Proceedings of the Mongolian Biodiversity Databank Workshop: Assessing the Conservation Status of Mongolian Mammals and Fishes: II – Mammals: Assessment Results and Threats.

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Abstract

The Mongolian Biodiversity Databank Workshop was held at the National University of Mongolia and Hustai National Park from 31st October to 4th November, 2005. As part of the workshop, participants assessed the conservation status of all Mongolian mammal species using the IUCN Categories and Criteria. Of the 128 species assessed, 2% were Critically Endangered (CR), 11% Endangered (EN) and 4% Vulnerable (VU). A further 5% were categorised as Near Threatened (NT) and 36% categorised as Data Deficient (DD). Ungulates were the most highly impacted: 79% were threatened with extinction. Twelve percent of carnivore species and 12% of rodent species were threatened. No non-rodent small mammal species were listed in a threatened category. Rodents and non-rodent small mammals were less well known, with 44% and 43% respectively found to be Data Deficient. This may have affected the threat assessment of these species. Greatest species richness of Mongolian mammals was found in the northern and western part of the country. The greatest number of threatened species also inhabit the north of the country, as well as the south-west. The main threat affecting most mammals in Mongolia was hunting, with lack of enforcement of legislation also considered a problem.

Keywords: *biodiversity, extinction risk, mammal, Mongolia, threat*

Introduction

The first Mongolian Biodiversity Databank Workshop, held at the National University of Mongolia and Hustai National Park from 31st October to 4th November, 2005, aimed to identify current knowledge of Mongolian mammals by bringing together experts in the field. Over several days of discussion these zoologists applied the IUCN Categories and Criteria to all mammal species and assessed threats affecting them. During this time, data were entered into the Mongolian Biodiversity Databank, including the justifications for the assessments. Although research has been conducted on Mongolian mammals for many years, relatively little has been published in the west and has therefore not received the international recognition that it deserves. This workshop enabled researchers to come together and share information, with the result that data about these species, or the lack of it, could be identified and published.

Mongolia is a large country with a small population (2.4 million people in 1.56 million km[2]) that is currently undergoing a period of socio-political change (Ykhanbai *et al.*, 2005). Although Mongolia has a rich biodiversity, this change has put pressure on the native wildlife due to the resulting market economy (Reading *et al.*, 1999). Over the last 20 years the number of livestock in Mongolia has increased, with a concomitant threat of desertification and competition with wildlife for pasture or water sources (ADB, 2005). Hunting has also increased as vehicles become more abundant (ADB, 2005) and trade routes with China have opened. Mongolia is therefore at a crucial point in the conservation of its native mammals. Some species, such as the Mongolian gazelle (*Procapra gutturosa*), although at threat, are still in sufficient numbers that management plans can be put in place to conserve future populations (Olson *et al.*, 2005). Other species, such as the red deer (*Cervus elaphus*), are desperately in need of protection (Zahler *et al.*, 2004). Without knowledge of the distribution and abundance of a species, conservation is difficult. The information resulting from the workshop should help policy makers alter or draft legislation to protect wild-

life, and also direct the attention of researchers and NGOs to the animals most at risk or most lacking in information.

The results of the workshop relating to mammals are presented in this article. The distribution of each mammal species was assessed, which enabled production of maps to explore large scale patterns within Mongolia such as areas of high species richness, high numbers of threatened species, or areas where Data Deficient species are concentrated. These maps are necessarily preliminary for many species, such as the small mammals. By assessing each species with the IUCN Categories and Criteria, species most at risk of extinction could be identified, as well as those needing further research. Finally, the participants could assess the threats most affecting Mongolian mammals, and so discuss conservation measures needed to mitigate these. It is hoped that the results presented here will be a positive step in the ongoing conservation of Mongolian mammals.

Results and Discussion

The distribution of Mongolian mammals

The mammal distribution maps developed at the workshop were overlaid using ArcView 3.0 and are presented here to explore patterns of species richness, threatened species richness and areas where there are high concentrations of poorly known taxa. The more northern provinces such as Bayan-Ulgii, Uvs, Khövsgöl, Selenge and Khentii had the highest concentration of mammals, with recorded numbers of species exceeding 60 in the northern

part of Bayan-Ulgii and Uvs provinces (Figure 1). In contrast, species richness was lowest in eastern Mongolia.

