



Diversity and population status of *Ursus arctos* in Pakistan

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Received: 05 March 2012

Revised: 05 March 2012

Accepted: 16 March 2012

Key words: Pakistan, brown bears, population size, national parks, conservation.

Abstract

Brown bears (*Ursus arctos*) are poorly studied in Pakistan and historically, it was found in the entire range of the mountains of northern Pakistan, in a total area of 150,000 km², but in the past 50 years its population size are declining and have gone extinct from some areas. Brown bears are now distributed over 3 major mountain ranges and 4 intermountain highlands. Bears are legally protected, however, and recently designated as critically endangered in IUCN's Red List of Mammals of Pakistan. Seven populations probably persist in the Himalaya, Karakoram, and Hindu Kush ranges; the Deosai Plateau in western Himalaya hosts the only stable population. Seven national parks and many wildlife sanctuaries and game reserves, which provide legal protection to bears, have been established in the northern mountains of Pakistan. Growing human population, expanding infrastructure, increasing number of livestock, and increasing dependency on natural resources, particularly alpine pastures, are key threats. Poaching for its commercial parts and for cubs and growing unmanaged tourism also contribute to population decline. The population has become conservation dependent, and actions like effective management of protected areas, better management of natural resources, and environmental education need immediate attention.

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Introduction

The *Ursus arctos* commonly known as brown bear is distributed across northern Eurasia and North America. It can weigh from 300 to 780 kilograms and its largest subspecies, the Kodiak bear, rivals the polar bear as the largest member of the bear family (Erdbrink, 1953) and as the largest land-based predator (Dexel, 2002). Brown bears are thought to have evolved from *Ursus etruscus*, the oldest fossils occur in China from about 0.5 million years ago. They entered Europe about 250,000 years ago, and North Africa shortly after. Brown bear remains from the Pleistocene period are common in the British Isles, where it is thought they out-competed cave bears (McLellan and Reiner, 1994). 16 subspecies of brown bear have been recognized in the world (Wozencraft, 2005). In Pakistan two sub species *Ursus arctos isabellinus* (Himalayan brown bear) and *Ursus arctos syriacus* (Syrian brown bear) have been reported (Heptner and Naumov 1998).

Worldwide, numbers and distribution of brown bears have declined by about 50% during the past 100 years (Servheen, 1990). There are about 200,000 brown bears in the world and it remains listed as a least concern species by the IUCN (2008). The largest populations are in Russia with 120,000, the United States with 32,500, and Canada with 21,750. About 95% of the brown bear population in the United States is in Alaska. In Europe, there are 14,000 brown bears in ten fragmented populations (Stonorov and Stokes, 1972). They are extinct in the British Isles. Brown bears were once native to Asia, the Atlas Mountain in Africa, Europe and North America, but are now extinct in some areas, and their populations have greatly decreased in other areas (Allan et al. 1974). In Asia, brown bears are found in most of Russia, parts of the Middle East, and in a small area of China. They are also found in Pakistan, Afghanistan and India (Can and Togan, 2004; Mishra and Fitzherbert, 2004).

The brown bear is nocturnal, but are not full hibernator and can be woken easily; both sexes like to den in a protected spot, during the winter months. Brown bears are mostly solitary, although they may gather in large numbers at major food sources and form social hierarchies based on age and size. During combat, bears use their paws to strike their opponents in the chest or shoulders and bite the head or neck (Seryodkin *et al.*, 2005).

The mating season is from late May to early July. Being serially monogamous, brown bears remain with the same mate from several days to a couple of weeks. Females mature sexually between the age of 5 and 7 years, while males usually mate a few years later, when they are large and strong enough to successfully compete with other males for mating rights. Cubs remain with their mother from two to four years. Brown bears practice infanticide (Eva *et al.*, 2006). An adult male bear may kill the cubs of another bear either to make the female sexually receptive or simply for consumption.

They are omnivores and feed on a variety of plants and animals. They derive up to 90% of their dietary food energy from vegetable matter, but also occasionally prey on mammals, such as deer, sheep, goats, bison and muskoxen (French and French, 1990).

