Studies on Snow Leopard and Prey Species in `Hemis` National Park

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The Himalayas came into being as a result of the tectonic movement of two huge land masses and
their collision. some 23 million years ago. The formation of the Himalayas created an entire array of new habitats and provided corridors for dispersal of the flora and fauna. In the Himalayan region three major biogeographic realms meet. Therefore. in terms of biodiversity. this region is one of the richest. with several pockets of endemism. Not only does it support a high biodiversity but it is also a lifeline for millions of people of the Indo-Gangetic plains of India.

The trans- Himalayan region. which lies north in the rain-shadow of the main Himalayas. is usually described as "high altitude cold desert". Within India it covers approximately 186.000 sq km which is also one of the least (0.4%) protected regions under the protected area network in India. The region has many endangered species listed in schedules I & II of the Indian Wildlife (Protection) Act. 1972, Government of India. as also in IUCN's Red Data Book.

The trans-Himalayas experience extremes of cold and arid climatic conditions which account for its low productivity. Animals occur in low densities and require larger areas to maintain a viable population. The trans-Himalayan region is an intrinsically fragile ecosystem and its overuse has pushed
it close to ruin at many locations. This area has
remained unstudied by ecologists and the paucity of information on the trans-Himalayas is recognized by managers and conservationists. Snow leopard *(Panthera uncia)*. an endangered large predator of the region. was considered a flagship species for the overall conservation of this fragile ecosystem on the lines of "Project Tiger." This called for urgent conservation measures which required scientific information especially on the ecology of snow leopard and its associated species.

The study area was part ofHemis National Park. in

the trans-Himalayan region in Ladakh in the state of Jammu and Kashmir. The intensive study area (100 sq km) encompassed the entire catchment of Rumbak, a small tributary of the Indus river in the northwest part of the National Park. The study area was divided into three regions: Region I, the lower reaches; Region II, the middle region; and Region III, the higher reaches. The study area provided a relatively discrete population of blue sheep for the study. The catchment boundary of the study area was fairly high and acted as a barrier, across which there was very little movement of blue sheep population. The study area represented the typical bioclimatic and terrain conditions occurring in most of the trans-Himalayan region of Ladakh.

After a preliminary survey in 1985-86, I conducted a detailed study from October, 1987 to February, 1990. Owing to the hostile climatic conditions, inaccessibility and ruggedness of terrain in the study area, data collection was very difficult from direct sightings. Therefore, I had to depend largely on indirect evidence, such as spoors of the animals.

A total of 3800 km of foot transacts were traversed to collect the information. I spent about 78% (500 days) of the time camping out. Habitat maps were prepared on a Survey of India (1:50,000 scale) topographical map to determine the availability of each habitat type in the study area. Information on blue sheep was collected from direct observations made from systematically laid foot transacts (total length traversed was 945 km).

Data on snow leopard was collected from direct as well as indirect evidence. The food habits of snow leopards were determined from scat analysis and their habitat use by following the tracks.

The vegetation of the area is generally dry alpine steppe. Several ecological factors such as altitude, aspects, temperature, rainfall, and slope played an important role in determining the vegetation type, structure, and composition. In all, six vegetation types were identified within the study area on physiognomic basis. The upper limit of vegetation growth was 5000 m to 5200 m, beyond which bare rocks and permanent ice predominated. *Stachys Tanacetum* and *Artemesia-Caragana* were the dominant vegetation types in the study area. In Regions I and II, south-faCing slopes were dry and

very sparsely vegetated. The average cover on the slopes was under 2%. In the upper reaches, *DeschampSia-Sedge* meadow community fonned lush pastures on the gently rolling north-facing slopes.

The blue sheep *(Pseudois nayaur),* a major prey species of snow leopard throughout its distribution range, was the most common ungulate (240 individuals) in the study area. In the present study, the blue sheep were sexed and aged into seven classes based on the shape and size of the horn. Two types of groups were identified--all male and mixed. The sighted groups together comprised 4261 animals, of which 3988 were sexed and aged. The adult sex ratio in the blue sheep population was close to the unity (93 males to 100 females). Yearling ratio was consistent throughout the year, i.e. close to 30%. Seasonal variation in lamb to female ratio showed high mortality during spring. The lamb to female ratio within the first month after birth was far below the reported ratio for the other blue sheep populations.

During late Winter and early spring, when food availability was lowest. habitat use, food habits and distribution pattern of the blue sheep suggested strategies for efficient use of the available resources. Blue sheep maximized the use of available resources through wider distribution, small group size, selection of habitat, and altitudinal migration. Male and female blue sheep used the habitat differently. Such partitioning assured optimal reproductive success of females. The blue sheep distribution, habitat use in relation to aspect, slope, and position on slope were found to correspond with food availability and proximity to escape terrain. Among the different categories of slopes, steep slopes were preferred; among the position on slopes, upper and middle slopes were preferred, and distance from escape terrain was the overriding parameter that was eventually decisive in habitat selection by blue sheep. During winter, northern aspects were avoided and warmer southern aspects were preferred. Strong affinity of females to escape terrain suggested that forage was not the only constraint in their seasonal distribution and habitat use. This means that anti-predatory strategy had priority over food availability, especially during lambing. The average group size was 12 and an increase in group size was observed from winter (9)

to summer (19). Sparse distribution of forage in winter and spring may be one of the reasons for smaller group size and vice versa in summer.

Annual prey consumption by one snow leopard was estimated to be five blue sheep, five domestic goats, one domestic sheep, marmots, nine Tibetan woolly hare and fifteen birds. In terms of biomass, blue sheep contributed 58% in the diet of snow leopard. If the snow leopard population is self regulating, then the total requirement for four snow leopards in the study area would be twenty-one blue sheep in a year. This predation by snow leopard alone is
sustainable and should not be considered a big
threat to the blue sheep population in the study area. Long term conservation of a viable snow leopard population (fifty individuals) would require a habitat area of approximately 1275 sq kIn with a population of 2200 blue sheep.