Khovd, Khövsgöl, Gobi-Altai, Bayankhongor and Umnugobi were revealed as provinces with a high number of threatened species (Figure 2). Areas of very high species richness such as Khövsgöl and Khentii also had high richness of threatened species. However, southern areas, such as Gobi-Altai, Omnogobi and Dornogobi, although not containing high species richness, had the highest richness of threatened species. It is possible that these provinces support high numbers of threatened species because they were extirpated elsewhere in Mongolia, therefore these areas may serve as refugia (Reading pers. coms.).

Species were categorised as Data Deficient (DD) where there was insufficient information to confidently assess their risk of extinction. In general these species tended to be small mammals such as bats, rodents and insectivores, but a number of larger mammals were also categorised as DD. Many of the provinces with high species richness had a high number of DD species (e.g. Khövsgöl, Selenge and Khentii), and provinces with low species richness tended to have lower numbers of DD species (e.g. Dornod, Sukhbaatar, Tov and Dundgobi) (Figure 3). However, there were also a number of regions in southern Mongolia with relatively low species richness and disproportionately high numbers of DD species, such as Gobi-Altai, Umnugobi and Dornogobi. This possibly reflects the lack of research conducted in these areas, particularly in the

Species richness
1 - 9
10 - 19
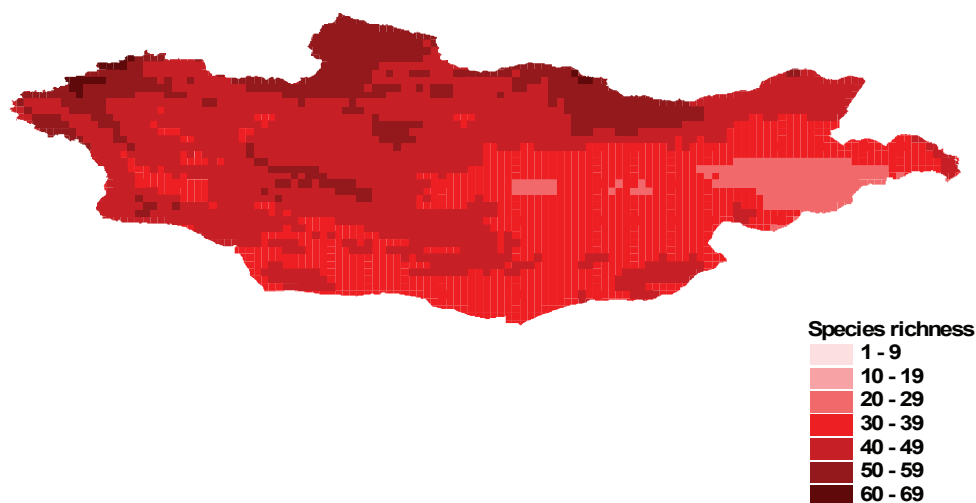20 - 29
30 - 39
40 - 49
50 - 59
60 - 69

Figure 1. Species richness of Mongolian mammals. The darker shades represent areas with the highest number of threatened species.

Figure 2. Species richness of threatened Mongolian mammals. The darker shades represent areas with the highest number of threatened species.
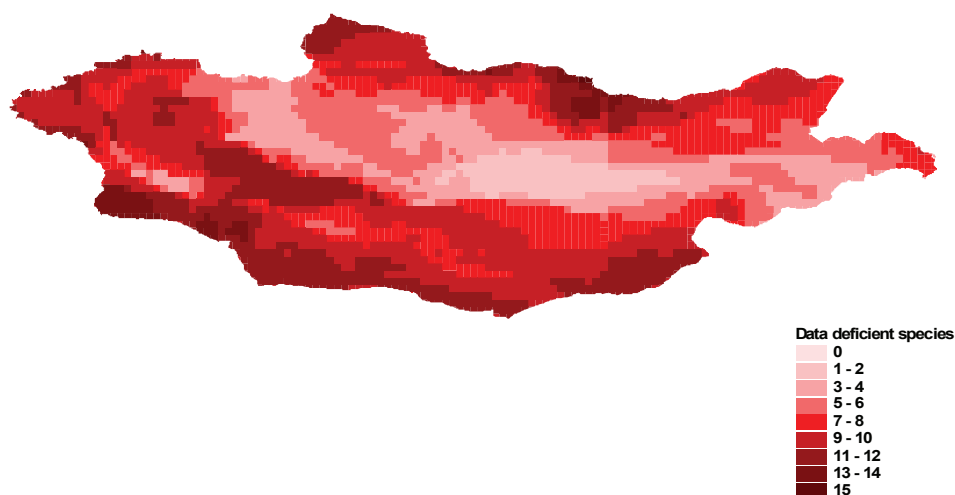

Figure 3. Species richness of Data Deficient Mongolian mammals. The darker shades represent areas with the highest number of threatened species.

south-eastern desert zone.

