARNIVORA	PHOCIDAE	*Erignathus barbatus*	NA		NA		N
CARNIVORA	PHOCIDAE	*Halichoerus grypus*	LC		LC		N
CARNIVORA	PHOCIDAE	*Monachus monachus*	CR	C2a(ii)	CR	C2a(ii)	N

Appendix 1. Red List status of European mammals, continued

Order	Family	Species	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU 25)	IUCN Red List Criteria (EU 25)	Endemic to Europe? (Y/N)*
CARNIVORA	PHOCIDAE	*Pagophilus groenlandicus*	NA		NA		N
CARNIVORA	PHOCIDAE	*Phoca vitulina*	LC		LC		N
CARNIVORA	PHOCIDAE	*Pusa hispida*	LC		LC		N
CARNIVORA	URSIDAE	*Ursus arctos*	LC		NT		N
CARNIVORA	URSIDAE	*Ursus maritimus*	VU	A3c	NE		N
CARNIVORA	VIVERRIDAE	*Genetta genetta*	LC		LC		N
CETACEA	BALAENIDAE	*Balaena mysticetus*	NA		NA		N
CETACEA	BALAENIDAE	*Eubalaena glacialis*	CR	D	CR	D	N
CETACEA	BALAENOPTERIDAE	*Balaenoptera borealis*	EN	D	EN	D	N
CETACEA	BALAENOPTERIDAE	*Balaenoptera acutorostrata*	LC		LC		N
CETACEA	BALAENOPTERIDAE	*Balaenoptera physalus*	NT		NT		N
CETACEA	BALAENOPTERIDAE	*Balaenoptera musculus*	EN	D	EN	D	N
CETACEA	BALAENOPTERIDAE	*Megaptera novaeangliae*	LC		LC		N
CETACEA	DELPHINIDAE	*Delphinus delphis*	DD		DD		N
CETACEA	DELPHINIDAE	*Globicephala melas*	DD		DD		N
CETACEA	DELPHINIDAE	*Grampus griseus*	DD		DD		N
CETACEA	DELPHINIDAE	*Lagenodelphis hosei*	NA		NA		N
CETACEA	DELPHINIDAE	*Lagenorhynchus acutus*	LC		LC		N
CETACEA	DELPHINIDAE	*Lagenorhynchus albirostris*	LC		LC		N
CETACEA	DELPHINIDAE	*Orcinus orca*	DD		DD		N
CETACEA	DELPHINIDAE	*Peponocephala electra*	NA		NA		N
CETACEA	DELPHINIDAE	*Pseudorca crassidens*	NA		NA		N
CETACEA	DELPHINIDAE	*Sousa chinensis*	NA		NA		N
CETACEA	DELPHINIDAE	*Stenella coeruleoalba*	DD		DD		N
CETACEA	DELPHINIDAE	*Steno bredanensis*	NA		NA		N
CETACEA	DELPHINIDAE	*Tursiops truncatus*	DD		DD		N
CETACEA	ESCHRICHTIIDAE	*Eschrichtius robustus*	RE		RE		N
CETACEA	MONODONTIDAE	*Delphinapterus leucas*	NA		NA		N
CETACEA	MONODONTIDAE	*Monodon monoceros*	NA		NA		N
CETACEA	PHOCOENIDAE	*Phocoena phocoena*	VU	A2cde	VU	A2cde	N
CETACEA	PHYSETERIDAE	*Kogia breviceps*	NA		NA		N
CETACEA	PHYSETERIDAE	*Kogia sima*	NA		NA		N
CETACEA	PHYSETERIDAE	*Physeter catodon*	VU	A1d	VU	A1d	N
CETACEA	ZIPHIIDAE	*Hyperoodon ampullatus*	DD		DD		N
CETACEA	ZIPHIIDAE	*Mesoplodon europaeus*	DD		DD		N
CETACEA	ZIPHIIDAE	*Mesoplodon densirostris*	DD		DD		N
CETACEA	ZIPHIIDAE	*Mesoplodon bidens*	DD		DD		N
CETACEA	ZIPHIIDAE	*Mesoplodon mirus*	DD		DD		N
CETACEA	ZIPHIIDAE	*Ziphius cavirostris*	DD		DD		N
CHIROPTERA	MOLOSSIDAE	*Tadarida teniotis*	LC		LC		N
CHIROPTERA	RHINOLOPHIDAE	*Rhinolophus ferrumequinum*	NT		NT		N
CHIROPTERA	RHINOLOPHIDAE	*Rhinolophus hipposideros*	NT		NT		N
CHIROPTERA	RHINOLOPHIDAE	*Rhinolophus mehelyi*	VU	A4c	VU	A4c	N
CHIROPTERA	RHINOLOPHIDAE	*Rhinolophus euryale*	VU	A2c	VU	A2c	N
CHIROPTERA	RHINOLOPHIDAE	*Rhinolophus blasii*	VU	A4c	DD		N
CHIROPTERA	VESPERTILIONIDAE	*Barbastella barbastellus*	VU	A3c+4c	VU	A3c+4c	N
CHIROPTERA	VESPERTILIONIDAE	*Eptesicus nilssonii*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Eptesicus serotinus*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Hypsugo savii*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Miniopterus schreibersii*	NT		NT		N

