

PROTECTED AREAS AND SNOW LEOPARDS: THEIR DISTRIBUTION AND STATUS

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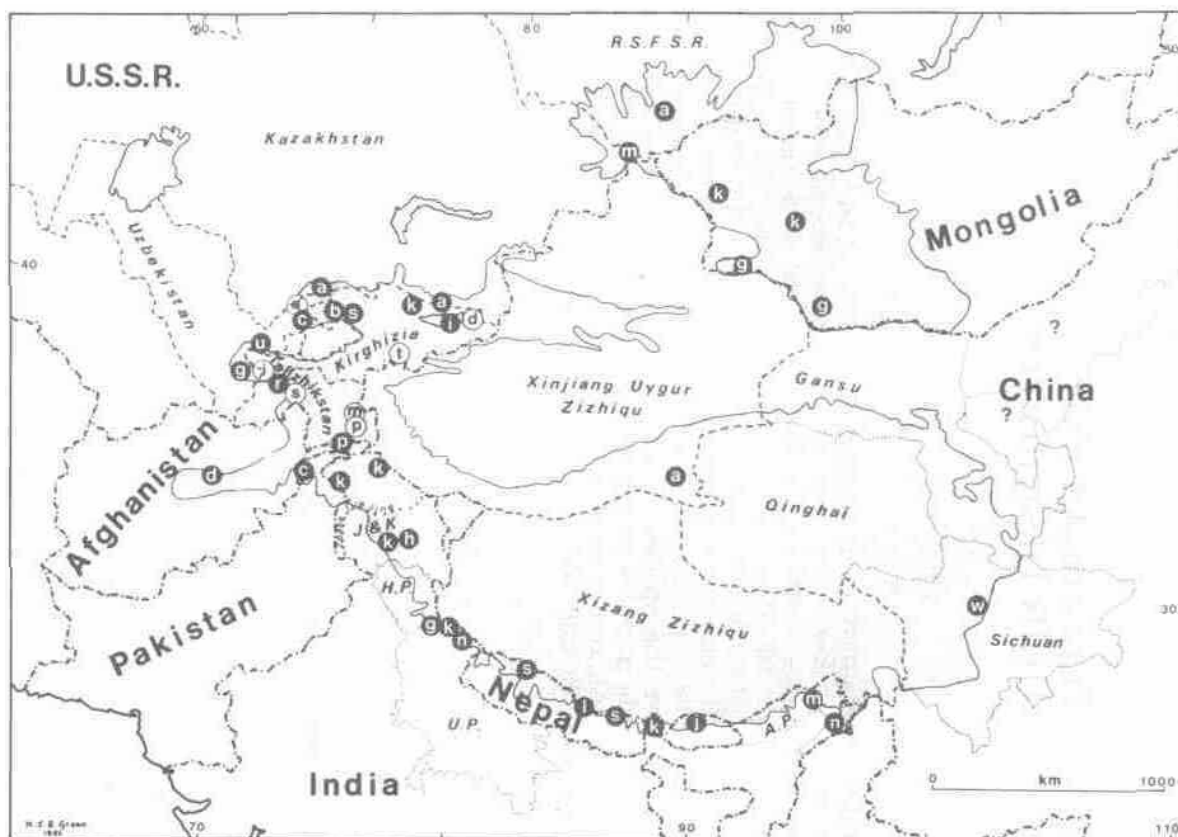
Considerable efforts have been devoted to conserving the snow leopard *Panthera uncia* in recent years but progress has inevitably been slow due to the difficulties of studying a sparsely distributed, secretive and endangered species in often isolated, mountainous terrain. Although knowledge about the species' overall distribution in the highlands of Central Asia still remains fragmentary, it is important to briefly examine the available information in order to review measures taken to date to conserve the species through the protected areas network. The purpose of this paper is to examine the distribution and status of protected areas, inhabited (or visited) by snow leopard in relation to the species' distribution and highlight deficiencies in the present network.

METHODS

Recent literature was examined in order to estimate the present distribution of the snow leopard. Information about protected areas was obtained from IUCN's protected areas database held at the Conservation Monitoring Centre in Cambridge.

DISTRIBUTION AND CONSERVATION

The approximate distribution of the snow leopard is shown in Figure 1, together with the locations of



protected areas in which the species is present. Details of individual protected areas are given in Table I.

