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## PROTECTED AREAS AND SNOW LEOPARDS:

### THEIR DISTRIBUTION AND STATUS

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#### INTRODUCTION

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 Fig. 1, together with the locations of protected areas in which the species is present. Details of individual protected areas are given in Table 1.

#### Afghanistan

The snow leopard occurs in several widely scattered locations in the Pamirs and Hindu Kush of north-eastern 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 bazar. In view of the on-going 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, north-east 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

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 areas and procedures for their establishment and

border of India in Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Sikkim and Arunachal Pradesh.

**Jammu & Kashmir:** Few snow leopards 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, 1984). It is also reported by Chundawat and Rogers (this volume) 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 low 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 bharal 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, 1984). The total population in Ladakh has been estimated at 100-200 snow leopards (Mallon, 1984), 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 & 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 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 & Spiti District (Mallon, 1984), where it is thought to be locally common, particularly in Spiti. It also occurs in Kinnaur District to the south-east (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., 1985), 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 reserve in Lahul & Spiti, particularly in Spiti where the human population is low and the habitat relatively undisturbed (Mallon, 1984).

**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, 1981). 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 5,185-5,490 m 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.; Chundawat and Rodgers, this volume). 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

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 1930s, 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 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).

Table 1: List of protected areas existing in 1986 in which the presence of snow leopard is reliably confirmed.

| COUNTRY<br>Name of Protected Area                                          | Year<br>Established | Size<br>(ha.) | Status of snow leopard<br>(Authority)                            |
|----------------------------------------------------------------------------|---------------------|---------------|------------------------------------------------------------------|
| AFGHANISTAN (Total)                                                        |                     | (107,938)     |                                                                  |
| Dara-i-Ajar (Ajar Valley)<br>Wildlife Sanctuary                            | 1978                | 40,000        | Present (Abdul Haq In Habibi, 1977; Sayer and van der Zon, 1981) |
| Pamir-i-Buzurg (Big Pamir)<br>Wildlife Sanctuary                           | 1978                | 67,938        | Present (Sayer and van der Zon, 1981; Petocz, 1978)              |
| BHUTAN (Total)                                                             |                     | (781,300)     |                                                                  |
| Jigme Dorji Wildlife Sanctuary                                             | 1974                | 781,300       | Common (Blower, 1986)                                            |
| CHINA (Total)                                                              |                     | (4,700,000)   |                                                                  |
| Gansu Province (No information)                                            |                     |               |                                                                  |
| Nei Monggol Zizhiqu (Inner Mongolian<br>Autonomous Region (No information) |                     |               |                                                                  |
| Ningxia-Hui Autonomous Region<br>(No information)                          |                     |               |                                                                  |
| Qinghai Province (No information)                                          |                     |               |                                                                  |
| Sichuan Province (Total)                                                   |                     | (200,000)     |                                                                  |
| Wolong Nature Reserve                                                      | 1975                | 200,000       | Present (Schaller et al., 1985)                                  |
| Xinjiang Uygur Zizhiqu (Total)<br>(Sinkiang Uighur Autonomous Region)      |                     | (4,500,000)   |                                                                  |
| Arjin Mountain Nature Reserve                                              | 1983                | 4,500,000     | Present (Butler et al., 1986)                                    |
| Xizang Zizhiqu (Tibet Autonomous<br>Region) (No information)               |                     |               |                                                                  |
| INDIA (Total)                                                              |                     | (624,127)     |                                                                  |
| Arunachal Pradesh (Total)                                                  |                     | (180,782)     |                                                                  |
| Namdapha National Park                                                     | 1972                | 180,782       | Present (Anon., n.d.; Chundawat and Rodgers, this volume)        |
| Jammu & Kashmir (Total)                                                    |                     | (102,500)     |                                                                  |
| Hemis High Altitude National Park                                          | 1981                | 60,000        | Relatively common (Mallon, 1984; J.L. Fox, pers. comm.)          |