Appendix 1. Red List status of European mammals, continued

Order	Family	Species	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU 25)	IUCN Red List Criteria (EU 25)	Endemic to Europe? (Y/N)*
CHIROPTERA	VESPERTILIONIDAE	*Myotis nattereri*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Myotis blythii*	NT		NT		N
CHIROPTERA	VESPERTILIONIDAE	*Myotis myotis*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Myotis brandtii*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Myotis capaccinii*	VU	A4bce	VU	A4bce	N
CHIROPTERA	VESPERTILIONIDAE	*Myotis dasycneme*	NT		NT		N
CHIROPTERA	VESPERTILIONIDAE	*Myotis daubentonii*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Myotis emarginatus*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Myotis punicus*	NT		NT		N
CHIROPTERA	VESPERTILIONIDAE	*Myotis mystacinus*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Myotis bechsteinii*	VU	A4c	VU	A4c	N
CHIROPTERA	VESPERTILIONIDAE	*Myotis alcathoe*	DD		DD		Y
CHIROPTERA	VESPERTILIONIDAE	*Myotis aurascens*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Nyctalus lasiopterus*	DD		DD		N
CHIROPTERA	VESPERTILIONIDAE	*Nyctalus azoreum*	EN	B1ab(iii)	EN	B1ab(iii)	Y
CHIROPTERA	VESPERTILIONIDAE	*Nyctalus noctula*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Nyctalus leisleri*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Pipistrellus pipistrellus*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Pipistrellus nathusii*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Pipistrellus maderensis*	EN	B1ab(iii,v)	EN	B1ab(iii,v)	Y
CHIROPTERA	VESPERTILIONIDAE	*Pipistrellus kuhlii*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Pipistrellus pygmaeus*	LC		LC		N
CHIROPTERA	VESPERTILIONIDAE	*Plecotus kolombatovici*	NT		NT		N
CHIROPTERA	VESPERTILIONIDAE	*Plecotus auritus*	LC		LC		Y
CHIROPTERA	VESPERTILIONIDAE	*Plecotus austriacus*	LC		LC		Y
CHIROPTERA	VESPERTILIONIDAE	*Plecotus macrobullaris*	NT		VU	B2ab(iii)	N
CHIROPTERA	VESPERTILIONIDAE	*Plecotus sardus*	VU	B2ab(iii)	VU	B2ab(iii)	Y
CHIROPTERA	VESPERTILIONIDAE	*Plecotus teneriffae*	EN	B1ab(iii,v)	EN	B1ab(iii,v)	Y
CHIROPTERA	VESPERTILIONIDAE	*Vespertilio murinus*	LC		LC		N
ERINACEOMORPHA	ERINACEIDAE	*Atelerix algirus*	LC		LC		N
ERINACEOMORPHA	ERINACEIDAE	*Erinaceus europaeus*	LC		LC		Y
ERINACEOMORPHA	ERINACEIDAE	*Erinaceus roumanicus*	LC		LC		N
ERINACEOMORPHA	ERINACEIDAE	*Hemiechinus auritus*	LC		NE		N
LAGOMORPHA	LEPORIDAE	*Lepus corsicanus*	VU	A2bcde+3bcde	VU	A2bcde+3bcde	Y
LAGOMORPHA	LEPORIDAE	*Lepus granatensis*	LC		LC		Y
LAGOMORPHA	LEPORIDAE	*Lepus europaeus*	LC		LC		N
LAGOMORPHA	LEPORIDAE	*Lepus capensis*	LC		LC		N
LAGOMORPHA	LEPORIDAE	*Lepus castroviejoi*	VU	B1ab(iii,v)	VU	B1ab(iii,v)	Y
LAGOMORPHA	LEPORIDAE	*Lepus timidus*	LC		LC		N
LAGOMORPHA	LEPORIDAE	*Oryctolagus cuniculus*	NT		NT		N
LAGOMORPHA	PROLAGIDAE	*Prolagus sardus*	EX		EX		Y
PRIMATES	CERCOPITHECIDAE	*Macaca sylvanus*	NA		NA		N
RODENTIA	CASTORIDAE	*Castor fiber*	LC		LC		N
RODENTIA	CRICETIDAE	*Allocricetulus eversmanni*	LC		NE		N
RODENTIA	CRICETIDAE	*Arvicola amphibius*	LC		LC		N
RODENTIA	CRICETIDAE	*Arvicola sapidus*	NT		NT		Y
RODENTIA	CRICETIDAE	*Chionomys nivalis*	LC		LC		N
RODENTIA	CRICETIDAE	*Cricetulus migratorius*	LC		NA		N
RODENTIA	CRICETIDAE	*Cricetus cricetus*	LC		LC		N
RODENTIA	CRICETIDAE	*Dicrostonyx torquatus*	LC		NE		N