FIGURE 1. Approximate current distribution of the snow leopard (shaded area) and of protected areas (> 10,000 ha) in which the species is present. Protected areas are denoted by solid circles or, in the case of temporary reserves (zakazniki) in the U.S.S.R., by open circles. The letter of the alphabet within each circle corresponds to the first letter of the name of the protected area given in Table I.

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TABLE I. List of protected areas existing in 1986 in which the presence of snow leopard is reliably confirmed.

COUNTRY	Name of Protected Area	Year of establishment	Size ha	Status of snow leopard (Authority)
AFGHANISTAN (Total)		(107. 1978	40 938)	Present (Abdul Haq in Habibi. 1977, Sayer arid vanderZon. 1981]
	Dara-i-Ajar (Ajar Valley)		,000	
	Wildlife Sanctuary Pamiir-I-Buzurg (Big Pamiir) Wildlife Sanctuary	1978	67.938	
BHUTAN (Total)			(781.300]	Present [Sayer and van der Zon, 1981; Petocz. 197S)
	Jigme Dorjil Wildlife Sanctuary	1974	781.300	
CHINA (Total)			(4.700.000]	Common (Blower. 1986)
Gansu Province				
	Nel Monggol Zlzhiqu (Inner Mongolian Autonomous (Region)			no information
	Ningzia-Hui Autonomous Region			no Information
Qinghai Province				
Sichuan Province (Total)				
	Wolong Nature Reserve	1975	(200.000) 200.000	Present [Schaller et al., 1985)
Xinjiang Uygur Zlzhiqu (Total) (Sinkiang Uighur Autonomous Region)				
	Arjin Mountain Nature Reserve	1983	4,500.000	Present (Butler et al., 1986)
	Xizang Zlzhiqu (Tibet Autonomous Region)			no Information
INDIA (Total)				
	Arunachal Pradesh (Total)		624,127 180, 782	
	Namdapha National Park	1972	180,782	
Himachal Pradesh				

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COUNTRY Name of Protected Area	Year of e establishment	Size ha	Status of snow leopard (Authority)
Jammu & Kashmir (Total)		(102,500)	
Hemals High Altitude National Park	1981	60,000 42,500	Relatively common (Mallon, 1984a; J.L. Fox, pers. comm.)
Kishtwar National Park	1981		Present [Kurt, 1976; Mallon, 1984)
Sikkim [Total]		85,000	
Khangchendzonga National Park	1977	85,000	Present [Government of Sikkim, 1981)
Uttar Pradesh (Total)		255,845	
Govind Pashu Vihar	1955	95,312	Present [Dang, 1967; Chandola, 1984)
Kedarnath Sanctuary	1972		Present, (Green, 1982)
Nanda Devi National Park	1982	63,033	Present (Dhang, 1961; Khachet, 1979; Green 1982)
MONGOLIA (Total)		5,423,900	
Great Gobi Desert National Park	1975	5,300,000	Present, (Mallon, 1984b)
Kh. isagt-Khayrkhan Nature Reserve	1965 1995)	33,000	Present, (Borisov et al
Khuhtsyrh Reserve	1977	90,900	Present, (Dzieciolowski et al 1980)
NEPAL (Total)		773,800	
Dhorpatan Hunting Reserve		132,500	Present, (Jackson, pers. comm.)
Langlang National Park	1976	171,000	Some evidence, (Green, 1981)
Sagarmatha National Park*	1976	114,800	Probably present, (Jackson, pers. comm.)
Shey-Phoksundo National Park	1984 (Schaller, 1977, Jackson, 1979, Jackson and Ahlborn, 1984, 1986)	355,500	Relatively common,