| COUNTRY<br>Name of Protected Area                | Year<br>Established | Size<br>(ha.) | Status of snow leopard<br>(Authority)                                                               |
|--------------------------------------------------|---------------------|---------------|-----------------------------------------------------------------------------------------------------|
| Teploklyuchenskiy Zoological (Hunting) Sanctuary | 1958                | 32,100        | Present (Shalybkov and Storchevoy, 1985)                                                            |
| Toguz-Torouskiy Zoological (Hunting) Sanctuary   | 1977                | 10,000        | Present (Shalybkov and Storchevoy, 1985)                                                            |
| R.S.F.S.R. (Total)                               |                     | (863,728)     |                                                                                                     |
| Altaiskiy State Nature Reserve                   | 1932                | 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)                                      |
| Sangvorskiy Zoological Sanctuary                 | 1972                | 51,000        | Present (Shalybkov and Storchevy, 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, 1980; Lustin/Korelov in Braden, 1982)               |
| Gissarskiy State Nature Reserve <sup>1</sup>     | 1984                | 87,500        | Present (Borodin and Syroechkovski, 1983)                                                           |
| Uzbekistan S.S.R. National Park                  | 1978                | 32,400        | Present (Nikolaevskiy, 1985)                                                                        |
| Total                                            |                     | 14,817,155    |                                                                                                     |

\*World Heritage Site

#Biosphere Reserve

<sup>1</sup>

Consists of the former Kyzylsuyskiy and Mirakinskiy State Nature Reserves of 30,094 ha and 46,795 ha. respectively.

## Discussion

The known world snow leopard population stands at between 1,500 and nearly 2,900 animals (Table 2), but these figures are based on crude and sometimes outdated estimates. Moreover, they do not take into account the population in much of China, and the Himalayan and Hindu Kush regions for which there are no estimates. Nevertheless, on the basis of the available information, the world population is likely to be at least double present estimates but unlikely to be in excess of 10,000 animals. Although little is known about the numbers of snow leopard within individual reserves, protected areas probably

harbour only a small proportion of the total population.

Criteria concerning the minimum size of protected areas for snow leopard have yet to be identified. Jackson and Ahlborn (1984) suggest a size of no less than 50,000 ha in order to maintain a population of at least 50 breeding individuals with inbreeding at less than 1% (see Frankel and Soule, 1981), given that home range size is about 1,400 ha and disturbances from human activities are negligible. It is encouraging to note that more than half the number of protected areas listed in Table 1 are in excess of 50,000 ha (although not all of the habitat is necessarily suitable for snow leopard).

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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.

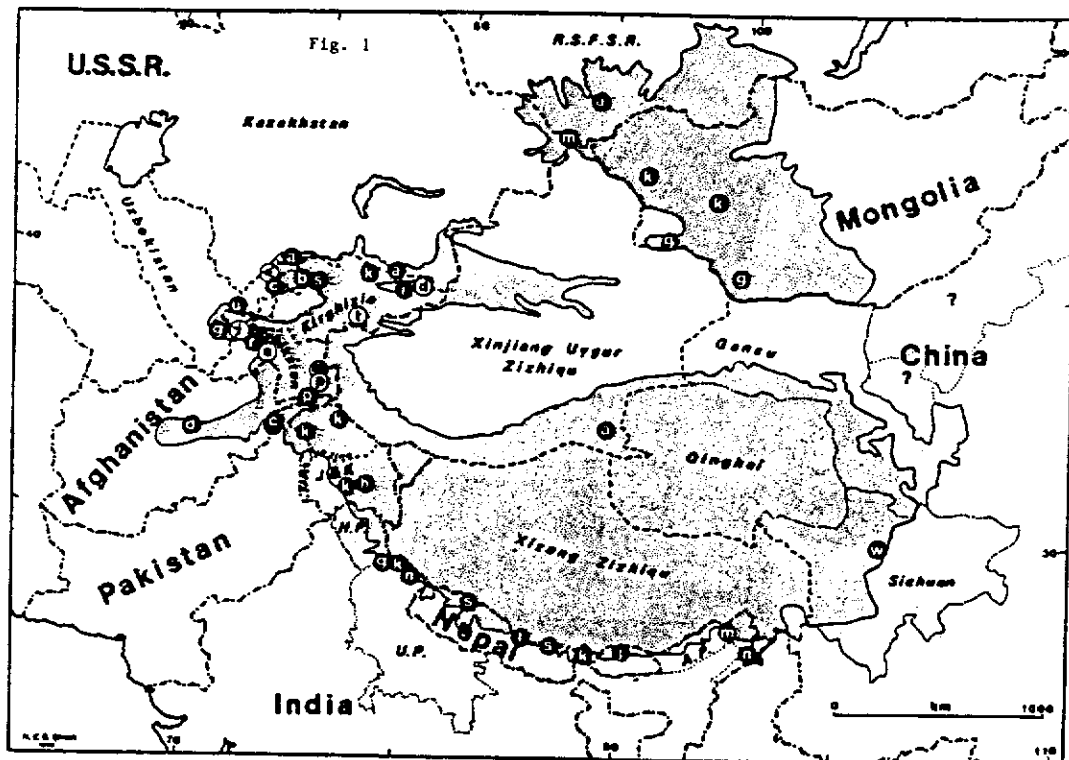
The present network of protected areas in China, particularly in the mountains of north-western China and the Tibetan Plateau (important snow leopard habitat) is recognised as being inadequate (Wang, 1980). In Sichuan