Appendix 1. Red List status of European mammals, continued

Order	Family	Species	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU 25)	IUCN Red List Criteria (EU 25)	Endemic to Europe? (Y/N)*
RODENTIA	CRICETIDAE	*Dinaromys bogdanovi*	NT		DD		Y
RODENTIA	CRICETIDAE	*Ellobius talpinus*	LC		NE		N
RODENTIA	CRICETIDAE	*Lagurus lagurus*	LC		NE		N
RODENTIA	CRICETIDAE	*Lemmus lemmus*	LC		LC		Y
RODENTIA	CRICETIDAE	*Lemmus sibiricus*	LC		NE		N
RODENTIA	CRICETIDAE	*Meriones tamariscinus*	LC		NE		N
RODENTIA	CRICETIDAE	*Meriones meridianus*	LC		NE		N
RODENTIA	CRICETIDAE	*Mesocricetus newtoni*	NT		NE		Y
RODENTIA	CRICETIDAE	*Microtus duodecimcostatus*	LC		LC		Y
RODENTIA	CRICETIDAE	*Microtus tatricus*	LC		LC		Y
RODENTIA	CRICETIDAE	*Microtus lusitanicus*	LC		LC		Y
RODENTIA	CRICETIDAE	*Microtus multiplex*	LC		LC		Y
RODENTIA	CRICETIDAE	*Microtus arvalis*	LC		LC		N
RODENTIA	CRICETIDAE	*Microtus thomasi*	LC		LC		Y
RODENTIA	CRICETIDAE	*Microtus guentheri*	LC		LC		N
RODENTIA	CRICETIDAE	*Microtus felteni*	LC		LC		Y
RODENTIA	CRICETIDAE	*Microtus bavaricus*	CR	B1ab(iii)+2ab(iii)	CR	B1ab(iii)+2ab(iii)	Y
RODENTIA	CRICETIDAE	*Microtus oeconomus*	LC		LC		N
RODENTIA	CRICETIDAE	*Microtus cabrerae*	VU	B2ab(ii,iii)c(iv)	VU	B2ab(ii,iii)c(iv)	Y
RODENTIA	CRICETIDAE	*Microtus savii*	LC		LC		Y
RODENTIA	CRICETIDAE	*Microtus levis*	LC		LC		N
RODENTIA	CRICETIDAE	*Microtus agrestis*	LC		LC		N
RODENTIA	CRICETIDAE	*Microtus gregalis*	LC		NE		N
RODENTIA	CRICETIDAE	*Microtus liechtensteini*	LC		LC		Y
RODENTIA	CRICETIDAE	*Microtus gerbei*	LC		LC		Y
RODENTIA	CRICETIDAE	*Microtus subterraneus*	LC		LC		N
RODENTIA	CRICETIDAE	*Microtus socialis*	LC		NE		N
RODENTIA	CRICETIDAE	*Microtus brachycercus*	LC		LC		Y
RODENTIA	CRICETIDAE	*Microtus middendorffii*	NA		NE		N
RODENTIA	CRICETIDAE	*Myodes rutilus*	LC		LC		N
RODENTIA	CRICETIDAE	*Myodes rufocanus*	LC		LC		N
RODENTIA	CRICETIDAE	*Myodes glareolus*	LC		LC		N
RODENTIA	CRICETIDAE	*Myopus schisticolor*	LC		LC		N
RODENTIA	DIPODIDAE	*Allactaga major*	NT		NE		N
RODENTIA	DIPODIDAE	*Allactaga elater*	LC		NE		N
RODENTIA	DIPODIDAE	*Dipus sagitta*	NA		NE		N
RODENTIA	DIPODIDAE	*Pygeretmus pumilio*	LC		NE		N
RODENTIA	DIPODIDAE	*Sicista severtzovi*	LC		NE		Y
RODENTIA	DIPODIDAE	*Sicista subtilis*	NT		VU	B1ab(iii)	N
RODENTIA	DIPODIDAE	*Sicista betulina*	LC		LC		N
RODENTIA	DIPODIDAE	*Sicista strandi*	LC		NE		N
RODENTIA	DIPODIDAE	*Stylodipus telum*	LC		NE		N
RODENTIA	GLIRIDAE	*Dryomys nitedula*	LC		LC		N
RODENTIA	GLIRIDAE	*Eliomys quercinus*	NT		NT		Y
RODENTIA	GLIRIDAE	*Glis glis*	LC		LC		N
RODENTIA	GLIRIDAE	*Muscardinus avellanarius*	LC		LC		N
RODENTIA	GLIRIDAE	*Myomimus roachi*	EN	B1ab(ii,iii)	DD		N
RODENTIA	HYSTRICIDAE	*Hystrix cristata*	LC		LC		N
RODENTIA	MURIDAE	*Acomys minous*	LC		LC		Y
RODENTIA	MURIDAE	*Apodemus alpicola*	LC		LC		Y