The status of Mongolian mammals

Mongolian mammal species to be assessed were agreed upon by the Taxon Steering Committee, resulting in a list of 128 species. As for the Red Lists, only wild populations inside their native range or populations resulting from benign introductions were included. In general, mammals were assessed at the species level. Thus distinct subspecies within Mongolia, such as *Saiga tatarica monogolica,* an important subspecies of the saiga antelope, is referred to as *Saiga tatarica*. The only taxa that are referred to at the subspecies level are the Gobi bear (*Ursus arctos gobiensis*), the Bactrian camel (*Camelus bactrianus ferus*) and Przewalski's horse (*Equus ferus przewalskii*). The Gobi bear was included because the subspecies was identified as an

extremely important taxa for Mongolian conservation and was assessed at the subspecies level. The Bactrian camel is referred to as *Camelus bactrianus ferus* rather than *Camelus bactrianus* to make it clear that only the wild population is being considered. Recent taxonomic evidence (Oakenfull *et al.*, 2000) suggests that although they are genetically distinct, the domestic horse and Przewalski's horse are both subspecies of *Equus ferus* (Boddaert, 1785). Therefore in this article, Przewalski's horse will be referred to as (*Equus ferus przewalskii*), indicating only wild horses are included in the assessment.

Of the 128 species assessed, 17% were categorised as regionally threatened, of which 2% were Critically Endangered (CR), 11% Endangered (EN) and 4% Vulnerable (VU) (Figure 4). A further 5% were categorised as Near Threatened (NT). Thirty-
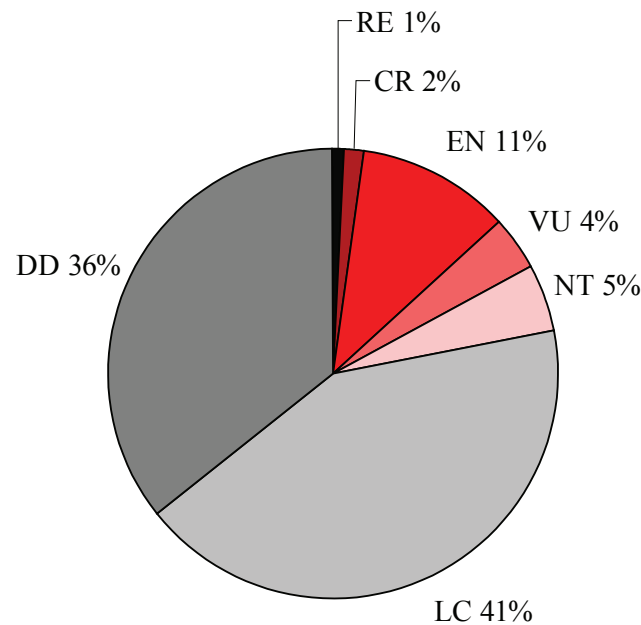
Figure 4. Conservation status of the 128 native species of Mongolian mammals according to the IUCN Regional Red List Categories and Criteria. RE = Regionally Extinct, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern and DD = Data Deficient.

six percent of the mammals of Mongolia were categorised as Data Deficient (DD). Only one species, the Asiatic wild dog (*Cuon alpinus*) was categorised as Regionally Extinct (RE) in Mongolia.

When Mongolian mammal species were divided into discrete groups such as ungulates and carnivores, their overall conservation status could be compared (Figure 5). Virtually all the ungulates (Artiodactyla and Perissodactyla) were classified as threatened in Mongolia. Eleven (79%) of the 14 ungulate species assessed were categorised as threatened and of the remaining three ungulates, two were categorised as NT. None of the ungulates were classified as DD. Twelve percent of the carnivores, including species such as the snow leopard (*Uncia uncia*), sable (*Martes zibellina*) and Gobi bear, were categorised as threatened. A further 17% were categorised as NT and 40% were listed as Least Concern (LC). Unlike the ungulates, a high proportion (27%) were DD.

