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First Study of Snow Leopards Using GPS-Satellite Collars Underway in Pakistan

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Snow leopards (*Uncia uncia*) are highly cryptic and occupy remote inaccessible habitat, making studying the cats difficult in the extreme. Yet sound knowledge of the cat's ecology, behavior and habitat needs is required to intelligently conserve them. This information is lacking for snow leopards, and until recently so was the means to fill that knowledge gap. Two long-term studies of snow leopards using VHF radio collars have been undertaken in Nepal (1980s) and Mongolia (1990s) but logistical and technological constraints made the findings of both studies equivocal. Technological advances in the interim, such as GPS collars which report data via satellite, make studies of snow leopards more promising, at least in theory.

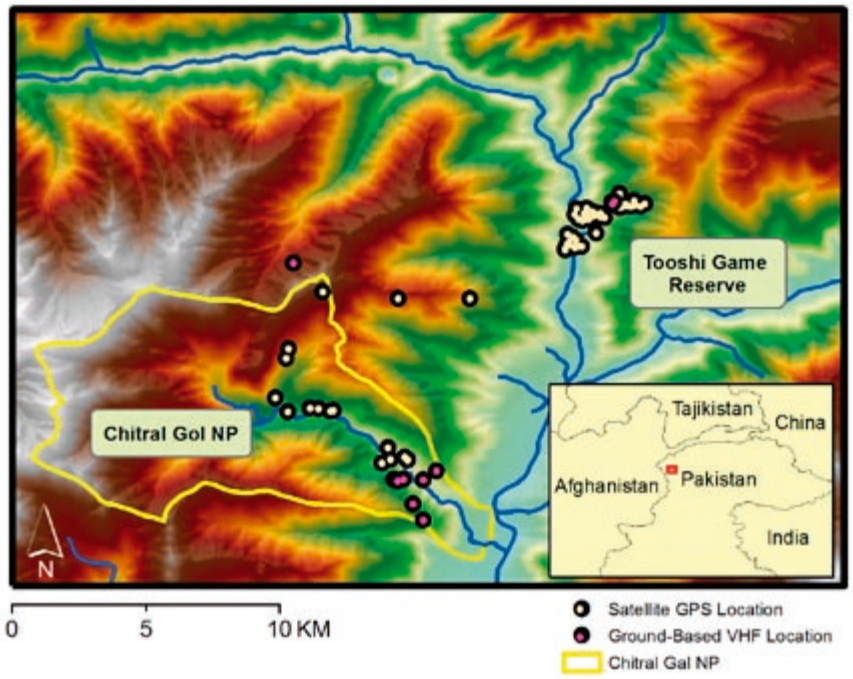

Fig. 1. Location of the study area in northern Pakistan (small map) and distribution of locations of the female snow leopard fitted with a GPS-collar.

In 2006, the International Snow Leopard Trust was contracted by Pakistan's Northwest Frontier Province Wildlife Department to undertake a study of large carnivores in Chitral Gol National Park (CGNP), the site of the first photograph of a wild snow leopard by George Schaller in the 1970s. Tourists, naturalists, and filmmakers from around the world routinely come to CGNP specifically to observe snow leopards and the abundant flare-horned Markhor (*Capra falconeri*), a key prey of the big cats. The study is funded through the Protected Areas Management Project (PAMP) which is an umbrella project aimed at conserving globally important habitat and species in three important protected areas in Pakistan, with core funding from UNDP-GEF. Sign surveys, camera traps and non-invasive genetic techniques were to be the primary research tools for enumerating, and determining distribution and habitat use for all large carnivores in the park. With additional support from Felidae Conservation Fund and other donors, we were able to include a much needed snow leopard collaring component using state-of-the-art GPS-Argos collars.

Location

CGNP, located in the vicinity of the Chitral town in the Hindu-Kush, was a royal hunting reserve until it was declared a National Park in 1984. Accessible via a steep10 km dirt road from Chitral, the park is famous for supporting healthy populations of endangered flared horned markhor and snow leopard, as well as wolf (*Cannis lupus campestris*), red fox (*Vulpes vulpes*), lynx (*Lynx lynx*), and jackal (*Canis aureus*).

Aims and Methods

We proposed to capture up to 5 snow leopards using foot snares and attach GPS satellite collars (Telonics, Inc.) in an attempt to gain critical data on their home-range size, movement and activity patterns, use of travel corridors, intra-specific distances (avoidance of conspecifics), and snow leopard habitat use in relation to human habitation and livestock pastures. The collars were programmed to take GPS fixes 3 times each day and uplink data via the Argos satellite system once every two weeks. All GPS data will be permanently stored in the collars which are programmed to drop off after approximately 13-months, near the end of battery life. A VHF beacon will allow us to retrieve the collar and download any data not transmitted via satellite. Ultimately the information gained will allow implementation of appropriate conservation strategies in Chitral and elsewhere.