Appendix 1. Red List status of European mammals, continued

Order	Family	Species	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU 25)	IUCN Red List Criteria (EU 25)	Endemic to Europe? (Y/N)*
RODENTIA	MURIDAE	*Apodemus mystacinus*	LC		LC		N
RODENTIA	MURIDAE	*Apodemus uralensis*	LC		LC		N
RODENTIA	MURIDAE	Apodemus epimelas	LC		LC		Y
RODENTIA	MURIDAE	Apodemus agrarius	LC		LC		N
RODENTIA	MURIDAE	*Apodemus sylvaticus*	LC		LC		N
RODENTIA	MURIDAE	*Apodemus flavicollis*	LC		LC		N
RODENTIA	MURIDAE	*Micromys minutus*	LC		LC		N
RODENTIA	MURIDAE	*Mus macedonicus*	LC		LC		N
RODENTIA	MURIDAE	*Mus cypriacus*	LC		LC		N
RODENTIA	MURIDAE	*Mus musculus*	LC		LC		N
RODENTIA	MURIDAE	*Mus spretus*	LC		LC		N
RODENTIA	MURIDAE	*Mus spicilegus*	LC		LC		Y
RODENTIA	MURIDAE	*Rattus rattus*	LC		LC		N
RODENTIA	SCIURIDAE	*Marmota marmota*	LC		LC		Y
RODENTIA	SCIURIDAE	*Marmota bobak*	LC		NE		N
RODENTIA	SCIURIDAE	*Pteromys volans*	DD		NT		N
RODENTIA	SCIURIDAE	*Sciurus vulgaris*	LC		LC		N
RODENTIA	SCIURIDAE	*Spermophilus citellus*	VU	A2bc	VU	A2bc	Y
RODENTIA	SCIURIDAE	*Spermophilus suslicus*	NT		NA		Y
RODENTIA	SCIURIDAE	*Spermophilus pygmaeus*	LC		NE		N
RODENTIA	SCIURIDAE	*Spermophilus major*	LC		NE		N
RODENTIA	SCIURIDAE	*Spermophilus fulvus*	LC		NE		N
RODENTIA	SCIURIDAE	*Tamias sibiricus*	LC		NE		N
RODENTIA	SPALACIDAE	*Spalax giganteus*	VU	B2ab(iii)	NE		Y
RODENTIA	SPALACIDAE	*Spalax leucodon*	LC		LC		N
RODENTIA	SPALACIDAE	*Spalax zemni*	VU	B2ab(ii,iii)	NE		Y
RODENTIA	SPALACIDAE	*Spalax microphthalmus*	LC		NE		Y
RODENTIA	SPALACIDAE	*Spalax graecus*	NT	D2	NE		Y
RODENTIA	SPALACIDAE	*Spalax arenarius*	EN	B1ab(ii,iii)+ 2ab(ii,iii)	NE		N
SORICOMORPHA	SORICIDAE	*Crocidura russula*	LC		LC		N
SORICOMORPHA	SORICIDAE	*Crocidura ichnusae*	DD		DD		N
SORICOMORPHA	SORICIDAE	*Crocidura canariensis*	EN	B1ab(ii,iii)	EN	B1ab(ii,iii)	Y
SORICOMORPHA	SORICIDAE	*Crocidura zimmermanni*	VU	B1ab(i,ii,v)+ 2ab(i,ii,v)	VU	B1ab(i,ii,v)+ 2ab(i,ii,v)	Y
SORICOMORPHA	SORICIDAE	*Crocidura leucodon*	LC		LC		N
SORICOMORPHA	SORICIDAE	*Crocidura sicula*	LC		LC		Y
SORICOMORPHA	SORICIDAE	*Crocidura suaveolens*	LC		LC		N
SORICOMORPHA	SORICIDAE	*Diplomesodon pulchellum*	NA		NE		N
SORICOMORPHA	SORICIDAE	*Neomys anomalus*	LC		LC		N
SORICOMORPHA	SORICIDAE	*Neomys fodiens*	LC		LC		N
SORICOMORPHA	SORICIDAE	*Sorex caecutiens*	LC		LC		N
SORICOMORPHA	SORICIDAE	*Sorex coronatus*	LC		LC		Y
SORICOMORPHA	SORICIDAE	*Sorex tundrensis*	LC		NE		N
SORICOMORPHA	SORICIDAE	*Sorex alpinus*	NT		NT		Y
SORICOMORPHA	SORICIDAE	*Sorex samniticus*	LC		LC		Y
SORICOMORPHA	SORICIDAE	*Sorex isodon*	LC		LC		N
SORICOMORPHA	SORICIDAE	*Sorex minutissimus*	LC		LC		N
SORICOMORPHA	SORICIDAE	*Sorex minutus*	LC		LC		N
SORICOMORPHA	SORICIDAE	*Sorex araneus*	LC		LC		N

Appendix 1. Red List status of European mammals, continued.

Order	Family	Species	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU 25)	IUCN Red List Criteria (EU 25)	Endemic to Europe? (Y/N)*
SORICOMORPHA	SORICIDAE	*Sorex granarius*	DD		DD		Y
SORICOMORPHA	SORICIDAE	*Sorex antinorii*	DD		DD		Y
SORICOMORPHA	SORICIDAE	*Sorex arunchi*	DD		DD		Y
SORICOMORPHA	SORICIDAE	*Suncus etruscus*	LC		LC		N
SORICOMORPHA	TALPIDAE	*Desmana moschata*	VU	A2bc+4bc	NE		N
SORICOMORPHA	TALPIDAE	*Galemys pyrenaicus*	NT		NT		Y
SORICOMORPHA	TALPIDAE	*Talpa romana*	LC		LC		Y
SORICOMORPHA	TALPIDAE	*Talpa stankovici*	LC		LC		Y
SORICOMORPHA	TALPIDAE	*Talpa occidentalis*	LC		LC		Y
SORICOMORPHA	TALPIDAE	*Talpa caeca*	LC		LC		Y
SORICOMORPHA	TALPIDAE	*Talpa europaea*	LC		LC		N
SORICOMORPHA	TALPIDAE	*Talpa levantis*	LC		NE		N

*Refers to whether or not a species is endemic to the European region as defined by the EMA.