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COUNTRY Name of Protected Area	Year of establishment	Size ha	Status of snow leopard (Authority)
PAKISTAN (Total)		(319.001)	
North-West Frontier Province (Total)		[7.7801	
Chilral Gol National Park	198	7.780	Present (Schaller. 1976. 1977] - not resident (Malik. 1985]
4		(311.221)	
		44.308	Present (Schaller, 1977)
Northern Areas (Total) Kargah			
Wildlife Sanctuary			
	1975		
Khunjerab National Park	1975		Present (Schaller. 1974. 1977]
266.913			
U.S.S.R. (Total] Kazakhstan		(2.087.089)	
S.S.R. (Total)		(237.335)	
Aksu-Dzhabagly State Nature Reserve	1927	74,416	Present (Andrhiskevicius. 1980; Braden, 1982; Borodin and Syroechkovskl. 1983]
Alma-Alinskiy State	1931		Present (Andruskevicius. 1980; A.A. Sludskiy in Braden. 1982) - rare (Borodin and Syroechkovski. 1983)
91.552			
Nature Reserve			Present [Borodin and Syroechkovski. 1983)
Markakol'skiy State	1976		
71.367			
Nature Reserve			Present (Borodin and Syroechkovski. 1983)
Kirghizia S.S.R. (Total)		(151.978)	
Besh-Aral'skly State	1979	18.200	Present (V.V. Pokrovskiy in Braden. 1982) - few (Andriuskevicius. 1980)
Nature Reserve			
Issyk-Kul'skly State	1948		Present (Andriuskevicius, 1980; V.V. Pokrovskiy in Braden, 1982; Borodin and Syroechkovski. 1983)
17.310			
Nature Reserve			
Saiy-Chelekskiy State	1959		Present (Nikolaevskly. 1985)
23.868			
Nature Reserved			
Kirgizskiy State Nature	1976	19.400	
Park 'Ala-Arch a'			
		31.100	
Dzhety-Oguxskiy	1958		
Zoological (Hunting) Sanctuary			
COUNTRY			
Name of Protected Area			
	Year of	Size	Stains of snow leopard
	establishment	ha	(Authority)

Teploklyuchenskiy 32.100 Zoological (Hunting) Sanctuary	1958		Present (Shalybkov and Storchevoy, 1985)
Toguz-Torouskiy Zoological (Hunting) Sanctuary	1977	10,000	Present (Shalybkov and Storchevoy, 1985)
R.S.F.S.B. (Total)		(863.728)	
			Present (V.A. Shilov and V.V. Baskalov in Braden. 1982) - very rare (Borodin and Syroechkovski. 1983)
Tadzhikistan S.S.R. (Total)		(665.739)	
Iskarderkul'skiy Zoological Sanctuary	1970	30.000	Present (Shalybkov and Storchevoy, 1985)
Muzkul'skiy Zoological Sanctuary	1972	68,000	Present (Shalybkov and Storchevoy, 1985)
Pamirskiy Zoological Sanctuary	1974	500.600	Present (Shalybkov and Storchevoy. 1985)
Ramit State Nature Reserve	1959	16,139	Present (Braden. 1984) - rare (Borodin and Syroechkovski. 1983)
Sangvorskly Zoological Sanctuary	1972	51.000	Present (Shalybkov and Storchevoy. 1985)
Uzbekistan S.S.R. (Total)		(168,309)	
Akbulakskiy State Sanctuary	1973	12.600	Present (Shalybkov and Storchevoy. 1985)
Chatkal'skiy State Nature Reserve	1947	35,809	Present (Bannikov. 1969; Andriuskevicius. 1980; Lustin/Korelov in Braden. 1982)
Gissarskiy State Nature Reserve ¹	1984	87,500	Present (Borodin and Syroechkovski, 1983)
Uzbekistan S.S.R. National Park	1978	32.400	Present (Nikolaevskly, 1985)
Total		14.817.155	

* World Heritage Site

^t Biosphere Reserve

¹ Consists of the former Kyzylsuyskly and Mirakinskly state nature reserves of 30.094 ha and 46.795 ha. respectively.

COUNTRY Name of Protected Area	Year of establishment	Size ha	Stains of snow leopard (Authority)
Teploklyuchenskiy 32.100 Zoological (Hunting) Sanctuary	1958		Present (Shalybkov and Storchevoy, 1985)
Toguz-Torouskiy Zoological (Hunting) Sanctuary	1977	10,000	Present (Shalybkov and Storchevoy, 1985)
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Afghanistan

The snow leopard occurs in several widely scattered localities in the Pamirs and Hindu Kush of northeastern Afghanistan. Its distribution has

been estimated by Hassinger (1973) and more recent information is documented by Habibi (1977). Sayer (1980). and Sayer and van der Zon (1981). The size of the population is not known, but Rodenburg (1977) estimated that 70-80 snow leopard pelts were traded annually in the Kabul bazaar, in view of the ongoing guerilla activities, prey species are probably being decimated to the detriment of the snow leopard population, which most likely is becoming significantly fragmented.

