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## **Snow Leopard As Charismatic Carnivore In Higher Ranges Of Indian Himalyas: A Study Of Their Population, Distribution, Habitat, And Feeding Habitat**

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**Abstract:** Snow leopard is an elusive mammal species of the cat family, is the top-predator of the Central and South Asian, high- altitude ecosystem. In India this is very disappointing that out of 6 states and union territories only Himachal Pradesh has successfully completed census of snow leopard. The exact number of snow leopard is unknown in India due to fact that the population studies snow leopard has not been carried out yet in India. The snow leopard is about 2.1 metres (7 feet) tall, including the 0.9 metre (3-foot) long tail. It stands 0.6 metre (2 feet) tall at the shoulder and weighs between 23 and 41 kilogrammes (50 and 90 pounds). Snow leopards have strong legs and are excellent jumpers, capable of leaping up to 50 feet. In India, the snow leopard is less studied than any other big felid, like the tiger, lion, and leopard.

### **1. Introduction:**

The Himalayas, the world's highest mountain range, have long served as a source of wonder, inspiration, and spiritual solace. This mountain range, which is home to a diverse range of flora and fauna, has nurtured human civilizations and cultures throughout history. The Himalayas contain a variety of unique features, such as wetlands, glaciers, and the source of many rivers, making it Asia's water tower. As a result, preserving this diverse set of mountain habitats is critical for the potential well-being of many natural organisms, including humans. The temperature is rising across Central Asia's mountains. In the last 20 years, the Tibetan plateau, which is home to more than half of the remaining snow leopards, has warmed by 3 degrees. The changes have an effect on the entire environment, including plants, water sources, and wildlife, and they could render a third of the snow leopard's habitat unusable.

*Panthera uncia*, the snow leopard, is the most charismatic carnivore to inhabit Asia's mountains. The snow leopard (*Panthera uncia*) is a large cat native to the mountain ranges of Central and Southern Asia. It is widely distributed but sparsely distributed over a 3.02 million km<sup>2</sup> area, and it is critically endangered throughout its range (Hunter and Jackson, 1997). Afghanistan, Bhutan, China, India, Kazakhstan, Kyrgyzstan, Mongolia,

3196 | **Dr. Avnish Chauhan Snow Leopard As Charismatic Carnivore In Higher Ranges Of Indian Himalyas: A Study Of Their Population, Distribution, Habitat, And Feeding Habitat**

Nepal, Pakistan, Russia, Tajikistan, and Uzbekistan are all home to snow leopards. Snow leopards are thought to number between 4,500 and 7,500 in total. (Jackson and Hunter, 1996; Fox, 1994).

Another possible danger to snow leopards is climate change (McCarthy and Chapron, 2003). Based on historical averages from 1980 to 1999, the Intergovernmental Panel on Climate Change (IPCC) predicts that the average annual temperature in South Asia and Tibet will rise by 3-4 degrees Celsius by 2080-2099, while annual precipitation will also rise in this area (Christensen et al., 2007). Previous research (Körner and Paulsen, 2004) has found a strong connection between treeline and environment. As a result of the warmer and wetter conditions predicted by climate change in this region, forests will ascend into alpine areas, the preferred habitat of snow leopards.



## 2. SCIENTIFIC CLASSIFICATION OF SNOW LEOPARD

### Scientific classification

Kingdom: Animalia  
Phylum: Chordata  
Class: Mammalia  
Order: Carnivora  
Suborder: Feliformia  
Family: Felidae  
Subfamily: Pantherinae  
Genus: Panthera  
Species: **P. uncia**

The average life span of the population is estimated to be between 10-13 years based on experiments and studies conducted on a tooth of a snow leopard found in the wild that had died of natural causes. Snow leopards kept in captivity, on the other hand, will live for up to 21 years. A female snow leopard will usually be pregnant for 93-110 days and give birth to a large number of cubs at once (Snow Leopard Trust). The snow leopard, formerly known as *Leo uncia*, has been reclassified as *Panthera*, along with the lion, tiger, and other large cats.