Progress to Date

We initiated the carnivore study in May 2006 when we placed 20 automated cameras traps over a large portion of the Park to ascertain general distribution of wildlife within the park and to gain baseline habitat use data. From this and interviews with the Park Rangers and

Wildlife Watchers we determined the timing and location for our first snow leopard collaring attempt. In late October, we established a base camp at the Merin Wildlife Watcher's hut in the lower reaches of the Park, anticipating the markhor would move down for the December rut and be followed by snow leopards. Fifteen Aldrich-style foot snares were set along ridgelines and trails known to be favored by the cats. Most snares were equipped with a radio trap-transmitter that would signal when a snare had been triggered.

On 17 November, less than two weeks after starting trapping, we captured a 35 kg adult female snow leopard and fitted her with a collar (Fig. 2). She also received two small blue eartags for future identification. In addition to GPS capability, the collar has a VHF beacon which operates 10 hours per day which allowed us to monitor her closely for several days after capture. Less than 2 weeks later a larger snow leopard was briefly caught in a snare, but pulled loose before we could immobilize it. Our collared female was re-captured two more times in the ensuing 6 weeks. Although tracks of another female with a cub were seen near our snares, no other cats were captured by the time we were forced to stop snaring in late January due to deep snow. Capture work is scheduled to resume in summer 2007.

Early Results and Observations

The type of GPS-Argos collar we are using in this study has been successfully used on a wide variety of species for many years. However, the success of many systems using Argos satellites to relay data or to calculate collar location has been hampered recently in studies taking place in Central Asia and parts of Europe due to substantial and unexplained background radio "noise" in the frequency range Argos uses. We had hoped that our study area would be outside the area of noise, but that has not proven to be the case. Our collars 0.5 watt signal was successfully received by Argos when the collar was tested in our Pakistan study area before placing it on an animal, despite the background noise. But signal strength seems to decrease when it is attached to an animal to the extent that it can not be detected by the satellite above the background noise. Hence, we have had no successful uplinks of data since the cat was collared on 17 November.

Fig. 2. An adult female snow leopard recovers from sedation wearing a GPS-Argos collar in CGNP, Pakistan (Photo T. McCarthy).

We are certain the collar is working as designed and collecting good GPS fixes as scheduled. We changed her collar when she was recaptured the 2nd time about 56 days after initial capture. We tested the collar again OFF the animal and had successful uplinks with the Argos satellite. The new collar, like the first one, has made no successful uplinks since deployment. We are now experimenting with collar antenna configurations and will test these on a captive snow leopard in an attempt to fix the problem prior to summer collaring. In the meantime we continue to attempt weekly VHF locations of the collared cat and anticipate that we will recover all of the data when the collar drops off after 13 months.

During the 56 days the first collar was on the leopard 168 GPS attempts were made of which 82 (48.8%) were successful. Those data were downloaded and mapped. We knew from VHF telemetry and direct observation that the collared female was ranging well outside of the Park. An international wildlife film team had been filming a female snow leopard in nearby Tooshi Game Reserve for the previous 2 years. The cat routinely came to a hillside to hunt in full view of humans who congregated on a roadway a few hundred meters across the valley. In December 2006 when the same female leopard arrived in Tooshi, the film crew reported to us that she was wearing our collar. Many hours of film is now available for us to compare behavior before and after collaring. Our very preliminary assessment suggests that although the collar appears large on the cat, it does not hamper her and she made several successful kills of markhor on film. We will be provided all 3 years of film of the cat to carefully study hunting, resting and cub rearing (she appeared with a single cub in the winter of 2004-05).

The GPS data from the collar shows two distinct centers of activity; one inside Chitral Gol National Park, and one on the edge of Tooshi Game Reserve some 12 km away (see map). The small number of locations recorded between the two sites suggests she spends little time in transit.

Although we have completed only preliminary analyses of the data, and despite the problems with Argos uplinks, we have already learned a great deal during the first 4 months of the collaring program. We already have more locations for the snow leopard collared in this study than we accomplished for any of the four VHF-collared snow leopards in Mongolia (mean = 62, range 24 to 114 locations per cat) which were tracked for 2 to 3 years each. If we can solve the uplink problems and place collars on 3 or 4 additional leopards this summer, the knowledge gained could be substantial.

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