In addition to being present in Dara-i-Ajar and Pami-i-Buzurg wildlife sanctuaries, the species occurs in the proposed Nuristan National Park, northeast of Kabul and bordering on Pakistan (Sayer and van der Zon, 1981). At present, however, there is no legislative basis for the creation and management of a system of protected areas.

Bhutan

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The entire high Himalaya of northern Bhutan, throughout which the snow leopard ranges (Gee. 1967). is contained within Jigme Dorji Wildlife Sanctuary. This is probably the most secure area in the Himalaya for the species (Jackson. 1981). The snow leopard appears to be relatively common but its habitat is being seriously degraded in some areas through grazing by livestock and burning (Blower. 1986).

The existing legislation covers most of the essential requirements of environmental conservation, but it contains serious omissions with respect to such matters as the criteria for different categories of protected area and procedures for their establishment and management. New legislation entitled Bhutan Wildlife (Protection) Act 1985 has been drafted and is presently under review (Blower. 1986).

China

In China, the snow leopard's distribution extends from the Tibetan Plateau through Qinghai Province to the western parts of Gansu and Sichuan provinces. It is also present in the Tien Shan, Pamir and Altun Shan of Xinjiang Uygur Zizhiqu (Sinkiang Uighur Autonomous Region)(Blomqvist. 1978). In a more detailed and up-to-date account of the species' distribution in China, Liao Yanfa and Tan Bangjie (this volume) provide evidence which suggests that it may also occur in the Helan Shan of northern Ningxia-Hui and in the Yin Shan of central Inner Mongolia.

The present network of protected areas in China, particularly in the mountains of northwestern China and the Tibetan Plateau (important snow leopard habitat) is recognized as being inadequate (Wang. 1980). In Sichuan Province, in the easternmost part of its dis-

tribution, the species occurs in Wolong (Schaller et al., 1985). one of several nature reserves established in the 1970s specifically for the protection of the giant panda *Ailuropoda melanoleuca*.

A number of nature reserves have been established in more recent years (Chen, 1985), including the Arjin Mountains in Xinjiang. which is China's largest nature reserve and the only protected area in the world representative of the northern Tibetan Plateau region. Snow leopard are reported to occur throughout the reserve wherever suitable prey species (argali Ovis *ammon*, bharal Pseudois *nayaur* and domestic sheep) are present (Butler et al., 1986). There are proposals to establish another large reserve of 1,000,000 ha in Xinjiang. adjacent to Pakistan's Khunjerab National Park, where the species is present (Schaller, 1974).

India

The snow leopard occurs along the northern border of India in

Jammu and Kashmir. Himachal Pradesh. Uttar Pradesh. Sikkim and Arunachal Pradesh.

Jammu and Kashmir: Few snow leopard remain in the mountain ranges surrounding the Vale of Kashmir (Green, 1982). The species may still be found on the southern slopes of the Himalaya in Kishtwar District (Mallon, 1984a). It is also reported by S. Chundawat and W. A. Rogers (pers. comm.) to be present in adjacent areas proposed as an extension to Dachigam National Park (14,100 ha), but is unlikely to survive in the national park itself. Holloway (1970) saw a snow leopard in lower Dachigam Valley in February 1970. At that time, an estimated six snow leopards were present in Dachigam, the population having declined from 10-12 prior to 1947 (Holloway and Wani, 1970). These data are based on reports from an experienced shikari (C.W. Holloway, pers. comm.) but may not be totally reliable. Apparently, neither that shikari, nor his father before him, has ever seen snow leopard in Dachigam (R.M. Jackson, pers. comm.).

The species occurs throughout Ladakh. It is probably locally common, especially in remote valleys inhabited by bhral but not man. Numbers do not appear to have greatly declined over the last few decades, except in the Suru Valley-Kargil area where there has been considerable hunting (Osborne et al., 1983; Mallon, 1984a). The total population in Ladakh has been estimated at 100-200 snow leopard (Mallon, 1984a), but at least twice this number can reasonably be expected to be present (R.M. Jackson, pers. comm.). A number of protected areas are in the process of being established in Ladakh by the Jammu and Kashmir Wildlife Protection Department. In addition to Hemis High Altitude National Park, where a snow leopard was observed at a kill in 1986 (J. L. Fox, pers. comm.). Rizong Karakorum (Nubra-Shayok) Wildlife Sanctuary (500,000 ha). Cold Desert Wildlife

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Sanctuary (400,000 ha) and several other protected areas with snow leopard have recently been proposed.