### **3. DISTRIBUTION OF SNOW LEOPARD IN THE WORLD:**

Eastern Afghanistan, the Himalayas, and the Tibetan Plateau, as well as southern Siberia, Mongolia, and western China, have alpine and subalpine zones with elevations ranging from 3,000 to 4,500 metres (9,800 to 14,800 feet). In the northern part of its range, it also lives at lower elevations (Janečka et.al. 2008).

Snow leopards are mostly found in the alpine region, between 3,000 and 5,200 metres above sea level. Snow leopards are found at far lower elevations in the northern limits of their distribution range (between 900 m to 2,500 m). Snow leopards prefer steep (more than 40° slope), rough, mountainous terrain with plenty of stalking cover, such as rocky outcrops and cliff dominated areas.

They eat mainly blue sheep in the Himalayas (bharal). Ibex (wild goat) and wild argali sheep are their main prey in the Karakorum, Tian Shan (China, Kyrgyzstan, Kazakhstan), and Altai (Russia, Mongolia) Mountains. Snow leopards also prey on small mammals such as marmots and hares, as well as larger birds such as snow cock and chukor. Snow leopards are opportunistic hunters, and as prey animal populations decline due to poaching and overgrazing by domestic livestock, they are increasingly attacking livestock in their range.

They normally mate in the winter, between January and March. Snow leopards use scent spray, scratch, claw raking, and scat to mark their territories during this period. These social marks are typically located along or near prominent landform features such as ridgelines, cliff bases, massive boulders, and stream confluences on their paths. Snow leopards have a gestation period of 93 to 110 days. The number of cubs in a litter can range from one to five. Cubs are usually born in the months of June and July.

### **4. HOME RANGE AND MOVEMENT**

The snow leopard is a wide-ranging animal with many home ranges that overlap. Based on data from five snow leopards in Nepal, researchers discovered that their home ranges ranged from 12 to 39 km<sup>2</sup>, with significant overlap between individuals and sexes. Snow leopard home ranges have been confirmed to be very diverse, and in Central Asia, they are usually much larger. Male and female home ranges in Mongolia were recorded to be greater than 400 km, and sometimes more than 1,000 km<sup>2</sup>.

**3198 | Dr. Avnish Chauhan Snow Leopard As Charismatic Carnivore In Higher Ranges Of Indian Himalyas: A Study Of Their Population, Distribution, Habitat, And Feeding Habitat**

## **5. PREY, DIET, AND DEPREDATION**

Major wild preys of the snow leopard are ibex, bharal or blue sheep, Himalayan tahr (*Hemitragus jemlahicus*), argali (*Ovis ammon*), and marmots (*Marmota* spp.) Lyngdoh et al., 2014. Blue sheep and ibex constitute the primary prey species of snow leopards across its global distribution range. Aside from these, snow leopards eat urial (*Ovis* spp.), red deer (*Cervus elaphus*), roe deer (*Capreolus pygargus*), and musk deer (*Capreolus pygargus*) (*Moschus* spp.). Snow leopards eat plants as well, and scat has been found to contain only twigs (Chundawat and Rawat, 1994). Snow leopards' diet could contain anywhere from 45 percent to 98 percent wild prey. Snow leopards have been confirmed to steal between 3% and 18% of local livestock holdings each year in some Himalayan areas. Domesticated livestock makes up a significant portion of the snow leopard's diet (between 40 and 70 percent), while the contribution of livestock is normally between 15 and 30 percent (Suryawanshi et al., 2013).

## **6. POPULATION OF SNOW LEOPARD IN INDIA-**

The snow leopard is known by a variety of names in its native lands, including “wvrn png” (Pashto: ), “shan” (Ladakhi), “zigsa” (Tibetan), “irves” (Mongolian: ирвс), “bars” or “barys” (Kazakh: аpc [brs]), “ilbirs” (Kyrgyz: Илбирс), “barfani chita (Hindi, urdu) and him tendua (Sanskrit).

