The Clouded Leopard: The "Littlest" Big Cat

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Abstract

*Over the past one hundred years, environments in central and southern Asia have seen isolated populations of large felids such as the tiger (*Panthera tigris*), the Asiatic lion (*Panthera leo persica*), and the Asiatic cheetah (*Acinonyx jubatus*), extirpated from over 90 percent of their former range. These cats were endemic in diverse habitats until the advent of firearms led to their extirpation over large areas by 1900. The clouded leopard (*Neofelis nebulosa*), the smallest "big cat," has in recent decades suffered extensive losses in southeast Asia and China due to habitat loss and poaching. Immunological studies place Neofelis within the larger Pantherine sub-family. Very few studies have been attempted of the clouded leopard in the wild due to inaccessibility of the predator's tropical forest habitat. Zoos around the world have had difficulty breeding the felid, and studies are underway to determine stress factors in captive populations. The protection of habitat in Borneo and elsewhere in southeast Asia is likely to be the most significant factor in maintaining viable wild populations.*

Decline of large Asian felids

Over the past hundred years, large felids such as the tiger (*Panthera tigris*), the Asiatic lion (*Panthera leo persica*), and the Asiatic cheetah (*Acinonyx jubatus*), have been extirpated from over 90 percent of their original range across central and southern Asia. The sole remaining population of the Asian cheetah, for example, is in northern Iran and numbers less than 50 individuals, in decline from poaching and a fragmented, degraded habitat (Nowell and Jackson 1996). The smallest big cat, the clouded leopard (*Neofelis nebulosa*) may face a similar fate in some areas of southern Asia, although scientists can only estimate the true extent of the cat's numbers and range (Dinerstein 1998).

Range and habits of *Neofelis nebulosa*

Clouded leopards, or "*baghs,*" as they are known in Nepal, were thought to have been extirpated in that country until the capture of four individuals in 1987-1988 (Dinerstein 1989). One was even caught raiding chickens in a village hundreds of miles west of the known limits of the species' range. This is surprising because the last published record for the clouded leopard in Nepal dates from 1863 (Dinerstein 1989). This beautiful cat derives its scientific name, *Neofelis nebulosa,* from the dark cloud-like ellipses, ovals, and swirling stripes that trace upon a background of golden or silvery fur.

The clouded leopard's highly secretive existence in remote tropical forests and its relatively small size (compared to other large felids) has caused it to be largely overlooked by wildlife researchers. Because little field data exists about this predator, opinions differ among researchers whether it spends most of its time in trees or on the ground, and whether it demonstrates nocturnal, diurnal, or crepuscular foraging behaviors (American Zoo and Aquarium Association 1997; Guggisberg 1975). Two remarkable distinguishing characteristics of the clouded leopard are its plush tail (nearly the length of a large male's 94 centimeter-long body) and sharp canine teeth that can reach 4.5 cm in length, proportionately the longest fangs of any living cat (Nowell and Jackson 1996).

Some researchers have speculated that a kinship may exist between extinct sabertooth cats and the clouded leopard because of the similarity in tooth structure, but no fossil linkage has been shown. The length of the tail (up to 90 cm) might favor the argument that the cat prefers environments where it can maneuver quickly through trees with the tail acting as a balance, performing the same function as that of a monkey's. Research in Thailand and in Borneo has confirmed that clouded leopards hunt fast-moving arboreal monkeys and gibbons (Nowell and Jackson 1996).

The morphology of the clouded leopard

The short-legged and stocky clouded leopard, standing between 45-55 cm at the shoulder, has a build reminiscent of the much larger jaguar (*Panthera onca*). Such a relationship may be more

than just coincidence. Most scientists now class *Neofelis nebulosa* in its own genus within the larger "pantherine" subfamily because of recent DNA studies (Wayne et al. 1989). This grouping includes the *Panthera* genus [tiger (*Panthera tigris*), lion (*Panthera leo*), jaguar, and other big cats such as the snow leopard (*Uncia uncia*), puma (*Felis Concolor*), and cheetah]. Other surprising pantherines include the marbled cat (*Pardofelis marmorata*), a miniature "look-alike" of the clouded leopard and the lynx (*Felis lynx*) (Wayne et al. 1989).

Geographical location and prey base

Researchers note that while the canine teeth of the clouded leopard reach big cat dimensions, there is not a corresponding increase in the size of the skull (Nowell and Jackson 1996). This would suggest that this medium-sized hunter is able to successfully fill a large cat role in regions devoid of its larger cousins, the tiger and the leopard. One such location is the island of Borneo in southeast Asia. Researchers such as Alan Rabinowitz of the Wildlife Conservation Society indicate that Borneo may harbor the healthiest populations of clouded leopards in Asia. This may be partly due to the absence of tigers and leopards that sometimes prey on clouded leopards (Nowell and Jackson 1996). Undoubtedly, the fact that Borneo has until recently contained undisturbed habitats with a small human population has aided the cat's cause. Observers have recorded clouded leopards, called in Malay the *machan dahan* (tree tiger), taking relatively large prey such as muntjac barking deer (*Muntiacus muntjak*) and wild boar (*Sus salvanius*) (Guggisberg 1975).