Himachal Pradesh: To the north, the species is widely distributed throughout Lahul and Spiti District (Mallon, 1984a), where it is thought to be locally common, particularly in Spiti. It also occurs in Kinnaur District to the southeast (Chandola, 1984). No sign or recent reports of snow leopard were found during surveys of the upper Ravi, Beas and Sutlej catchments in 1978-1980 (Gaston et al., 1983). The species was thought to have become locally extinct in the upper Beas Valley, having last been seen around Manali in 1965 (Gaston et al. 1983). but this may not yet be the case as two sub-adult trophies were seen in the Kulu Valley in 1982 (Chandola, 1984).

There is no evidence of the species' presence in the Great Himalaya National Park (173,600 ha) (Gaston et al., 1983), recently gazetted in 1984, nor is any other protected area in Himachal Pradesh known to have a resident population of snow leopard. Efforts to conserve the species might best be directed towards establishing some reserves in Lahul and Spiti, particularly in Spiti where the human population is low and the habitat relatively undisturbed (Mallon, 1984a).

Uttar Pradesh: Information about the snow leopard's distribution in Uttar Pradesh is limited to anecdotal observations made in the upper Tons Valley of Govind Pashu Vihar Sanctuary (Dang, 1967; Chandola, 1984). Kedarnath Sanctuary (Green, 1982) and Nanda Devi National Park (Dang, 1961). Dang's (1961) report of the species being "extraordinarily common" in Nanda Devi probably

reflects the ease with which snow leopard are observed here. It is unlikely that the national park supports a large snow leopard population because of its relatively small size and the deep snow in winter. Much more suitable habitat occurs to the north where relatively little snow accumulates in winter due to the rain-shadow effect.

Sikkim: Very little has been documented about the snow leopard in Sikkim. In the Khangchendzonga National Park, it was recorded in the Chortennyma La and Mugothang areas at 5.185-5.490m in 1978-1979 (Ali. 1981).

Arunachal Pradesh: Almost nothing is known about the snow leopard in Arunachal Pradesh except that it does occur in Namdapha National Park along with leopard *Panthera pardus*, tiger *P. tigris* and clouded leopard *Neofelis nebulosa* (Anon, n.d.). Such a unique assemblage of species of large cats is due to the confluence of three biotic provinces: Himalayan Highlands, Bengalian Forest and Burma Monsoon Forest (see Udvardy, 1975). The snow leopard is also present in the 48,300 ha proposed Moiling National Park (K. L. Mehta, pers. comm.).

Mongolia

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The snow leopard is considered to be very rare throughout Mongolia, its distribution encompassing the mountains of the Altai, Transaltai Gobi, Hangai and Hovsgol (Mallon, 1984b, 1985). The total population is estimated to be 700 ± 200 animals, with some 200 ± 30 within an area of 6,600 sq. km. in the Southern Gobi (Bold and Dorzhzunduy, 1976). The relatively high population density of 3/100 sq. km. in the Southern Gobi is attributed to the suspension of hunting and the locally large population of ungulates. Recently, Mongolian and Polish wildlife specialists estimated the country's snow leopard population to total 2,000-4,000 animals (Marechal, 1986), but this estimate is considered to be much too high (D.P. Mallon, pers. comm.).

In the Great Gobi Desert National Park, the snow leopard occurs in both the larger eastern and the smaller western units: in the Zaaltayskaya Gobi (4,419,000 ha), it is present in the Edcrengiyn-Num, Tsagan-Bogdo, Atas-Ula, Chingiz-Ula, Dzun-Toroyin-Nuru and Shara-Khlusuy-Nuru; and in the Dzhungarskaya Gobi (881,000 ha), it is found in Takhiyn-Shara-Nuru and Ikh-Khavtag-Nuru (Zhirnov and H'inskiy, 1985). Khuhtsyrh Reserve, in the High Altai, has an estimated eight snow leopards (Marechal, 1986).

Hunting used to account for 40-50 snow leopards killed annually (Hibbert, 1967). More recently, some 12 snow leopards were killed annually by farmers in efforts to control livestock predation (Marechal, 1986). The government decided, therefore, to encourage safari hunting and in 1986 introduced a quota of five snow leopards that had to be chosen from animals known to take livestock.