There are many species of Rodentia in Mongolia, including members of the families Castoridae, Dipodidae, Muridae, Myoxidae and Sciuridae. In Mongolia, this large group is comprised of species such as the small five-toed jerboa (*Cardiocranius paradoxus*), Siberian marmot (*Marmota sibirica*), and Eurasian beaver (*Castor fiber*). Twelve percent of rodents were classified as threatened, which is fewer than both ungulates and carnivores, but a high

proportion (44%) were classified as DD, indicating that rodents remain poorly understood and the actual number of threatened species may be much higher. Of all the other small (non-rodent) mammals, such as bats, hedgehogs, hares and shrews (Chiroptera, Erinaceomorpha, Lagomorpha and Soricomorpha) none were classified as threatened with extinction. However, again a high number of these species were listed as DD (43%) and further research may indicate a number of these species are threatened.

Threatened species

Twenty-one taxa were categorised as threatened in Mongolia and a further six were listed as NT (Table 1). Twelve of these were also classified as threatened or NT on a global scale (IUCN, 2004; see Table 2). Mongolia contains significant populations of many of these globally threatened species, such as the Asiatic wild ass (*E. hemionus*), Przewalski's horse, Bactrian camel, saiga antelope and snow leopard. Many of the species classified as regionally threatened have subspecies in Mongolia endemic to Central Asia, therefore management of these populations in Mongolia has major implications for the global status of the species.
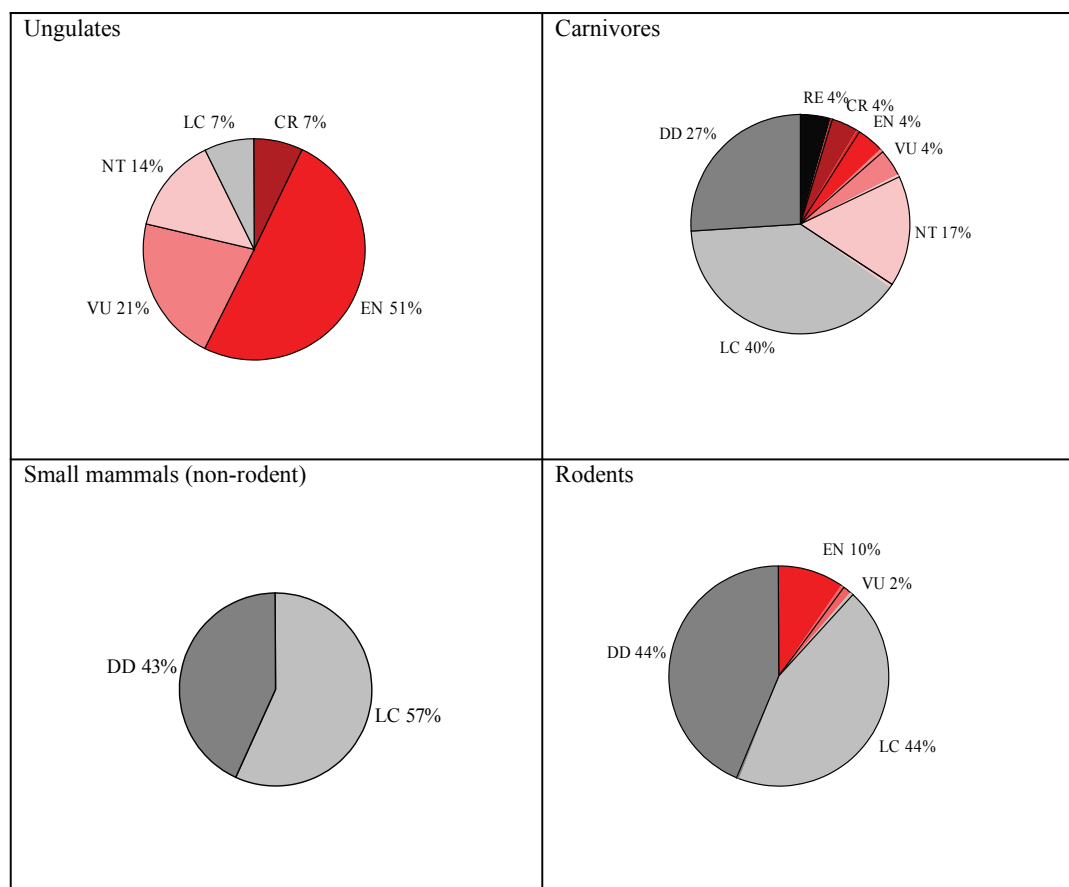
Figure 5. A comparison of the conservation status of four discrete groups of Mongolian mammals. RE = Regionally Extinct, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern and DD = Data Deficient.