The IUCN Red List of Threatened Species designated the Snow Leopard as Endangered in 2008 (Jackson et al., 2008), and it is currently being re-assessed and designated as Vulnerable for publication in 2017. There is an estimated 100,146 km<sup>2</sup> of possible snow leopard habitat in Jammu and Kashmir, Ladakh, Uttarakhand, Himachal Pradesh, Sikkim, and Arunachal Pradesh, of which about 34,000 km<sup>2</sup> (13,000 sq mi) is considered good habitat and 14.4% is protected areas. The Indian snow leopard population was reported to be about 200–600 individuals in the early 1990s, spread over around 25 protected areas. (McCarthy & Chapron, 2003).

## **7. POPULATION OF SNOW LEOPARD IN UTTARAKHAND:**

Due to distinct bio geographic characteristics, the high altitudes of the Indian Himalaya host a rich and unusual assemblage of wild flora and fauna (Polunin & Stainton 1984). (Rodgers et al. 2000). The snow leopard is found in the high mountains and is closely associated with the alpine and sub-alpine ecological zones, preferring steep terrain with cliffs, ridges, gullies, and rocky outcrops to break up the monotony (McCarthy et al. 2003). The snow leopard thrives in the Trans-Himalayan biogeographic region, of which a small portion is found in the Indian state of Uttarakhand.

In Uttarakhand, a first-of-its-kind project to count snow leopards has begun. Scientists from the Wildlife Institute of India (WII) in Doon and the Indo Tibetan Border Police are working together on the Snow Leopard Population Assessment in India (SPAII) project (ITBP). According to “habitat quality” estimates, there are about 620 snow leopards

**3199 | Dr. Avnish Chauhan Snow Leopard As Charismatic Carnivore In Higher Ranges Of Indian Himalyas: A Study Of Their Population, Distribution, Habitat, And Feeding Habitat**

spread across India's five Himalayan states, with 86 of them living in Uttarakhand. However, a more precise count of big cats has yet to be completed. A "snow leopard occupancy map" was established, according to forest officials, and about 40 camera traps were set up in high-altitude areas. Scientists have recorded 371 forest beats in Uttarakhand forests in order to search for snow leopard tracks. Kedarnath, Badrinath, Gangotri, Nandadevi, Pithoragarh, Bageshwar, Rudraprayag, Uttarkashi, and Tehri are among the forest divisions in the state that have been designated for the assignment. 109 grids of 15x15 square km areas will be made around the 371 forest beats to be reviewed by frontline personnel, researchers, and some qualified villagers. We've started the estimation preliminary work. We've been told that we must first classify the trails before moving on to the next stage of the survey. We will find five trails in the first step and then search for more in the landscape," said Navin Pant, sub-divisional officer (SDO) of Berinag, Pithoragarh. (Times of India, 3-Nov, 2020).



Snow leopards spotted in Uttarakhand

## **8. FEEDING HABITAT OF SNOW LEOPARD**

Humans are not hostile to snow leopards. There has never been a confirmed attack on a person by a snow leopard. Even if disturbed while feeding, a snow leopard would flee rather than protect its territory. Snow leopards, unlike other big cats, are unable to roar. They have the ability to mew, growl, yowl, and prusten. Prustening, also known as chuffing, is a non-threatening vocalisation produced by breathing through one's nose while closing one's mouth.

Bharal (*Pseudois nayaur*), also known as blue cow, Argali (*Ovis ammon*), Markhor (*Capra falconeri*), Musk Deer (*Moschus moschiferus*), Himalayan ibex (*Capra sibirica hemalayanus*), and Himalayan tahr are all prey for snow leopards (*Hemitragus jemlahicus*). They eat marmots, hares, pikas, and game birds, despite the fact that these strong predators can kill animals three times their weight. A single snow leopard consumes approximately 1.5 kg of meat per day, which is the equivalent of 20–30 adult

**3200 | Dr. Avnish Chauhan Snow Leopard As Charismatic Carnivore In Higher Ranges Of Indian Himalyas: A Study Of Their Population, Distribution, Habitat, And Feeding Habitat**

blue sheep per year. (Jackson and Hunter, 1996; Lyngdoh et al., 2014; Chundawat and Rawat, 1992).

