

Rangeland Biodiversity of the Chang Tang Wildlife Reserve in the Tibetan Autonomous Region, China

The Chang Tang Wildlife Reserve of Tibet, encompassing about 300,000 square kilometres, includes one of the last, largely undisturbed rangeland ecosystems in the world and provides habitat for numerous wildlife species, several of which are endangered and endemic to the Tibetan plateau. Rangelands in this Reserve can be categorised into three major types: alpine steppe, desert steppe, and alpine meadow. Rangelands are spatially heterogeneous ranging from patch to landscape scales in composition and productivity. Although limited in overall plant species' richness, the rangelands are nevertheless diverse and provide habitat for six wild ungulate species, as well as a variety of birds, small mammals, and large predators including the snow leopard and Tibetan brown bear. The six wild ungulates include: *chiru* or Tibetan antelope, Tibetan gazelle, Tibetan argali, blue sheep, the *kiang* or Tibetan wild ass, and wild yak. Tibetan gazelle are selective feeders, concentrating on forbs. Tibetan antelope, blue sheep, and argali are mixed feeders, consuming both graminoids and forbs while the wild yak and Tibetan wild ass consume mainly grasses and sedges. The Chang Tang is coming under increasing pressure from nomads and their livestock; illegal hunting, especially of Tibetan antelope; and the threat of oil-drilling and gold mining. Despite these pressures, the rangelands can continue to provide habitats for wildlife as well as pastures for livestock if properly managed. This will require innovative management plans that take into account the needs of the wildlife as well as the needs of the Tibetan herders and their livestock.

Conclusion

The fact that extraordinary wildlife populations still can be found on the rangelands of the Hindu Kush-Himalayas-Tibetan Plateau bears witness to the remarkable diversity and resilience of these ecosystems. Rangelands are coming under increasing pressure from an expanding human and livestock population, but, properly managed, they can continue to provide critical habitats for wild plants and animals as well as grazing land for livestock production. Conservation and development strategies for rangelands must aim to maintain the condition of the rangelands and protect biodiversity. To achieve this

goal, it will be necessary to design development programmes that take into account the needs of wildlife as well as the aspirations of the local people who share the rangelands with wild animals. Developing such programmes requires a much better understanding of the dynamics of rangeland ecosystems, increased knowledge of pastoral production systems, more thorough analysis of the constraints and opportunities for improving rangeland biodiversity, and modifications in policies and current approaches to management. These actions are crucial for conserving biodiversity and ensuring sustainable pastoral development in the face of growing threats from modernisation.

Rangeland Management and Wildlife Conservation in HKH

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Rangelands comprise over two million km within the Hindu Kush-Himalayan region (Miller 1995, 1997), including a large portion of the sub-alpine, alpine, and steppe-vegetated high elevation environments. These lands provide extensive pasture for domestic livestock. In more marginal areas (dry, rugged, high elevation with low plant coverage), however, rangelands are relatively rarely exploited by man and continue to constitute important habitats for wildlife. In areas where pastures are not heavily overexploited, many rangelands of the world characteristically permit a combined management of both livestock and natural ecosystem values, including wildlife conservation. Thus, for example, mountainous rangelands in the cattle and sheep country of parts of western North and South America still support populations of various wild ungulates. Likewise, the mountain rangelands of central Europe continue to host populations of ibex, chamois, and deer. Vast rangelands of Australia continue to maintain populations of kangaroos and many other wild herbivores.

Nevertheless, the demise of wild animal populations in many areas that have undergone profound changes in livestock development suggest that some similar changes will take place in the more productive rangelands of the Hindu Kush-Himalayas. The virtual elimination of wolves

and buffaloes and great reduction in the cougar, lynx, pronghorn antelope, and some wild sheep populations in western North America is a good example of this demise (Craighead 1991), as well as more recent changes in the dry African rangelands where Prins (1992) has argued for the incompatibility of livestock husbandry and wildlife. Thus, the directions in which governments and markets drive rangeland management and animal husbandry development in the Hindu Kush-Himalayas (Sabaerwal 1996) will have a profound effect on the continued existence and sustained viability of wild ungulates, other native herbivores, and their natural wild predators (Fox et al. 1994, Miller and Jackson 1994).

It is likely that, whereas the more rugged mountain areas (marginal rangelands) will be able to maintain a compatible livestock industry and wildlife populations, livestock development in more open and productive mountain basin regions, however, will have a significant and detrimental effect on some wildlife populations. These areas are more easily exploited both by livestock and by humans for pest (e.g., predator) removal and for meat/sport hunting. The continued coexistence of wildlife and man in the Central Asian highlands will depend greatly on the type of development livestock industries undergo and the nature of national

decisions regarding range management and biodiversity conservation.