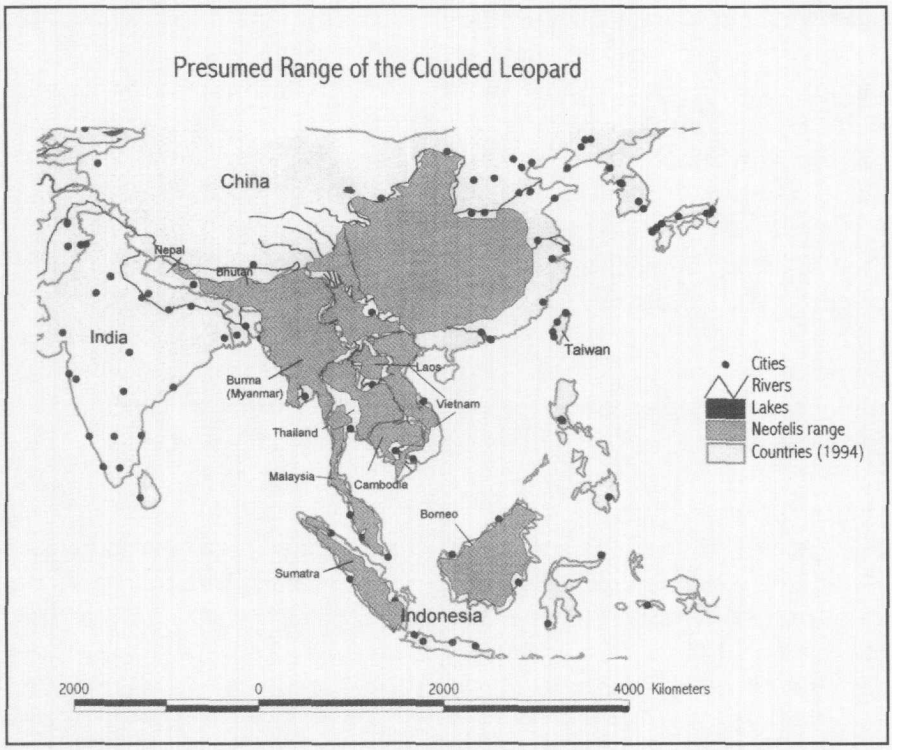

Figure 1. The presumed range of the clouded leopard stretches throughout Southeast Asia, China, and into the Indian subcontinent. Courtesy of the author, adapted from Nowell and Jackson (1996).

The clouded leopard exhibits characteristics distinctive of other large pantherines: long lifespan, relatively large size (weighing 11-22 kg on average in the wild), predating species at least half its own body weight, and broad territory ranges with correspondingly low population densities (Nowell and Jackson 1996). Researchers also speculate that on Borneo the *machan dahan* may be less nocturnal than in other areas of its range where tigers and leopards are present. Dinerstein (1989) noted that in habitats where the cat spent most of its time on the ground, its natural enemies, the tiger and leopard, might be absent.

Clouded leopard research in the wild

Tigers and leopards exist in the region where Dinerstein and his colleagues released a captured subadult male with a radio-collar into the Churia Hills of Nepal's Royal Chitwan National Park in 1988. They were able to track him for two weeks before losing the signal, marking the first time biologists had ever electronically monitored the movements of a clouded leopard in the wild (Dinerstein 1989). According to Dinerstein, the Smithsonian Institution in cooperation with the government of Nepal maintains the "Terai Ecology Camp" in Sauraha, within Royal Chitwan National Park.

Dinerstein was director of the Ecology Camp Project from 1984-88, and still visits the Ecology Camp twice a year (Dinerstein 1998, pers. comm). Nepalese biologists are beginning to restore degraded habitat around the park, with the goal of restoring up to 430 square kilometers as a buffer zone for wildlife around the park. Additionally, local villagers within the buffer zone are now earning much

needed income from managing the area for ecotourism and turning public opinion against poaching (Dinerstein 1998, pers. comm).

Two other clouded leopard cubs had been captured by villagers in the Terai lowland forests of eastern Nepal in 1987 and turned over to the Kathmandu Zoo (Dinerstein 1998, pers. comm). The clouded leopard has been seen traveling on roads within logged forests in Borneo, and lives in relatively open, dry tropical forests in central Burma (Dinerstein 1989). Such adaptability, combined with studies of captive populations in zoos, may be critical in saving declining populations of this carnivore over the long term.

Neofelis research in captivity

Zoos and other volunteer organizations have discovered that in captivity the clouded leopard often exhibits destructive stress-related behaviors, such as males killing female mates, or individuals plucking most of the fur from their tails through excessive grooming (Bratcher 1998, pers. comm). Some of these behaviors may also be traceable to inbreeding.