Province, in the easternmost part of its distribution, the species occurs in Wolong (Schaller et al., 1985), one of several nature reserves established in the 1970's 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



Approximate current distribution of the snow leopard (shaded area) and of protected areas (> 10,000ha) 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 name of the protected area given in Table 1.

present in the 48,300 ha proposed Moiling National Park (K.L. Mehta, pers. comm.).

## Mongolia

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, 1984a, 1985). The total population is estimated to be  $700 \pm 200$  animals, with some  $200 \pm 30$  within an area of 6,600 sq. km. in the Southern Gobi (Bold and Dorzhunduy, 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 (Marachal, 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 Ederengiyn-Nuru, Tsagan-Bogdo, Atas-Ula, Chingiz-Ula, Dzun-Toroyyn-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 Il'inskiy, 1985). Khuhtsyryh 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 *Canis 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.).

## 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

| COUNTRY<br>Name of Protected Area              | Year<br>Established | Size<br>(ha.) | Status of snow leopard<br>(Authority)                                                                        |
|------------------------------------------------|---------------------|---------------|--------------------------------------------------------------------------------------------------------------|
| Kishtwar National Park                         | 1981                | 42,500        | Present (Kurt, 1976; Mallon, 1984)                                                                           |
| Sikkim (Total)                                 |                     | (85,000)      |                                                                                                              |
| Khangchendzonga National Park                  | 1977                | 85,000        | Present (Government of Sikkim, n.d.; Ali, 1981)                                                              |
| Uttar Pradesh (Total)                          |                     | (255,845)     |                                                                                                              |
| Govind Pashu Vihar Sanctuary                   | 1955                | 95,312        | Present (Dang, 1967; Chandola, 1984)                                                                         |
| Kedarnath Sanctuary                            | 1972                | 97,500        | Present (Green, 1982)                                                                                        |
| Nanda Devi National Park                       | 1982                | 63,033        | Present (Dang, 1961, Khacher, 1979; Green, 1982)                                                             |
| MONGOLIA (Total)                               |                     | (5,423,900)   |                                                                                                              |
| Great Gobi Desert National Park                | 1975                | 5,300,000     | Present (Mallon, 1984; Zhirnov and Il'inskiy, 1985)                                                          |
| Khasagt-Khayrkhan Nature Reserve               | 1965                | 33,000        | Present (Borisov et al., 1985)                                                                               |
| Khuhtsyrh Reserve                              | 1977                | 90,900        | Present (Dzieciolowski et al., 1980)                                                                         |
| NEPAL (Total)                                  |                     | (773,800)     |                                                                                                              |
| Dhorpatan Hunting Reserve                      | ?                   | 132,500       | Present (R.M. Jackson, pers. comm.)                                                                          |
| Langtang National Park                         | 1976                | 171,000       | Some evidence (Green, 1981)                                                                                  |
| Sagarmatha National Park*                      | 1976                | 114,800       | Probably present (R.M. Jackson, pers. comm.)                                                                 |
| Shey-Phoksundo National Park                   | 1984                | 355,500       | Relatively common (Schaller, 1977; Jackson, 1979; Jackson and Ahlborn, 1984, 1986)                           |
| PAKISTAN (Total)                               |                     | (319,001)     |                                                                                                              |
| North-West Frontier Province (Total)           |                     | (7,780)       |                                                                                                              |
| Chitral Gol National Park                      | 1984                | 7,780         | Present (Schaller, 1976, 1977);<br>Not resident (Malik, 1985)                                                |
| Northern Areas (Total)                         |                     | (311,221)     |                                                                                                              |
| Kargah Wildlife Sanctuary                      | 1975                | 44,308        | Present (Schaller, 1977)                                                                                     |
| Khunjerab National Park                        | 1975                | 266,913       | Present (Schaller, 1974, 1977)                                                                               |
| U.S.S.R. (Total)                               |                     | (2,087,089)   |                                                                                                              |
| Kazakhstan S.S.R. (Total)                      |                     | 237,335       |                                                                                                              |
| Aksu-Dzhabagly State Nature Reserve            | 1927                | 74,416        | Present (Andriuskevicius, 1980; Braden, 1982;<br>Borodin and Syroechkovski, 1983)                            |
| Alma-Atinskiy State Nature Reserve             | 1931                | 91,552        | Present (Andriuskevicius, 1980; A.A. Sludskiy<br>in Braden, 1982);<br>Rare (Borodin and Syroechkovski, 1983) |
| Markakol'skiy State Nature Reserve             | 1976                | 71,367        | Present (Borodin and Syroechkovski, 1983)                                                                    |
| Kirghizia S.S.R. (Total)                       |                     | (151,978)     |                                                                                                              |
| Besh-Aral'skiy State Nature Reserve            | 1979                | 18,200        | Present (Borodin and Syroechkovski, 1983)                                                                    |
| Issyk-Kul'skiy State Nature Reserve            | 1948                | 17,310        | Present (V.V. Pokrovskiy in Braden, 1982)<br>Few (Andriuskevicius, 1980)                                     |
| Sary-Chelekskiy State Nature Reserve#          | 1959                | 23,868        | Present (Andriuskevicius, 1980; V.V. Pokrovskiy<br>in Braden, 1982; Borodin and Syroechkovski, 1983)         |
| Kirgizskiy State Nature Park 'Ala-Archa'       | 1976                | 19,400        | Present (Nikolaevskiy, 1985)                                                                                 |
| Dzhety-Oguzskiy Zoological (Hunting) Sanctuary | 1958                | 31,100        | Present (Shalybkov and Storchevov, 1985)                                                                     |