Table 1. Mammals categorised as regionally threatened (Critically Endangered, Endangered and Vulnerable) and Near Threatened in Mongolia.

Critically Endangered	*Endangered*	*Vulnerable*	*Near Threatened*
Red deer	Argali	Goitered gazelle	Siberian ibex
Cervus elaphus	*Ovis ammon*	*Gzella subgutturosa*	*Capra sibirica*
Gobi bear	Mongolian gazelle	Reindeer	Wild boar
Ursus arctos gobiensis	*Procapra gutturosa*	*Rangifer tarandus*	*Sus scrofa*
	Saiga antelope	Sable	Grey wolf
	Saiga tatarica	*Martes zibellina*	*Canis lupus*
	Bactrian camel	Asiatic wild ass	Corsac fox
	Camelus bactrianus ferus	*Equus hemionus*	*Vulpes corsac*
	Moose	Long-eared jerboa	Red fox
	Alces alces	*Euchoreutes naso*	Vulpes vulpes
	Siberian musk deer		Pallas's cat
	Moschus moschiferus		*Otocolobus manul*
	Snow leopard *Uncia uncia*		
	Przewalski's horse *Equus ferus przewalskii*		
	Eurasian beaver *Castor fiber*		
	Small five-toed jerboa *Allactaga elater*		
	Mongolian three-toed jerboa		
	Stylodipus sungorus		
	Tamarisk jird *Meriones tamariscinus*		
	Siberian marmot *Marmota sibirica*		
	Alashan ground squirrel *Spermophilus alashanicus*		

At the workshop, the IUCN global conservation assessments were reviewed and in some cases recommendations were made to change the assessments. Among the recommended changes was the re-classification of Przewalski's horse from Extinct in the Wild (EW) to EN. Przewalski's horse was last seen in the wild in 1969 (Wakefield *et al*., 2002) and was officially listed as EW by the IUCN Equid Specialist Group in 1996 (IUCN, 2004). Following re-introduction in 1992, the population is now living in the wild without human assistance. The number of mature individuals is greater than 50 and the population is reproducing successfully, which qualifies it as Endangered, using criterion D. This is a major conservation success for Mongolia. For more information see the article on Przewalski's horse (King, 2006) in this volume.

agricultural development was selected, this refers to the increasing numbers of livestock being kept in Mongolia; the areas of croplands are actually declining. This increase is resulting in competition for resources and over grazing, which degrades important habitat such as oases in the desert regions. In addition, the human occupation which accompanies increased livestock grazing causes further disturbance in a number of ways. Another major potential cause of habitat loss or degradation is climate change. It should be noted that the term 'environmental change' used in the figure, refers to recent droughts and cold winters (zuds), which have had a devastating effect on many Mongolian mammals. However, it is not yet certain if these conditions are a natural phenomenon or the result of human-induced climate change. Hunting/fishing, environmental change and resource extraction were

Table 2. The global threatened status of species from the 2004 IUCN Red List, which were also assessed as regionally threatened or Extinct in Mongolia at the Biodiversity Databank Workshop 2005

Critically Endangered	Endangered	Vulnerable	Near Threatened
Saiga antelope	Asiatic wild dog	Siberian musk deer	Pallas's cat
Saiga tatarica	*Cuon alpinus*	*Moschus moschiferus*	*Otocolobus manul*
Bactrian camel	Snow leopard	Goitered gazelle	Eurasian beaver
Camelus bactrianus ferus	*Uncia uncia*	*Gazella subgutturosa*	*Castor fiber*
	Przewalski's horse	Argali	
	Equus ferus przewalskii	*Ovis ammon*	
	Long-eared jerboa	Asiatic wild ass	
	Euchoreutes naso	*Equus hemionus*	

Comparison with global data

IUCN has assessed the global conservation status of nearly five thousand mammal species using the IUCN Red List Categories and Criteria, of which 23% were classified as threatened with extinction, 12% NT and 8% DD (Baillie *et al*., 2004). Although the proportion of mammals threatened regionally within Mongolia was 17%, the actual proportion may be quite similar to the global figure when the large number of DD species (36%) have been researched and ascribed a status category. The high number of DD species within Mongolia indicated that this region remains relatively poorly studied.