Bears become attracted to human-created food sources, such as garbage dumps, litter bins, and dumpsters; they venture into human dwellings or barns in search of food as humans encroach into bear habitats. Placing a bear in habitat used by other bears may lead to competition and social conflict, and result in the injury or death of the less dominant bear (Kerry *et al.*, 2002).

Brown bears seldom attack humans on sight, and usually avoid people. They are, however, unpredictable in temperament, and will attack if they are surprised or feel threatened.

Materials and methods

Study area

The study area of brown bear's distribution in Pakistan consists of the Northern Areas (NAs), the eastern part in the state of Azad Jammu and Kashmir (AJK) and the southern and western part of Khyber Pakhtunkhwa. The study area is rough and mountainous and lies in altitudinal range of 1,000m in the south and rise above 6,000m in the north above mean sea level. The landscape is characterized by the Western Himalaya, the Karakoram, and the Hindu Kush, and the north– south oriented intermountain highlands of the Hindu Raj, the Swat Kohistan, the Indus Kohistan, and the Kaghan-Neelam (Woods and Kalpatrick, 1997). Climatic conditions vary widely in the study area, ranging from arid and semi-arid cold desert in west to the monsoon-influenced moist temperate zone towards east. Annual temperatures in valleys may vary between 210°C to 40°C. Vegetation zones are mainly represented by alpine desert, alpine meadows, scrub, and coniferous forests. Human settlements, roads, and irrigated cultivation are concentrated along the valley bottoms. Between 2000–3000 m are summer villages, with summer pastures and crops. Alpine pastures start about 3,000 m and go up to the snow line, usually at 5,000 m (Ehlers and Kreutzmann 2000, GoP and IUCN, 2003).

Methods

Information was gathered through field surveys, interviews, and secondary data. Primary data were collected in the field. Line transects of 08–13 km long were placed to record sightings and signs of brown bears. The data were also obtained from the Wildlife Departments in the study area. During the survey the oral interviews were taken from the local people in different localities. The additional secondary information were taken from published and unpublished literature. Pakistan topographical maps were used to estimate potential brown bear habitat in Pakistan.

Results

Historically *Ursus arctos* occupied the western Himalaya, the Karakoram, the Hindu Kush, the Pamir, the western Kunlun Shan, and the Tian Shan ranges in southern Asia. In Pakistan *Ursus arctos* ranged over the approximately 150,000 km² northern part of the country. They have been reported in several localities in the western Himalaya. Their presence was also recorded in peripheral valleys, high meadows, and glaciers in the Karakoram, Hindu Kush, and Pamir ranges (Roberts, 1997).

In Himalaya, the brown bears mainly inhabit alpine and sub-alpine zones between 2,600 and 5,000 m (Sathyakumar, 1999). Their primary habitats in spring and fall are coniferous forests and alpine meadows in summer. Alpine meadows are limited in the southern part of the range of brown bears in Pakistan, but forests become more prevalent, for instance in the Neelam and Kaghan valleys, where brown bears are sympatric with Asiatic black bears. Dominant tree species are *Pinus wallichiana*, *Abies pindrow*, *Picea smithiana*, and *Cedrus deodara*. Broadleaved species includes *Aesculus indica*, *Ulmus wallichiana*, *Juglans regia*, *Quercus floribunda*, *Quercus semicarpifolia*, *Acer caesium*, *Betula utilis* and *Prunus cornuta*.

Population status

Brown bears have been extirpated from the majority of their historical range in Pakistan and currently exist only in small pockets. Their population size is approximately 120–160 individuals. The present population status of brown bear in Pakistan is given in Table 1.

In Northern Areas three populations and five sub-populations were identified. The Himalayan population is the largest, followed by the Karakoram population, whereas the Hindu Kush population is very small.

Table 1. Distribution and population size of brown bear in Pakistan in 2011.

