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A GROWING ECOLOGICAL IMBALANCE

Intensive research during the last few decades has shown that multifaceted human cultural and land use expansion has disturbed the ecological relationship within the abiotic and biotic environment of the snow leopard (*Uncia uncia*). Thus, at this crucial stage, educational and scientific studies are providing a basis for the development of sanctuaries and national parks in snow leopard habitat.

Khunjerab National Park lies between 36°-37° N and 75°-76° E and is contiguous with the Taxkorgan Reserve of Chinese Turkistan. The valleys of this unique geographical area are known to have had thousands of Marco Polo sheep (*Ovis ammon polii*) and ibex (*Capra ibex sibirica*) during 1899-1963. According to Roberts (1977) the late Mir of Hunza estimated the population of ibex to be about 1000. Rasool (1990) reported that due to hunting pressure up to 1987, the number of Marco Polo sheep and ibex were reduced to 25 and 600, respectively.

It is natural that the ecological pyramid is disturbed when there is a paucity of species at the herbivore trophic level. The above-mentioned studies bring to light that due to decline in the number of hoofed prey, the snow leopard has started facing problems of survival. The research work of Blumstein (1991) showed that due to a shortage of normal prey, this predator is switching over to a diet of marmot (*Marmota caudata aurea*), inhabiting areas around 14,000 ft in alpine meadows. About 25% of snow leopard diet consists of this animal.

Jackson (1992) says that in the Langu Valley of Nepal snow leopards were crepuscular, being most active around dawn until 1000 hr and then again in the late afternoon and evening. In Pakistan and elsewhere they tend to be much more nocturnal. Jafri (1991) observed that the groups of marmots were busy consuming vegetation in the afternoon at about 14,000 ft near the Pakistan-China Border (Khunjerab National Park); snow leopards may hunt marmots in the afternoon when these animals are out of their burrows actively feeding. In this situation the snow leopard is not nocturnal, but crepuscular and points to the need for further research work. Human interference is growing day by day in the habitat of the marmot and it is also facing a growing ecological imbalance.

The war in Afghanistan brought an influx of snow leopards into Chitral and neighbouring mountain ranges in the Northwest Frontier Province. Educational programmes are developing a concept of conservation of nature among the young generation in Pakistan, and an appreciation for actions such as the creation of Chitral Gol Sanctuary for snow leopard is one outcome of this effort (Nolte-Wilson 1990).

IMPACT OF CLIMATE CHANGES

The global climatic change has started affecting our high altitude habitats. The vertical temperature gradient in snow leopard habitat is modified by climatic effects such as the heating of narrow valley bottoms where dark rocks absorb solar heat, or cold catabatic air currents originate from glacier surfaces. Climate and hydrology in the Karakorum was studied by Weirs (1991), where near Gilgit (e.g., Bunji, Indus Valley) he showed a distinct increase in rainfall and decrease in temperature over the last 30 years. Miede and Miede (1991) studied plant communities and selected habitat conditions in the Karakorum, where climatically induced changes noted in the higher alpine vegetation indicated a decrease in temperature and winter precipitation during the recent past. At this stage one can foresee climatically induced changes opening a new chapter of research in the sphere of ecology in neighbouring mountain ranges. Thus, it is high time to investigate how the snowline, vegetation zones, and herbivore and snow leopard ecological relationships are responding and adjusting to these changes. The answers to these questions need urgent international collaborative research programmes.

Blue sheep (*Pseudois nayaur*) is a prey species of snow leopard that faces problems of survival during the severe and prolonged winter. Wegge (1988) carried out a survey of this wild sheep in the north and east of Shimshal in the Khunjerab National Park, where they represent the western-most population of this species in the world. In the Chatpert drainage he found a minimum of 133 animals within 40 km². The ratio of lambs was 64/100 females, indicating a poor survival of the lamb crop in 1988, possibly due to quite severe winter and spring conditions. Practical steps are needed to provide food to the predator and its prey. This will save them from starvation during the long and severe winter and in this way the snow leopards will not starve during the long winters.

AN URGENT NEED TO UTILIZE MODERN TECHNIQUES

Jackson and Hillard (1986) carried out a radio-telemetry study of snow leopard in its inhospitable mountain habitat of Nepal and later reported (Jackson 1992) that the home range of snow leopard varied widely from 12 to 39 km², averaging 21 km². Similar studies are needed in snow leopard habitat of Pakistan. By fitting snow leopard with small radio collars and by measuring its position at regular intervals one would be able to gather information on such topics as movements, habitat use, home range and social interaction in a varying pattern of climatically induced changes in the Karakorum ranges. Focardi et al. (1990) used airborne infrared thermography for census of ungulates. The use of this technique will be very helpful for studying the behaviour and census of snow leopard and its diminishing prey in local habitats of Pakistan and there is an urgent need to start international cooperative projects on this theme.

SNOW LEOPARD FACES THE CHALLENGE OF NEW DANGERS

Our mountain ranges were affected by Chernobyl radioactive fallout. Various studies have shown that migratory ducks passing through these ranges and entering feeding grounds were continuously radioactive (Jafri and Ishrat 1987, Jafri and Afzal 1988, Jafri and Jamal 1990). There is an urgent need to study to what degree predators such as snow leopard, as well as other trophic levels, have been affected by dangers of radiocesium and radiostrontium.

The snow leopard faces problems of survival caused by a number of diseases. Seminoma and parathyroid adenoma were discovered in snow leopard by Doster et al. (1989) and Chaudhary et al. (1992) isolated *P. multocida* F-3, 4 from a still-born snow leopard. Selenium deficiency exists in game animals as discussed by Flueck et al. (1990) and the effect of a declining Selenium cycle is required to be studied up to the carnivore level. General research programmes are needed to tackle the problems of diseases in snow leopard.

Need For The Development Of New Natural Resources In Wildlife Habitat

Natural resources are being depleted by growing human needs at all altitudes. Growing hazards of environmental degradation are evident far and wide in the Northern Areas, as discussed by Jafri (1984). In most wildlife areas precious trees are being cut for fulfilling the need of fuel and earning money. Thus, the Department of Zoology at Punjab University has started development of sericulture in Gilgit so that the human settlements may have a source of income (Jafri 1989, 1991, 1992). Integrated sericulture, fish farming and poultry farming, as well as game farming projects, have a potential future for providing necessities of life to the people in the ecological zones where humans and wildlife will continue to compete for survival in the future.

Need For More International Collaboration On Educational And Research Programmes

The basic concept of conservation of wildlife is provided by universities in gaining momentum in the form of management of snow leopard habitat in northern Chitral, Gilgit, northern Hunza and Baltistan Areas. However, the efforts of the International Snow Leopard Trust, WWF, IUCN and UNESCOs programme on the protection of World Heritage Sites and Biosphere Reserves need further expansion at each level of education and research.

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