Appendix 2. Species assessed as Not Applicable (NA) according to IUCN Regional Red Listing guidelines

Order	Genus	Species	Status	Justification
Artiodactyla	*Ovis*	*aries*	NA	Descended from ancient domestic animals
Artiodactyla	*Capra*	*hircus*	NA	Descended from ancient domestic animals
Artiodactyla	*Ovibos*	*moschatus*	NA	Went extinct c.4,000 B.P., reintroduced after 1500 A.D.
Artiodactyla	*Ammotragus*	*lervia*	NA	Introduced after 1500 A.D.
Artiodactyla	*Axis*	*axis*	NA	Introduced after 1500 A.D.
Artiodactyla	*Cervus*	*nippon*	NA	Introduced after 1500 A.D.
Artiodactyla	*Hydropotes*	*inermis*	NA	Introduced after 1500 A.D.
Artiodactyla	*Muntiacus*	*reevesi*	NA	Introduced after 1500 A.D.
Artiodactyla	*Odocoileus*	*virginianus*	NA	Introduced after 1500 A.D.
Carnivora	*Herpestes*	*auropunctatus*	NA	Introduced after 1500 A.D.
Carnivora	*Neovison*	*vison*	NA	Introduced after 1500 A.D.
Carnivora	*Nyctereutes*	*procyonoides*	NA	Introduced after 1500 A.D.
Carnivora	*Procyon*	*lotor*	NA	Introduced after 1500 A.D.
Lagomorpha	*Sylvilagus*	*floridanus*	NA	Introduced after 1500 A.D.
Marsupialia	*Macropus*	*rufogriseus*	NA	Introduced after 1500 A.D.
Primates	*Macaca*	*sylvanus*	NA	Introduced after 1500 A.D.
Rodentia	*Atlantoxerus*	*getulus*	NA	Introduced after 1500 A.D.
Rodentia	*Callosciurus*	*erythraeus*	NA	Introduced after 1500 A.D.
Rodentia	*Callosciurus*	*finlaysonii*	NA	Introduced after 1500 A.D.
Rodentia	*Castor*	*canadensis*	NA	Introduced after 1500 A.D.
Rodentia	*Myocastor*	*coypus*	NA	Introduced after 1500 A.D.
Rodentia	*Ondatra*	*zibethicus*	NA	Introduced after 1500 A.D.
Rodentia	*Rattus*	*norvegicus*	NA	Introduced after 1500 A.D.
Rodentia	*Sciurus*	*carolinensis*	NA	Introduced after 1500 A.D.
Carnivora	*Cystophora*	*cristata*	NA	Marginal occurrence in Europe*
Carnivora	*Erignathus*	*barbatus*	NA	Marginal occurrence in Europe*
Carnivora	*Felis*	*chaus*	NA	Marginal occurrence in Europe*
Carnivora	*Martes*	*zibellina*	NA	Marginal occurrence in Europe*
Carnivora	*Mustela*	*sibirica*	NA	Marginal occurrence in Europe*
Carnivora	*Odobenus*	*rosmarus*	NA	Marginal occurrence in Europe*
Carnivora	*Pagophilus*	*groenlandicus*	NA	Marginal occurrence in Europe*
Cetacea	*Balaena*	*mysticetus*	NA	Marginal occurrence in Europe*
Cetacea	*Delphinapterus*	*leucas*	NA	Marginal occurrence in Europe*
Cetacea	*Kogia*	*breviceps*	NA	Marginal occurrence in Europe*
Cetacea	*Kogia*	*sima*	NA	Marginal occurrence in Europe*
Cetacea	*Lagenodelphis*	*hosei*	NA	Marginal occurrence in Europe*
Cetacea	*Monodon*	*monoceros*	NA	Marginal occurrence in Europe*
Cetacea	*Peponocephala*	*electra*	NA	Marginal occurrence in Europe*
Cetacea	*Pseudorca*	*crassidens*	NA	Marginal occurrence in Europe*
Cetacea	*Sousa*	*chinensis*	NA	Marginal occurrence in Europe*
Cetacea	*Steno*	*bredanensis*	NA	Marginal occurrence in Europe*
Chiroptera	*Eptesicus*	*bottae*	NA	Marginal occurrence in Europe*
Chiroptera	*Rousettus*	*aegyptiacus*	NA	Marginal occurrence in Europe*

Appendix 2. Species assessed as Not Applicable (NA) according to IUCN Regional Red Listing guidelines, continued

Order	Genus	Species	Status	Justification
Erinaceomorpha	*Erinaceus*	*concolor*	NA	Marginal occurrence in Europe*
Rodentia	*Apodemus*	*witherbyi*	NA	Marginal occurrence in Europe*
Rodentia	*Dipus*	*sagitta*	NA	Marginal occurrence in Europe*
Rodentia	*Meriones*	*tristrami*	NA	Marginal occurrence in Europe*
Rodentia	*Microtus*	*middendorffii*	NA	Marginal occurrence in Europe*
Rodentia	*Sciurus*	*anomalus*	NA	Marginal occurrence in Europe*
Rodentia	*Spalax*	*nehringi*	NA	Marginal occurrence in Europe*
Soricomorpha	*Diplomesodon*	*pulchellum*	NA	Marginal occurrence in Europe*

* Species were considered to be of marginal occurrence if it was estimated that less than 1% of their global population occurs in Europe. In the absence of population data, terrestrial species were considered of marginal occurrence if less than 1% of their range lies within Europe. This range-based rule was not strictly held to for marine species, as some very widespread marine species (e.g., the killer whale *Orcinus orca*) have less than 1% of their global range in the EMA study area, and probably less than 1% of their global population in that same area, but are nevertheless widespread, regularly recorded and typical components of the European marine fauna.