Area	Population	Sub-population	localities	Numbers	Status
Northern Areas	Himalayan	Deosai National Park	Karabosh, Dhappa, Shilla, Shagarthang, Bubind, and Chillam.	35	Declining
		Minimerg,	Burzil Pass, Shaban Top, Gultari, Minimerg, and Kamri.	12	Declining
		Nanaga Parbat	Babusar Pass, Raikot Valley, Astore Valley, and Rattu, Kalapnai	08	Declining
	Karakoram	Central Karakoram National Park	Shigar, Baraldu, Baltoro Glacier, Nagir, Chaprote, Bar Nallah, Biafo, Panmah glaciers, Bar Valley	20	Declining
		Khunjerab National Park	Barakhun Nullah, Khunjerab Pass, Sherlik area near Oprang River, Kilik, Minteka, and Khunjerab Nullah	13	Declining
	Hindu Kush	Ghizar		6	Declining
		Karambar		2	Declining
Kashmir		National Park	Gumot, Shontar, and Gurez valleys, Kel and Surgun Valley	15-20	Declining
Khyber Pakhtunkhwa Province		Tirch Mir	Turkho and Yarkhun	12	Declining
		Chitral	Chitral Gol National Park		Extinct
		Kalam		05	Declining
		Indus Kohistan	Palas Valley and adjacent areas	04	Declining
		Kaghan		10	Declining
		Siran Valley			Extinct
		Battagram		02	Declining

The western Himalaya in Northern Areas hosts three subpopulations, the Deosai National Park (DNP), Minimerg, and Nanaga Parbat. The largest subpopulation was found in Deosai National Park with 35 individuals, occupies the main Deosai Plateau and surrounding valleys: Karabosh, Dhappa, Shilla, Shagarthang, Bubind, and Chillam. The Minimerg subpopulation exists east of the Deosai along the line of control (LOC), and covers the localities of Burzil Pass, Shaban Top, Gultari, Minimerg, and Kamri. A total of 12 individuals were reported in Minimerg. The third subpopulation of Himalaya is present around the slopes of the Nanga Parbat Peak, including localities

such as Babusar Pass, Raikot Valley, Astore Valley, and Rattu, Kalapnai. Sum of 8 individuals were reported in this area.

In Karakoram Range two subpopulations of brown bears were found in Central Karakoram National Park (CKNP) and Khunjerab National Park (KNP). In Central Karakoram National Park brown bears 20 bears were reported from Shigar, Baraldu (Ho Nala), and Baltoro Glacier and Nagir, Chaprote, Bar Nallah, Biafo and Panmah glaciers, and also from the Bar Valley. In Khunjerab National Park, 13 bears have been reported from Barakhun Nullah, Khunjerab Pass,

Sherlik area near Oprang River, Kilik, Minteka, and Khunjerab Nullah.

The third population exists in the Hindu Kush Range, with 3 declining and 1 extinct subpopulations. 6 bear were reported from the Karambar Lake, located at the source of the Karambar River, behind the Chiantar Glacier, close to the border with Afghanistan (Wakhan Corridor). In the Gizer area, 2 bears exist in the Gizer Valley.

Northern Kashmir is restricted to the Neelam Valley. Alpine and sub-alpine pastures are 2 major categories of the land use in this area, where the habitat is under heavy grazing pressure and over time the productivity and biodiversity has declined. Brown bears are unlikely to inhabit areas south of Gumot National Park because there is no suitable habitat available. Presently they occupy only the northern part of this valley including the Gumot, Shontar, and Gurez valleys, and the Kel Area. Two bears were seen in the Surgun Valley and two bears in the Gurez Valley. The brown bear population is estimated at 15–20 individuals in this valley.