The presence of wildlife on rangelands leads to several types of interaction between pastoral communities, domestic livestock, and the wild species of flora and fauna. Some of these interactions are listed below. Examples of significant species from the region are listed in Table 1.

The costs to animal husbandry due to wildlife include:

- Grazing competition (kiang, blue sheep, takin)
- Soil / pasture degradation (mouse-hare or 'rabbit rat', marmot)
- Predation (wolf, snow leopard, common leopard, *dhole*, brown bear, lynx)
- Disease transmission (spread of hoof and mouth disease via blue sheep)
- Fodder crop raiding (bear, wild boar, barking deer, goral, monkeys, blue sheep)

The economic uses of wildlife include:

- Fur industry (fox, martin, lynx; leopards and many small cats—now illegal)
- Skins for packing and floor rugs - not common today (all ungulates, cats)
- Wool industry (Tibetan antelope - 'shatoosh', currently significant illegal trade)
- Natural medicines (musk deer, leopard—bones, bear—bile, many other species)
- Meat (antelope, yaks, wild sheep & goats, most ungulates)
- Trophy hunting (most large-horned sheep and goats, some deer)
- Wildlife viewing (many species, but of limited use)

In Ladakh, India, livestock owners have received monetary compensation for grazing competition between the Tibetan wild ass or *kiang* and domestic livestock (Fox et al. 1991, N. Kitchloo, Wildlife Warden, pers. comm.). Blue sheep and takin populations have been reported by Bhutanese officials (this workshop) to be so dense in some areas that these populations raise concerns with regard to food competition with domestic sheep and yak. The pika or mouse-hare (rabbit-rat) is the target of large-scale eradication programmes on the plateaus of western China. Their burrowing habits apparently cause soil degradation, and they compete with livestock for forage (this workshop). Similarly, compensation programmes to livestock owners for animals lost to predators have been introduced in Ladakh, India (N. Kitchloo, pers. comm.), and in Mongolia (R. Jackson, pers. comm) but are fraught with problems of verification and equitable distribution of available funds.

In general, areas of concern associated with the interaction between animal husbandry and biodiversity conservation include the following.

- Livestock mortality due to predation
- Grazing competition between livestock and wild herbivores
- Soil degradation by mouse-hare and marmots
- Transmission of disease between domestic and wild ungulate populations
- Maintenance of wild populations (e.g., yak) as potential sources of genetic diversity for domestic breeds

The Hindu Kush-Himalayan region, including the Tibetan highlands, is comprised of an area of substantial wild ungulate diversity, and the path of development for pastoralism and rangeland use will greatly in-

Table 1: Mammalian Herbivores of the Sub-alpine, Alpine, and Steppe Rangelands of the Hindu Kush-Himalayas

Common Name	Scientific Name	Body Mass (kg)	Location
Large Herbivores (ungulates)			
Wild yak	<i>Bos grunniens</i>	850	Cn
Tibetan wild ass, or Kiang	<i>Equus hemionus kiang</i>	350	Cn
Marco Polo sheep	<i>Ovis ammon polii</i>	95	Cn
Tibetan argali	<i>Ovis ammon hodgsoni</i>	85	Cn
Tibetan gazelle	<i>Procapra picticaudata</i>	30	Cn
Tibetan antelope	<i>Pantholops hodgsoni</i>	35	Cn
Blue sheep	<i>Pseudois nayaur</i>	50	Cn,Cs
Asiatic ibex	<i>Capra ibex sibirica</i>	65	Cn,Cs
Ladakh urial	<i>Ovis vignei</i>	45	Cn,Cs,B
Markhor	<i>Capra falconeri</i>	65	Cs,B
Himalayan tahr	<i>Hemitragus jemlahicus</i>	80	Cs,B
Musk deer	<i>Moschus moschiferus</i>	11	Cs,Cn,B
Red deer (<i>Shou</i>)	<i>Cervus elephus wallichi</i>	150	Cn,B
Hangul or Kashmir stag	<i>Cervus elaphus hanglu</i>	125	B,Cs
Takin	<i>Budorcas taxicolor</i>	240	B,Cs
Goral	<i>Nemorhaedus goral</i>	27	B,Cs
Serow	<i>Capricornis sumatraensis</i>	25	B
Wild boar	<i>Sus scrofa</i>	32	B
Barking deer	<i>Muntiacus muntjak</i>	14	B
Urial	<i>Ovis orientalis</i>	35	B
Small Herbivores			
Wooley hare	<i>Lepus oiostolus</i>	2	Cn
Cape hare	<i>Lepus capensis</i>	2	B
Himalayan mouse-hare	<i>Ochotona roylei</i>	1	Cs,Cn
Large mouse-hare	<i>Ochotona macrotis</i>	1	Cn
Ladakh mouse-hare	<i>Ochotona ladacensis</i>	1	Cn
Long-tailed marmot	<i>Marmota caudata</i>	5	Cs,Cn
Himalayan marmot	<i>Marmota bobak</i>	5	Cs,Cn
Sikkim vole	<i>Pitymys sikimensis</i>	1	Cs,Cn
Murree vole	<i>Hyperacrius wynnei</i>	1	Cs
Royle's vole	<i>Alticola roylei</i>	1	Cs
Field mouse	<i>Mus sp.</i>	1	B,Cs,Cn