Appendix 3. Species listed on Annexes II, IV and V of the Habitats Directive

Taxon or taxa	Annex II	Annex IV	Annex V	Geographic restrictions?
ERINACEOMORPHA				
Erinaceus algirus		X		
SORICOMORPHA				
Crocidura canariensis		X		
Crocidura sicula		X		
Galemys pyrenaicus	X	X		
CHIROPTERA				
Rhinolophus blasii	X	X		
Rhinolophus euryale	X	X		
Rhinolophus ferrumequinum	X	X		
Rhinolophus hipposideros	X	X		
Rhinolophus mehelyi	X	X		
Barbastella barbastellus	X	X		
Miniopterus schreibersi	X	X		
Myotis bechsteini	X	X		
Myotis blythii	X	X		
Myotis capaccinii	X	X		
Myotis dasycneme	X	X		
Myotis emarginatus	X	X		
Myotis myotis	X	X		
All Microchiroptera except the above		X		
Rousettus aegiptiacus	X	X		
RODENTIA				
Gliridae: All species except *Glis glis* and *Eliomys quercinus*		X		
Myomimus roachi	X	X		
* *Marmota marmota latirostris*	X	X		
* *Pteromys volans* (*Sciuropterus russicus*)	X	X		
Spermophilus citellus (*Citellus citellus*)	X	X		
* *Spermophilus suslicus* (*Citellus suslicus*)	X	X		
Sciurus anomalus		X		
Castor fiber	X	X	X	**Annex II**: except the Estonian, Latvian, Lithuanian, Finnish and Swedish populations **Annex IV**: except the Estonian, Latvian, Lithuanian, Polish, Finnish and Swedish, populations **Annex V**: Finnish, Swedish, Latvian, Lithuanian, Estonian and Polish populations
Cricetus cricetus		X	X	**Annex IV**: except the Hungarian populations **Annex V**: Hungarian populations
Mesocricetus newtoni	X	X		
Microtus cabrerae	X	X		
* *Microtus oeconomus arenicola*	X	X		
* *Microtus oeconomus mehelyi*	X	X		
Microtus tatricus	X	X		
Sicista betulina		X		
Sicista subtilis	X	X		

Taxon or taxa	Annex II	Annex IV	Annex V	Geographic restrictions?
Hystrix cristata		X		
CARNIVORA				
* *Alopex lagopus*	X	X		
Canis aureus			X	
* *Canis lupus*	X	X	X	**Annex II**: except the Estonian population; Greek populations: only south of the 39th parallel; Spanish populations: only those south of the Duero; Latvian, Lithuanian and Finnish populations **Annex IV**: except the Greek populations north of the 39th parallel; Estonian populations, Spanish populations north of the Duero; Latvian, Lithuanian, Polish, Slovak, Bulgarian populations and Finnish populations within the reindeer management area as defined in paragraph 2 of the Finnish Act No 848/90 of 14 September 1990 on reindeer management
				Annex V: Spanish populations north of the Duero, Greek populations north of the 39th parallel, Finnish populations within the reindeer management area as defined in paragraph 2 of the Finnish Act No 848/90 of 14 September 1990 on reindeer management, Latvian, Lithuanian, Estonian, Polish and Slovak populations
* *Ursus arctos*	X	X		**Annex II**: except the Estonian, Finnish, and Swedish populations
* *Gulo gulo*	X			
Lutra lutra	X	X		
Martes martes			X	
Mustela eversmanii	X	X		
Mustela putorius			X	
* *Mustela lutreola*	X	X		
Vormela peregusna	X	X		
Felis silvestris		X		
Lynx lynx	X	X	X	**Annex II**: except the Estonian, Latvian and Finnish populations **Annex IV**: except the Estonian population **Annex V**: Estonian population
* *Lynx pardinus*	X	X		
Halichoerus grypus	X		X	
* *Monachus monachus*	X	X		
Phoca hispida botnica	X		X	
* *Phoca hispida saimensis*	X	X		
Phoca vitulina	X		X	
All other Phocidae			X	
Genetta genetta			X	
Herpestes ichneumon			X	
LAGOMORPHA				
Lepus timidus			X	

Taxon or taxa	Annex II	Annex IV	Annex V	Geographic restrictions?
ARTIODACTYLA				
* *Cervus elaphus corsicanus*	X	X		
Rangifer tarandus fennicus	X			
* *Bison bonasus*	X	X		
Capra aegagrus (natural populations)	X	X		
Capra ibex			X	
Capra pyrenaica (except *Capra pyrenaica pyrenaica*)			X	
* Capra pyrenaica pyrenaica	X	X		
Ovis gmelini musimon (*Ovis ammon musimon*) (natural populations – Corsica and Sardinia)	X	X		
Ovis orientalis ophion (*Ovis gmelini ophion*)	X	X		
* *Rupicapra pyrenaica ornata* (*Rupicapra rupicapra ornata*)	X	X		
Rupicapra rupicapra (except *Rupicapra rupicapra balcanica*, *Rupicapra rupicapra ornata* and *Rupicapra rupicapra tatrica*)			X	
Rupicapra rupicapra balcanica	X	X		
* *Rupicapra rupicapra tatrica*	X	X		
CETACEA				
Phocoena phocoena	X	X		
Tursiops truncatus	X	X		
All other Cetacea		X		

Appendix 4. Example species summary and distribution map

The species summary gives all the information collated (for each species) during this assessment, including a distribution map. You can search for and download all the summaries and distribution maps from the European Mammal Assessment website: http://ec.europa.eu/environment/nature/conservation/species/ema/.