In Khyber Pakhtunkhwa the Brown bears are restricted to northern parts of the Province. Brown bears occupy the Hindu Kush Range in the northern part of the Chitral District, the Kalam area in Swat Kohistan, Kaghan Valley, and Pallas Valley in Indus Kohistan (Arshad 2003). There are 3 populations (Kalam, Indus Kohistan, and Kaghan) and 2 subpopulations (Tirch Mir, Chitral) of the Hindu Kush population in Khyber Pakhtunkhwa. A population reported from Siran valley in Hazara, and the subpopulation in Chitral Gol National Park are extinct (Schaller 1977, Mirza 2003). Their number in District Battagram was only 2. A small subpopulation of Tirch Mir still persists in the headwaters of Yarkhun and along the Afghan border. Fulton (1903) reported that brown bears were common in Turkho and Yarkhun valleys, and also Schaller (1977) observed some signs in this area. Local staff of the IUCN's Mountain Areas Conservancy Project

(MACP) project also believes some bears are surviving in this area.

Discussion

Brown bears in Pakistan are declining due to loss of habitat and fragmentation, human-induced mortality, commercial poaching for the sale of bear parts, bear baiting, and poaching of bear cubs for sale to gypsies.

Pakistan became the world's ninth most populous country in 1994, and, at 2.1% per year in 1998, has one of the world's highest population growth rates (Population Census Organization 2001). The population has reached 142.5 million, from 16.6 million in 1901, and is projected to double by 2035 (Faizunnisa and Ikram 2002). The environmental consequences of rapid population growth are pervasive, and the increases in demands for natural resources and their subsequent depletion have many consequences for bears and other wildlife. Forests are being cut for timber and firewood and cleared for increasing areas for cultivation. Bear utilize alpine meadows more than any other vegetational zone in NAs, where they constitute around half of the available land. However, in NAs such meadows have experienced accelerated transformation in the last 2 decades (Kreutzmann 1991, 1995). This has resulted in an obvious numeric and spatial expansion in nomadic and transhumance grazing in alpine pastures.

Hunting has been a traditional practice in most of the bear range in Pakistan. Increasing accessibility and number of vehicles has increased the hunting of wildlife. As a consequence, bears and other large mammals have been largely eliminated in the areas near settlements. Despite the ongoing protection efforts in areas like Deosai National Park, human-induced mortality continues and a minimum of 09 bears were killed in the 10-year period 2001–2010, (3 males, 4 females, and 2 cubs). Bears have been hunted for sport (usually by military officers), persecuted by villagers who feel their livestock is threatened, and

more recently killed for commercial purposes. Female bears are also killed to capture their cubs for sale to gypsies. Cubs of the year are preferred, as they are easy to train for bear displays and baiting events. Nomad graziers (gujjars), who travel all the way from the plains to the mountains with their livestock, are known to be involved in this business in addition to other illegal activities, like collection of medicinal plants. Graziers are suspected to transport poached wildlife down to the plains.

Brown bears are potentially threatened by impacts of climate change. Potential threats include loss of habitat, decline in food supply, habitat shift to non-protected areas, and increased competition with humans. The major habitat of brown bears in Pakistan is the alpine cold desert zone that lies in the alpine tundra biome. The computer simulation model BIOME3 predicted changes in the size and location of forest ecosystems and biomes of Pakistan under the influences of climate changes (increase in temperature and rainfall scenarios) in the year 2020 and 2040–50 (Hagler Bailly Pakistan 1999). In general, the model predicted a positive effect on the forests of Pakistan, but alpine tundra, which covers about 6.8% of the total area, would be reduced to 4.6% by the year 2020. A northward and upward shift of all biomes is predicted. The coniferous biome is expected to expand at the expense of alpine tundra. Brown bears already suffering habitat degradation and fragmentation by anthropogenic activities will face further shrinkage of habitat, and this could have serious consequences on their survival.

Pakistan has ratified the Convention on Biological Diversity (CBD), and as a follow up, developed the National Conservation Strategy (NCS) and Biodiversity Action Plan (BAP) for environmental protection and biodiversity conservation. Wildlife conservation is the responsibility of the provinces in Pakistan, and each province has its own legislation, which is implemented by its respective wildlife or forest department. The

brown bear range in northern Pakistan is managed by 3 provincial departments: the NAs Forestry, Parks and Wildlife Department; the Khyber Pakhtunkhwa Wildlife Department; and the AJK Department of Fisheries and Wildlife. The National Council for Conservation of Wildlife (NCCW) in the Federal Ministry of Environment, Local Government and Rural Development is responsible at the national level for the coordination of the provincial conservation programs in order for Pakistan to fulfill its international obligations and agreements regarding biodiversity conservation.