Threats to Mongolian mammals

During the assessment process, participants identified the main activities or processes resulting in the decline of species, such as resource extraction and hunting/fishing (Figure 6). They also identified the direct threat causing the decline, such as loss of habitat, disease or pollution. In all cases where

identified as the main processes leading to the decline of Mongolian mammals (Figure 6). These were followed by persecution and increasing livestock numbers. The large percentage of DD species was reflected in the high number for which the dominant threat could not be identified. Energy consumption and infrastructure development were identified as much less dominant threat processes.

Where applicable, the primary, secondary and tertiary direct threats were identified for each species. Intentional mortality caused by hunting was the primary threat identified for more than half the threatened mammals (62%, see Table 3). This was a particularly serious threat for ungulates such as the saiga antelope, argali (*Ovis ammon*), red deer, Siberian musk deer (*Moschus moschiferus*) and Mongolian gazelle, as well as furbearers such as snow leopards and Siberian marmots. This threat has resulted in rapid declines of many species in recent years. For example, over the past decade the Siberian marmot has declined by roughly 70% in Mongolia, largely due to illegal and unsustainable
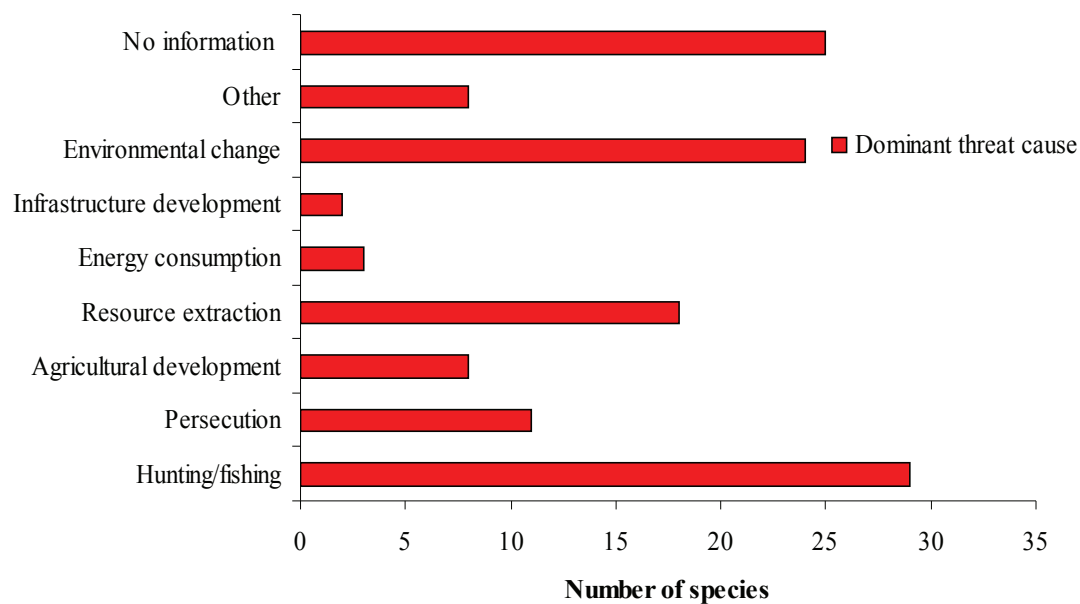
Figure 6. The dominant causes and activities leading to the decline of Mongolian mammals, as identified by participants during the workshop.

hunting (Batbold, 2002). Mongolian argali populations were believed to have experienced an even greater rate of decline, 70% in one generation, also largely driven by illegal hunting (Amgalanbaatar *et al.*, 2002). The red deer was found to have one of the highest decline rates for all Mongolian mammals – 92% over 18 years (Zahler *et al.*, 2004), resulting in it being assessed as Critically Endangered. This has also been primarily attributed to illegal hunting. It is noteworthy that while intentional mortality (hunting) was by far the greatest present threat to Mongolian mammals, it is not the most significant threat to mammals globally. On a global scale the threat of hunting is dwarfed by habitat destruction and degradation (Baillie *et al.*, 2004). It is likely therefore, that while Mongolian mammals are undoubtedly affected by habitat loss and degradation, the threat of hunting is having a much greater and more immediate impact.