Nepal

Nepal's population is largely restricted to areas north of the main Himalayan range along the border with Tibet, with the greatest number of snow leopards in the west. Although vulnerable to extinction, the species is not considered to be endangered within the country. Less than 20% of Nepal affords potentially suitable habitat, which supports at least 300 animals (Jackson, 1979, pers. comm.).

Of Nepal's protected areas, Shey-Phoksundo National Park in the northwest has by far the largest snow leopard population. Estimates of density vary from at least 5-10 snow leopards (excluding cubs)/100 sq.

km. in the Langu Valley (Jackson and Ahlborn, 1986) to 1.2/100 sq.km. in Shey (Schaller, 1977). which is both more arid and an area inhabited by man and wolves *Cam's lupus*. While it is not known if Langtang and Sagarmatha national parks have resident populations, transient snow leopards from Tibet visit both these areas (R. M. Jackson, pers. comm.).

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Pakistan

The snow leopard has a wide distribution in northern Pakistan. It occurs sparsely in northern Chitral and over most districts of Gilgit, in northern Hunza and Baltistan (Roberts, 1977). It is considered to be rare, with usually no more than two or three animals frequenting a particular valley at intervals (Schaller, 1977). Based on an extrapolation of census data for Chitral, Schaller (1977) estimated a population of less than 250.

In Chitral Gol National Park, the status of the snow leopard changed from tenuous security in 1970 to seriously threatened by 1974 as a result of hunting (Schaller, 1976). No sightings have been reported for the last three years (R.M. Jackson, pers. comm.). The park may still be visited by snow leopard but there is no evidence of a resident breeding population. Top priority has been given to control poaching and to acquire all private land within the park (Malik, 1985). Very little is known about the species in other protected areas, although a small population is known to exist in Khunjerab National Park (Schaller, 1974).

Protected areas, which are managed at provincial level through the provision of various acts and an ordinance, have been created haphazardly and without any criteria for their selection. Under the existing legislation, public access is prohibited or regulated within wildlife sanctuaries, yet settlement and grazing by domestic livestock is allowed in national parks (Grimwood, 1972). Weak enforcement of the law is an overall constraint but safeguards against habitat degradation within protected areas are also inadequate (Rau, 1984).

U.S.S.R

A detailed account of the species' distribution in the Soviet Union is given by Andriuskevicius (1980). The Kopet Dag Mountains on the Turkmenistan-Iran border and the mountains around Lake Baikal are considered to be the furthest possible limits of its past distribution to the west and east, respectively. Numerous sightings made in the Kopet Dag Mountains area from 1882 to the 1930's, however, are controversial due to the possibility of mistaken identity. Overall, the population has been severely reduced since the beginning of the twentieth century, with estimates varying from 300-1,000. The core population occurs in the Tien Shan of Kirghizia (alternate spelling: Kirgizia) and the Pamirs of Tadzhikistan, but the species' range extends over other union republics, namely R.S.F.S.R., Uzbekistan and Kazakhstan (Braden, 1982).

Less protection is afforded to the snow leopard in Kirghizia and Tadzhikistan as compared with R.S.F.S.R., Uzbekistan, and Kazakhstan, where the total area of reserved lands (nature reserves and national parks) is considerably greater (Table 1). There are, however, a number of large zoological (hunting) sanctuaries in both Kirghizia and

the lowlands, largely due to the logistics and cost of effectively policing and managing mountainous areas. Efforts to conserve the snow leopard will help to focus attention on mountain environments in Central Asia and, ultimately, will directly benefit rural human populations.

TABLE II. World snow leopard populations; figures are crude estimates which provide only a rough guide to numbers.

Country	Estimated # of snow leopard		Authority
	Minimum	Maximum	
Afghanistan	?		
Bhutan	?		
China- West Gansu	350	350	Uao and Tan (this volume)
India-J&K (Ladakh)	100	200	Mallon (1984a)
Mongolia	500	900	Bold and Dorzhunduy (1976)
Nepal	150	300-	Jackson (1979)
Pakistan	104	130	Schaller (1977)
U.S.S.R.	300	1,000	Braden (1982)
Total	1,504	2,880	

• On the basis of subsequent research in Nepal, this estimate is considered to be low (R. M. Jackson, pers. comm.).

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