Source: Nomenclature according to Nowak and Paradiso 1983

Location symbols refer to elevation ranges, as follows:

- B = 500-3,000m;
 - Cs = 3,000-5,500m (south side of the Himalayas);
 - Cn = 3,000-5,500m (north side of the Himalayas).
- Probably extinct on the southern side of the Himalayas

fluence the conservation of this great variety of species. In many cases, such species are in direct competition with domestic ungulate livestock. Both wild sheep and goat (*Caprinae*) and deer (*Cervidae*) groups of wild ungulates apparently evolved some-

where between the Himalayan region and the Middle East (Geist 1987), and a wide array of primitive (e.g., goral, musk deer) to advanced (e.g., argali, red deer) species still occur in the region. Today, the higher reaches of the Hindu Kush-Himalayan re-

gion support over 30 species of wild ungulates (Table 1), providing a diversity within relatively short cross-sectional distances similar to that found over comparable areas on the African savannas. Some of these species occur in the dense forests of the lower Himalayas; but most are, at least in part, associated with forest and sub-alpine rangelands or high, dry non-forested alpine and steppelands. In addition, various species of smaller mammalian herbivores (Table 1) also significantly contribute to the ecosystemic dynamics of these rangelands, sometimes with deleterious consequences for human exploitation of pasturelands.

Threatened wild species, indigenous to the rangelands of the Hindu Kush-Himalayas, include the wild yak, Tibetan argali, Ladakh urial, Tibetan antelope, snow leopard, wolf, and brown bear. Other species are affected by land-use patterns associated with pastoralism — some are considered a menace to livestock husbandry. These include small herbivores such as the pika, marmot, and hare, as well as large herbivores such as the Tibetan wild ass, Tibetan antelope, Tibetan gazelle, blue sheep, and Asiatic ibex and predators such as the wolf, wild dog (*dhole*), and lynx. Note that today, while large predator and wild ungulate numbers continue to dwindle in the Hindu Kush-Himalayas, they have been or are currently being re-established in the mountain rangelands of North America (e.g., the wolf in Yellowstone) and Europe (e.g., the ibex and lynx in the Alps). Timely efforts to maintain the existing, large mammal biodiversity can help avoid expensive re-establishment programmes in the future.

At present, some 10 per cent of the Hindu Kush-Himalayan region has been legally designated as protected areas for nature conservation (Green 1993; 1994). The vast majority of these parks and reserves

are situated in mountain rangelands. The spectacular alpine scenery of mountain conservation areas does not generally constitute the most productive habitats and for that reason can be relatively more easy to protect from human alteration than tropical areas. However, because of their low productivity, these habitats often require large areas to maintain viable populations of wildlife.

The management of protected areas and their surrounding lands, both for wild species and the maintenance of pastoral systems, has recently become a major concern of conservationists in the Hindu Kush-Himalayan region. This shift represents an important advance in outlook that has taken place over the past several decades. Whereas the conservation management prescriptions for these areas are still being derived, especially with regard to traditional human land uses, it is clear that national imperatives associated with conservation and tourism will demand management to maintain some definition of 'natural' wild plant and animal communities in such protected rangeland areas, as well as in healthy rangelands outside legally designated protected areas. This requires a sound understanding of the interaction between livestock husbandry and both forage pastures (plant food species for livestock) and wild animal species to ensure effective management. Unfortunately, our knowledge of the functioning of these rangeland ecosystems and their likely reactions to imposed changes is quite limited. Specifically, such ecosystem questions have rarely been addressed when considering either proposed livestock development programmes or nature conservation programmes. In situations in which these concerns overlap, such questions are virtually non-existent. This needs to change.

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