Three wildlife laws are effective in northern Pakistan: the Azad Jammu and Kashmir Wildlife Act (1975), the Northern Area Wildlife Preservation Act (1975), and the Khyber Pakhtunkhwa Wildlife (Protection, Preservation, Conservation and Management) Act (1974). These acts provide the basis for the creation of protected areas in 3 fundamental categories: national parks, wildlife sanctuaries, and game reserves. All provinces have made considerable process in the establishment of protected areas (PAs) that provide legal cover for the protection and conservation of a variety of wildlife; 7 national parks, 8 wildlife sanctuaries, and 10 game reserves have been established in brown bear range in Pakistan. These PAs cover the majority of the existing brown bear populations and provide them with legal protection against hunting and other threats. However, except for a few of those areas including the DNP and the KNP, which are effectively managed, these PAs unfortunately just exist on paper. They were created haphazardly and face problems like weak law enforcement, poor institutions and infrastructure, and lack of adequate resources. Among a total of 25 PAs in northern Pakistan, 16 lack basic baseline information, 22 do not have any management plan, and 19 are without any management infrastructure.

Recommendations

The bear population in Pakistan has shrunk radically and continues to decline in its entire range. Immediate efforts are needed to ensure its long-term survival, which will be more effective if taken jointly by the state departments, non-governmental organizations, research institutes, and communities.

Because most existing bear populations are covered either by the PAs or conservancies, there is no need to create additional protected areas, at least in the short term. However, with limited financial resources and ineffective protection and management systems, these PAs carry little meaning. The World Conservation Union (World Conservation Union, 2000) reviewed PAs of Pakistan, and through a process of wide consultation (Ghazali and Khairi, 1994) developed a comprehensive action plan framework for strengthening the PAs system and improving its efficiency. The framework identifies priorities for actions and investment, sets definable and measurable goals, and can be smoothly integrated into long-term national policy. The only thing lacking is its implementation and adoption by the concerned departments and authorities.

Environmental education is an important instrument to change perceptions and attitudes. Launching education and awareness initiatives that cater to local communities, staff of the PAs, visitors, and the general public can bridge the knowledge gap and be vital to achieving synergy in conservation efforts. Trophy hunting in Pakistan is an increasingly popular tool for conservation through community participation. The trophy hunting program has been effective in rehabilitating populations of wild ungulates; however, its contribution to the conservation of biodiversity as a whole is limited. The programs' impact on bears is perhaps neutral, while other predators like snow leopards and wolves have been negatively affected (Hussain, 2003). This pro-gram can play a significant role if conservation of carnivores is integrated in the

approach. Human population growth, infrastructure development, forest depletion, and many other related factors have consequences for the bear population. The growth in number of livestock and increasing dependency on alpine pastures is the major threat to bears, and increasingly generates human–bear conflicts. Appropriate management of this issue will largely determine the future of this species in many areas.

Management of the Himalayan brown bear on an international scale is central to ensure its survival in the long run. The Neelum Valley and the Pamir Knot are two ideal venues for cross-border cooperation for conservation. The Neelum Valley has been designated as a conservancy and a proposal is being worked out to create two new protected areas in its northern segment (Gugai and Gurez National Parks).

Deosai National Park should remain the focus of conservation efforts, because the future of the brown bear in the country will largely depend on stability in this park. It is important to work simultaneously on improving habitat quality in Deosai and on improving its connectivity with neighboring populations. Better connectivity will protect populations from inbreeding depression and will increase the colonization rate in the Himalaya. Suitable corridors in the range should be identified and maintained to facilitate dispersal.

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