Unseasonal heavy snowfall in the Himalayas is a result of climate change, forcing the elusive snow leopard to lower altitudes, where it meets other animals, including the common leopard, who are also moving up the slopes as a result of climate change. Conservationists are concerned that this will exacerbate the endangered snow leopard's vulnerability, which is already threatened by habitat destruction and poaching. Residents in Uttarakhand are now seeing snow leopards roaming close to their villages during the winter months, when most human residents retreat further downhill. Similar incidents have been recorded in Pakistan's northwestern provinces.

Snow leopards have been observed descending below 3,000 metres when it snows heavily in the winter. Bharal (blue sheep), musk deer, Himalayan thar, and ibex are among the animals that migrate downhill in search of food. A herd of Bharal was recorded and seen 50 kilometres downhill of Gangotri National Park, in the direction of Uttarkashi, between November and February.

## **9. THREATS TO SNOW LEOPARD**

In 2017, the snow leopard was reclassified by the IUCN (International Union of Nature and Natural Resources) as Vulnerable. This elusive cat is facing a number of threats:

### **a. Threats due to climate change**

In fact, it is estimated that 30% of the Snow Leopard's habitat would be lost as a result of this phenomenon. This is expected to have significant consequences for a species that needs large swaths of land per person. The loss of habitat is also said to have a significant effect on the Snow Leopard's prey. Because of the low productivity of these alpine habitats, grazers like Bharal have a reduced carrying ability, limiting the amount of food available to the Snow Leopard.

### **b. Poaching**

Illegal trade in furs, bones, and organs, which can fetch thousands of dollars (especially in the Asian traditional medicine trade). Cubs are sold to zoos and circuses illegally. Poachers use untraceable steel traps and rifles; one snow leopard was reportedly killed and traded every day between 2008 and 2016. (220 to 450 cats per year).

### **c. Loss of Prey**

A decline in number of wild prey—primarily wild mountain sheep and goats – due to both illegal and legal hunting and competition with livestock for grazing.

#### **d. Loss of Habitat**

More humans and livestock are moving into snow leopard territory, fragmenting the habitat and isolating and endangering snow leopards. Climate change is also threatening to make up to one-third of the snow leopard's habitat unusable due to rising temperatures in Central Asia's mountains. In the last 20 years, the Tibetan plateau, which is home to more than half of the remaining snow leopards, has warmed by 3 degrees.

#### **e. Human-Snow Leopard Conflict**

Humans sometimes kill snow leopards in revenge for – or to avoid – preying on livestock, which is becoming increasingly common in snow leopard habitat.

Such losses are devastating for the herders, who are also economically deprived.

It's possible that this accounts for more than half of all snow leopard deaths..

#### **f. Mining and Development**

Roads and fenced railway lines are examples of large-scale structures and barriers. The building of strong international fences by China and Russia would virtually eliminate the traditional, natural movement of wild animals such as argali sheep, kiang and saiga antelopes, and snow leopards from one country to the next. The Mongolian-Russian snow leopard population has been effectively separated from that of China's Qinghai-Tibet area and Central Asia's Tien Shan Mountains thanks to the high-speed rail connecting China and Europe.

#### **g. Lack of Effective Protection**

The majority of snow leopards live in areas outside of national parks or other protected areas, and 40% of the over 170 protected areas are too limited to cover even a single snow leopard pair's home range. Many countries are unable to pay living wages to rangers. These shy animals seem to be in distress these days. Climate change has 'exposed' them to the public in a way that no other phenomenon in history has done. In the last two decades, poaching for Chinese traditional medicine, less prey, habitat destruction, and retaliatory killing (due to predation of farmers' livestock) have further decreased their numbers, stacking the odds against them.

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**3202 | Dr. Avnish Chauhan Snow Leopard As Charismatic Carnivore In Higher Ranges Of Indian Himalyas: A Study Of Their Population, Distribution, Habitat, And Feeding Habitat**

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