Habitat degradation was the primary threat to three species: Tamarisk jird (*Meriones tamariscinus*), Mongolian three-toed jerboa (*Stylodipus sungorus*) and long eared jerboa (*Euchoreutes naso*) (Table 3). For these species, the cause of the habitat degradation was overgrazing due to increasing numbers of livestock. These are small mammals and therefore less threatened by hunting pressures. Together, habitat loss, fragmentation and degradation were a secondary threat to more than half the threatened species. In all cases, habitat degradation

was caused by overgrazing from livestock. Two species, the red deer and the Mongolian gazelle, were secondarily threatened by habitat fragmentation, caused by infrastructure development. Habitat loss was a secondary threat to five species, of which two are artiodactyls, the Bactrian camel and moose (*Alces alces*), and was caused by increasing resource extraction and mining. Other causes of habitat loss, such as logging and clear-felling of forests, were found to be reducing habitat available to Eurasian beaver and sable. Competition was also an important secondary threat due to increasing numbers of livestock that overlap with the resources required by wildlife. Threats recorded as the third most influential were more varied, including disease and pollution of water systems from gold-mining.

Climate change was identified as a secondary and tertiary threat to some species and highlighted as an important threat for the future. Many of the species for which climate change was identified as a threat are distributed in the south, such as the Gobi bear and Bactrian camel, where severe conditions most commonly occur. However, as many of the species in this region were listed as Data Deficient, the impact of climate change may be poorly documented. If the projections from climate models are correct (Millennium Ecosystem Assessment, 2005), then climate change will likely be the dominant threat for the future.

Table 3. Summary of the direct threats facing threatened Mongolian mammals, as identified by the workshop participants. The primary threat is represented by a black square, the secondary threat is mid grey, and the tertiary threat is light grey.

Threat category	Species	Habitat degradation	Habitat fragmentation	Habitat loss	Pollution	Disease	Parasites	Predation	Hybridisation	Competitors	Intentional mortality	Accidental mortality	Climate change	Other	Not known
CR	*Cervus elaphus*		▦	░							■				
	Ursus arctos gobiensis												▦	■	
EN	*Procapra gutturosa*		▦								■			░	
	Allactaga elater	▦								■			░		
	Saiga tatarica	▦								░	■				
	Camelus bactrianus ferus		▦						■				░		
	Alces alces			▦	░						■				
	Marmota sibirica					░					■			▦	
	Moschus moschiferus										■			▦	
	Uncia uncia										■			▦	
	Equus ferus przewalskii					░			■	▦					
	Castor fiber			▦	░						■				
	Meriones tamariscinus	■								▦			░		
	Stylodipus sungorus			▦						▦			░		
	Spermophilus alashanicus														■
	Ovis ammon	░								▦	■				
VU	*Gazella subgutturosa*									▦	■			░	
	Rangifer tarandus	▦						░			■				
	Equus hemionus	▦								░	■				
	Martes zibellina			▦							■				
	Euchoreutes naso	■										▦	░		

Conservation measures

For each species, conservation measures in place were identified and further conservation measures were recommended (Figure 7). Habitat and site-based actions, such as protected areas, were identified as in place for the largest proportion of species. This was followed by policy-based actions, including legislation, and then actions relating specifically to species. No education measures were acknowledged.

Participants recognised that a significant proportion of the territory of Mongolia is currently designated as protected. The establishment of The National Programme on Special Protected Areas in 1998 by the State Great Khural (Parliament), has expanded the network of protected areas and aims to have them covering 30% of Mongolia by 2030 (Jargal, 2003). A number of species have a large proportion of their distribution within protected areas, e.g. the Gobi bear, saiga antelope, long-eared jerboa and snow leopard. Although there are many protected areas, it has been noted that some protected areas have a size and habitat-type that is not optimal for many species, particularly migratory ungulates (Johnstad & Reading, 2003). In addition, greater resources are needed to effectively manage these parks. Therefore, participants recommended that future management and appropriate designation of protected areas should have priority to better conserve biodiversity.