Protected areas are concentrated along much of the peripheral boundary of the species' distribution (Fig. 1). There appear to be few protected areas with snow leopard in the central and eastern portions of its range but this partly reflects the lack of information on Chinese reserves. The presence of only a single permanent reserve in Tadzhikistan S.S.R., which may contain over half of the Soviet Union snow leopard population (Braden, 1984), is also cause for concern. Initiatives need to be taken not only to expand the present network of protected areas but, in view of their widely scattered distribution, also to make provision for movements between snow leopard populations by affording adequate protection to habitat within intervening areas. Politically sensitive areas bordering international boundaries are particularly valuable in this respect.

The importance of saving this rare and beautiful animal from extinction is inextricably linked with the need to conserve and manage fragile mountain ecosystems, which are coming

under increasing pressure from human populations and their associated livestock. This is particularly true for much of the Himalaya where widespread disturbance to the habitat is leading to soil erosion in many places. Conservation efforts in the Himalaya are far behind initiatives taken in 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.

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Table 2: World snow leopard population - figures are crude estimates which provide only a rough guide to numbers.

| Country              | Estimated number of snow leopards |              | Authority                     |
|----------------------|-----------------------------------|--------------|-------------------------------|
|                      | Minimum                           | Maximum      |                               |
| Afghanistan          | ?                                 | ?            |                               |
| Bhutan               | ?                                 | ?            |                               |
| China - W. Gansu     | 350                               | 350          | Liao and Tan<br>(this issue)  |
| India - J&K (Ladakh) | 100                               | 200          | Mallon (1984)                 |
| Mongolia             | 500                               | 900          | Bold and Dorzhzunduy,<br>1976 |
| Nepal                | 150                               | 300*         | Jackson (1979)                |
| Pakistan             | 104                               | 130          | Schaller (1977)               |
| U.S.S.R.             | 300                               | 1,000        | Braden (1982)                 |
| <b>Total</b>         | <b>1,504</b>                      | <b>2,880</b> |                               |

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

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