Apodemus sylvaticus

LC

Taxonomic Authority: (Linnaeus, 1758)

☐ Global Assessment ☑ Regional Assessment Region: Europe ☐ Endemic to region

No synonyms available

Common names

LONG-TAILED FIELD MOUSE English
MULOT SYLVESTRE French
RATÓN DE CAMPO Spanish; Castilian
WOOD MOUSE English

Upper Level Taxonomy

Kingdom: ANIMALIA
Class: MAMMALIA
Family: MURIDAE
Phylum: CHORDATA
Order: RODENTIA

Lower Level Taxonomy

Rank:
Subpopulation:
Infra- rank name:
Authority:
Plant Hybrid

General Information

Distribution

The wood mouse has a large range that extends throughout Europe (with the exception of Finland and northern parts of Scandinavia, the Baltic and Russia) and parts of North Africa (Panteleyev 1998, Montgomery 1999, Wilson and Reeder 2005). It is present on the majority of offshore islands including the British Isles and Iceland. It occurs from sea level to 2,000 m.

Range Size

Area of Occupancy:
Extent of Occurrence: >20,000
Map Status: done

Elevation

Upper limit: 2,000
Lower limit: 0

Depth

Upper limit:
Lower limit:

Depth Zones

☐ Shallow photic ☐ Bathyl ☐ Hadal
☐ Photic ☐ Abyssal

Biogeographic Realm

☐ Afrotropical
☐ Antarctic
☐ Australasian
☐ Neotropical
☐ Oceanian
☐ Palearctic
☐ Indomalayan
☐ Nearctic

Population

It is widespread and abundant throughout much of its range, and populations appear to be stable. Population density mayfluctuate more than tenfold between years of maximum and minimum abundance, but there are no regular cycles (Montgomery 1999).

Total Population Size

Minimum Population Size:
Maximum Population Size:

Habitat and Ecology

It is a very adaptable species, inhabiting a wide variety of semi-natural habitats including all types of woodland, moorland, steppe, arid Mediterranean shrubland, and sand dunes. It is also found in many man-made habitats including suburban and urban parks, gardens and wasteland, pastures and arable fields, and forestry plantations. It has an omnivorous diet including seeds and invertebrates. Although it can cause occasional damage, it is not generally considered an agricultural pest (Montgomery 1999).

System	Movement pattern	Crop Wild Relative
☐Terrestrial ☐Marine ☐Freshwater	☐ Congregatory ☐ Migratory	☐ Is the species a wild relative of a crop?

Threats

There are no major threats to this species, although pollution by lead and agrochemicals may have localized negative impacts.

	Past	Present	Future
13 None	☑	☑	☑

Conservation Measures

It occurs in protected areas within its range. No specific conservation actions are needed.

	In Place	Needed
4 Habitat and site-based actions	☑	☐
4.4 Protected areas	☑	☐
4.4.2 Establishment	☑	☐

Countries of Occurrence

	Native Presence Confirmed	Native Presence Possible	Extinct	Possibly Extinct	Re-introduced	Possibly Reintroduced	Introduced	Introduced	Vagrant	Possibly Vagrant
Albania	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Algeria	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Andorra	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Austria	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Belarus	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Belgium	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Bosnia and Herzegovina	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Bulgaria	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Croatia	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Czech Republic	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Denmark	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
France	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Germany	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Greece	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hungary	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Iceland	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ireland	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Italy	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Liechtenstein	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lithuania	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Luxembourg	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Macedonia, the former Yugoslav Republic of	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Moldova	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Monaco	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Morocco	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐

Native	Native Presence Confirmed	Presence Possible	Extinct	Possibly Extinct	Re-introduced	Possibly Reintroduced	Introduced	Introduced	Vagrant	Possibly Vagrant
Netherlands	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Norway	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Poland	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Portugal	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Romania	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Russian Federation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Serbia and Montenegro	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Slovakia	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

General Habitats	Score	Description
1 Forest	1	Suitable
1.4 Forest - Temperate	1	Suitable
3 Shrubland	1	Suitable
3.4 Shrubland - Temperate	1	Suitable
3.8 Shrubland - Mediterranean-type Shrubby Vegetation	1	Suitable
4 Grassland	1	Suitable
4.4 Grassland - Temperate	1	Suitable
13 Marine Coastal/Supratidal	1	Suitable
13.3 Marine Coastal/Supratidal - Coastal Sand Dunes	1	Suitable
14 Artificial/Terrestrial	1	Suitable
14.1 Artificial/Terrestrial - Arable Land	1	Suitable
14.2 Artificial/Terrestrial - Pastureland	1	Suitable
14.3 Artificial/Terrestrial - Plantations	1	Suitable
14.4 Artificial/Terrestrial - Rural Gardens	1	Suitable
14.5 Artificial/Terrestrial - Urban Areas	1	Suitable

Species Utilization

☑ Species is not utilized at all

IUCN Red Listing

Red List Assessment: (using 2001 IUCN system) Least Concern (LC)
Threat category adjusted from Global to Regional status: No Change in Category
Red List Criteria:
Date Last Seen (only for EX, EW or Possibly EX species):
Is the species Possibly Extinct? ☐ Possibly Extinct Candidate? ☐

Rationale for the Red List Assessment

This species is widespread and abundant across its large range. There are no major threats and no suspicion of declines. Consequently it is assessed as Least Concern.
Reason(s) for Change in Red List Category from the Previous Assessment:

- ☐ Genuine Change
  - ☐ Genuine (recent)
  - ☐ Genuine (since first assessment)
- ☐ Nongenuine Change
  - ☐ New information
    - ☐ Taxonomy
    - ☐ Criteria Revision
    - ☐ Other
  - ☐ Knowledge of Criteria
  - ☐ Incorrect data used previously
- ☐ No Change
  - ☐ Same category and criteria
  - ☐ Same category but change in criteria