The American Association of Zoos and Aquariums (AZA) "species survival plan" states that all captive clouded leopard populations can be traced back to only four different bloodlines. The captive gene pool originated with a small group of clouded leopards termed the "Bawdy line" in Florida that seeded all captive populations worldwide (Ziegler 1998, pers. comm).

The Carnivore Preservation Trust (CPT), a volunteer grassroots organization located in Pittsboro, North Carolina, houses approximately 260 rare and endangered animals at their sixty-acre facility, with the aim of preserving viable populations of rare mammalian species and restoring them to their original ecosystems (The Carnivore Preservation Trust 1998). They have ongoing work in several developing countries, including prime clouded leopard habitat in Laos.

CPT and "Bolisat Phathana Khet Phoudoi" (BPKP), a Lao State Enterprise Company, have created a 3,000 hectare (7,500 acre) center close to three newly protected areas in the Laotian provinces of Bolikhamxay and Khammaoune (Carnivore Preservation Trust 1998). These areas of high diversity are still virtually unsurveyed, and recently several new vertebrate species were discovered. CPT hopes to create a research facility in cooperation with BPKP and the Laotian government that will integrate conservation benefits not only for the clouded leopard, tiger, and other endangered wildlife, but also provide direct economic and educational benefits to the local people. As of late 1999, work in Laos was still continuing in spite of the rather uncertain political situation (M. Tunstall 1999, pers. comm).

Due to extreme poverty and black market trading, uncontrolled poaching has decimated wildlife populations, including those of the clouded leopard. An education program to train Laotian nationals in domestic animal husbandry techniques is being implemented to offset the excessive consumption of local wildlife. Laotians are also being trained by CPT staff in species survey methods, captive breeding programs for rare species, and sustainable conservation projects (Carnivore Preservation Trust 1998).

Figure 2. Captive clouded leopards at rest. Photo courtesy of the Carnivore Preservation Trust.

Captive breeding of clouded leopards

Clouded leopards are considered one of the most difficult large cats to breed in zoological facilities (AZA 1997). Two zoos with captive breeding programs for *Neofelis* in the United States have focused on artificial insemination experiments rather than natural reproduction due to such difficulties in breeding. Such difficulties can include a pronounced sexual dimorphism: males in zoos sometimes exceed 27 kg, more than double the weight of an average female. Such pronounced size differences can potentially endanger the females when mating (Bratcher 1998, pers. comm).

In 1992, an artificially inseminated female clouded leopard at the Nashville Zoo bore a pair of cubs; the male of the litter still resides at the zoo. The zoo terminated its artificial insemination program in 1994 due to a lack of funding (Sara Bratcher 1998, pers. comm). The National Zoo in Washington, D.C., maintains a Conservation and Research Center (CRC) in Front Royal, Virginia, that currently conducts research on clouded leopards.

In April of 1998 a fecal hormone study on the clouded leopard commenced to determine the levels of stress hormones present in the droppings of clouded leopards (Lang 1998, pers. comm). One hypothesis under investigation is that clouded leopards exposed to the viewing public may exhibit higher levels of stress than those not exposed to humans. Up to twenty clouded leopards in two control groups may be compared using various hormone dosages; one control group may include those cats most accustomed to human contact, versus highly stressed cats that shy away from people. Another purpose of the study is to determine the effect of hormone application on female clouded leopards receptive to breeding.

If detrimental levels of stress hormones can be determined in captive populations, similar studies may be beneficial in analyzing what effect the stress of logging and poaching has on endangered clouded leopard breeding populations in the wild (Lang 1998, pers. comm). Due to limited funds, however, the National Zoo also terminated an earlier captive breeding program (Lang 1998, pers. comm).

The future of *Neofelis* in southern Asia

While captive breeding programs may yield valuable clues about clouded leopard behaviors, efforts must be made to curb poaching and habitat destruction in key southern Asian tropical forests. Clouded leopard populations are thought to be declining because of the high numbers of pelts for sale at fur markets and fewer sightings of the cats by native peoples. *Neofelis* pelts are worth over $2,000 on the black market in southeast Asia (American Zoo and Aquarium Assocation 1997). In China, where the clouded leopard was widely distributed south of the Yangtze River, the most common big cat pelts sold on the black market are clouded leopards (Nowell and Jackson 1996). The main customers are Taiwanese, which may account for the probable extinction of a *Neofelis* subspecies on that island.

Tropical forests throughout southern Asia are in peril due to destructive logging practices and rapid population growth. If large areas of intact forest can be preserved, healthy populations of the clouded leopard may have a future into the next century (Dinerstein 1998, pers. comm). The devastating poaching of ungulate species in southeast Asia may be curbed with educational programs in villages that warn of the loss of native wildlife, and include the introduction of economically viable alternative employment, including the raising of livestock. Detailed scientific surveys are also needed to pinpoint the location and size of scattered clouded leopard populations in various south Asian countries. If educational programs can succeed, and forests within Laos and Borneo are protected, the *bagh* may long remain in its niche as the "littlest" big cat.

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