Policy-based actions were identified as in place for a high proportion of species. There are many laws protecting various species, such as the Law on Hunting and the Law on Fauna (Wingard & Odgerel, 2001). The hunting of a species listed as
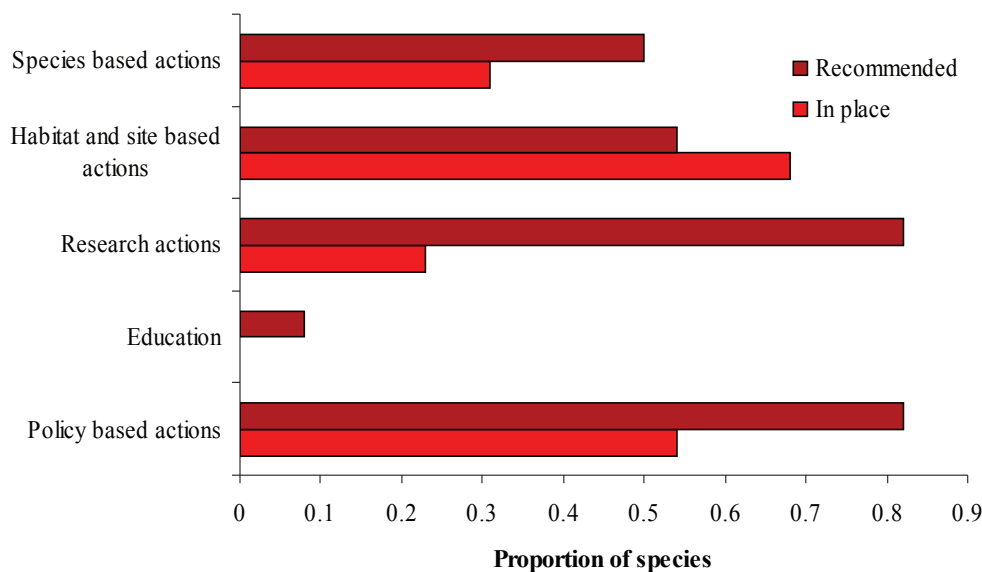
Figure 7. The proportion of species for which the different conservation measures in place and further actions recommended were identified.

'Very Rare' in the Law on Fauna is prohibited entirely by the Law on Hunting (Wingard & Odgerel, 2001). Further, Mongolia is a signatory country to the Convention on the International Trade of Endangered Species (CITES). The Convention regulates trade of endangered species by establishing export quotas to obtain sustainable trade, such as for the argali, which is listed in Appendix II and permits 80 hunting trophies with horns, and 44 skins and horns to be exported from Mongolia (UNEP-WCMW, 2006). In some cases trade is prohibited if the species is threatened, such as the snow leopard, listed in Appendix I (UNEP-WCMC, 2006). Policy actions were the most important conservation measure identified for the future (Figure 7), which includes the enforcement of existing laws. Currently, enforcement is considered inadequate to protect species from illegal hunting. Better enforcement of current laws will require better recruiting, training and provisioning of officers, and financial investment (Zahler *et al*., 2004). Once this has been achieved, more legislation protecting threatened and near threatened species is also required, for example there is no law article currently protecting the wolf (*Canis lupus*) (NT) or the majority of the threatened rodent species.

Research actions, in addition to policy-based actions, were recommended as highly important conservation measures for the future (Figure 7). Participants also noted that measures relating to habitat and site-based actions were still required and

that education initiatives should be implemented for some species. Educational programmes were not identified as in place for any species. While it is true there are few educational programmes promoting the conservation of biodiversity, a number do exist, such as the Zoological Society of London's Steppe Forward Programme and the Snow Leopard Trust, and are particularly beneficial to species threatened by illegal or unsustainable hunting, by raising awareness of the status of the species and laws protecting it. Research actions are necessary as much remains to be discovered about the taxonomy, ecology, threats and population trends of many Mongolian mammals. This is particularly important for species located in the southern regions of Mongolia, because compared with northern and western regions, many were assessed as DD. These research needs are illustrated by poorly understood species such as the Gobi bear, which is lacking in all aspects of ecology, taxonomy and population data (Zahler, 2004), and the argali, which receives little active management due to a lack of information on ecology, population dynamics, trends and behaviour (Amgalanbaatar & Reading, 2003).

Participants believed that public awareness should be increased through public education of the status of Mongolian mammals, particularly its threatened species, and the laws relating to hunting. Currently, the threat of illegal hunting hangs over most Mongolian mammals. Unless this is curbed soon, Mongolia will be left without a number of

its charismatic species. The rates of population decline mentioned in this article should not be left unchecked. As the climate of the world changes, management responses will also have to adapt. The arid environments of Mongolia are likely to be more susceptible to climate change and the future conservation of Mongolian mammals will need to involve a multi-faceted approach to ensure precious few are lost.

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