Current Population Trend: Stable Date of Assessment: 21/05/2006

Name(s) of the Assessor(s): Boris Kryštufek, Holger Meinig, Vladimir Vohralík, Rimvydas Juškaitis, Heikki Henttonen, Igor Zagorodnyuk
Evaluator(s): Caroline Pollock and Helen Temple
Notes: 2004 global assessment: LC (Schlitter, D. & Van der Straeten, E. (GMA Africa Workshop))

Criterion A				
A1a ☐	A1b ☐	A1c ☐	A1d ☐	A1e ☐
A2a ☐	A2b ☐	A2c ☐	A2d ☐	A2e ☐
	A3b ☐	A3c ☐	A3d ☐	A3e ☐
A4a ☐	A4b ☐	A4c ☐	A4d ☐	A4e ☐

Criterion B				
B1a ☐				
B1b(i) ☐	B1b(ii) ☐	B1b(iii) ☐	B1b(iv) ☐	B1b(v) ☐
B1c(i) ☐	B1c(ii) ☐	B1c(iii) ☐	B1c(iv) ☐	
B2a ☐				
B2b(i) ☐	B2b(ii) ☐	B2b(iii) ☐	B2b(iv) ☐	B2b(v) ☐
B2c(i) ☐	B2c(ii) ☐	B2c(iii) ☐	B2c(iv) ☐	

Criterion C	
C1 ☐	
C2a(i)☐	C2a(i)☐
C2b ☐	

Criterion D
D ☐
D1 ☐
D2 ☐

Criterion E
E ☐

Generation Length:

% population decline in the past:

Time period over which the past decline has been measured for applying Criterion A or C1 (in years or generations):

% population decline in the future:

Time period over which the future decline has been measured for applying Criterion A or C1 (in years or generations):

Number of Locations: Severely Fragmented: ☐

Number of Mature Individuals:

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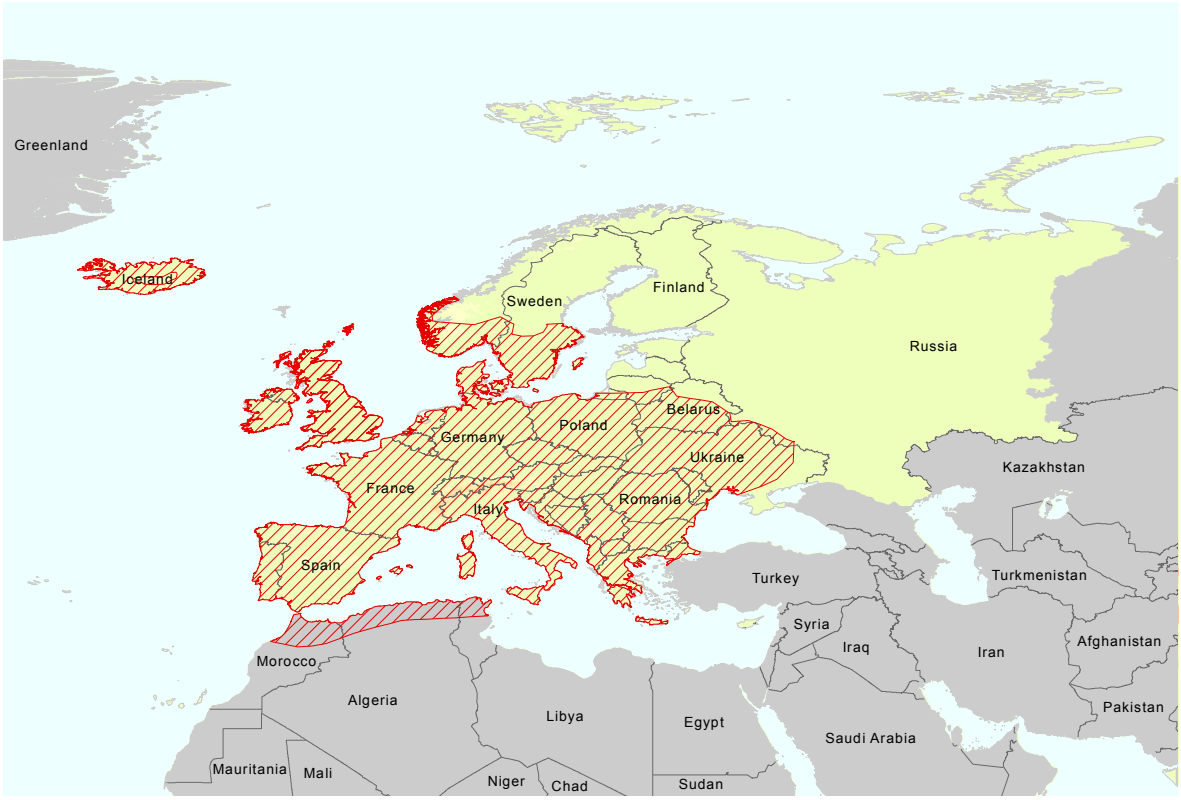

Apodemus sylvaticus

total range area = 5,215,306 km≤

range type

- Native Extant
- Introduced
- Native Reintroduced
- Probably Extinct
- Native - Possibly Present
- Prehistorically Introduced

EMA boundary

national boundaries

n/a subnational boundaries

lakes, rivers, canals

salt pans, intermittent rivers

elevation meters

5000
4000
3000
2000
1000

0 1,080 km

map created 04-30-2007

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Species Survival Commission

European Commission

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