GPS Collaring Frequently Asked Questions

Through our Long-Term Ecological Study (LTES) which began in the Tost region of southern Mongolia in 2008, we are discovering new insights into the lives of wild snow leopards. Below are some of the most commonly asked questions regarding the GPS collaring aspect of this study.

Are there better ways to study snow leopards without having to collar them?
There are other ways, and the Snow Leopard Trust has spent a lot of time and resources to develop a suite of techniques to study these elusive cats such as utilizing remote trap-cameras and genetic mapping using fecal samples. We have garnered a lot of information about snow leopard ecology from these methods both of which allows us to identify individuals. The unique spot pattern of the cats from the camera-traps allows us to identify and follow individuals over time and fecal genetics gives us a DNA fingerprint that allows individual identification. While the camera-traps and the genetics provides us with crucial information, it does not provide us with the same level of detail on space use and other behaviors as the GPS-collars does and there is thus a lot of important information that we can learn only from the GPS-collars. For example, GPS-collars are the only way to learn about things such as home range size, fine scale habitat use, dispersal, activity patterns and seasonal movements. This information, in turn, will help us know how large protected areas should be to maintain viable populations of snow leopards. So the collars provide us with critical information that helps us to understand and protect snow leopards.

When we collared a female snow leopard in Pakistan as part of a pilot program in 2006, we learned that she spent half of the year in Afghanistan which illustrated the need for transboundary cooperation. Other information we need to know is what happens to sub-adults when they leave the mother? How far do they go to set up their own territory? What percentage of those survive? Collars are the only way to answer these questions that are crucial for snow leopard conservation. Collars will also tell us how things change through the life of a snow leopard (like age-specific survival and reproductive rates). Our goal is not to collar every snow leopard where we work but to collar enough animals to get robust information about variation among individuals, between males and females, and among different age categories. We are particularly interested in monitoring females throughout their lives to learn more about snow leopard reproduction, which means that we aim to recapture females to change their collars when the batteries are depleted.

What have you learned from this collaring research?
Now in its 12th year, our Long-Term Ecological Study in the Tost Mountains in southern Mongolia is the longest-ever study of wild snow leopards. Thus far, 32 snow leopards have been fitted with GPS-collars (18 males and 14 females). This is more snow leopards than all previous collaring studies combined. From the prolific amount of data gathered thus far as a result of GPS collaring, we have learned that:

- Male cats use an area around 220 km^2, while females use about 130 km^2 and less than 15 km^2 when they are denning. However, young snow leopards may range as much as 1,000 km^2 as they disperse from their mothers.
- Snow leopard home range sizes are so large that 40 percent of the 170 Protected Areas within the cat's global range are too small to host even one breeding pair of snow leopards.
- There is very little overlap in the home ranges of adult cats of the same sex showing that snow leopards are largely territorial.
- The majority of prey animals are ibex (64%), domestic goats (25%), and argali (7%); snow leopards kill, on average, one ungulate every 8 days.

GPS Collaring Frequently Asked Questions

- Adult male snow leopards kill larger prey and 2-6 times more livestock compared to females and young males. As a result, we anticipate that retaliatory killing by livestock herders is likely to cause greater mortality of adult male snow leopards compared to females and young males.
- Snow leopards prey on wild ungulates rather than livestock at a rate much higher than would be predicted by prey abundance alone.
- We have located a total of five snow leopard dens with a total of nine cubs since our study began. Prior to our long-term study, snow leopard birth rates, birth intervals, and litter size were never documented in the wild.
- Male snow leopard M15, collared in 2018, weighed in at 53.8 kilograms. As far as we know, M15 is the heaviest known snow leopard in the wild.

How do you build local capacity in your collaring work?

The Snow Leopard Trust partners directly with local NGO's and governments in each of the countries that we have a presence in. In Mongolia, we partner with the Snow Leopard Conservation Foundation and many of our incredible staff who are involved in the Long-Term Ecological Study are Mongolian. We are always looking for opportunities to grow and enhance the capacity of our team as well as Mongolian researchers and managers. We involve national students in analysing and interpreting the collaring data to provide them with the knowledge to conduct sound science and conservation practices.

Data from our GPS collaring show that snow leopard movements overlap with or are close to herder settlements; and we know that domestic livestock contribute about 30% of snow leopard diets (Johansson et al. 2015). As negative attitudes towards snow leopards are a key driver of retribution killing, we have helped 20 Tost families by building tall fences around their night-time corrals to stop livestock losses by snow leopards and wolves. This community-focused work is ongoing and is a cost-effective means of protecting herder livelihoods. Safe livestock in fortified corrals also gives herders more peace of mind and helps to engender greater goodwill towards snow leopards.

How do the collars work?

The collars are programmed to take a GPS-position every five hours and send it to us via satellite communication. The collar also has a drop-off function that releases the collar from the animal after 20 months. This is an important function as it means that the animal does not have to wear the collar after the battery is used plus that we can retrieve the collar and make sure that we have gotten all the data and that we can change the battery and the belt and use the collar again. The Snow Leopard Trust maps the positions on a weekly basis and analyzes the data using GIS mapping to delineate home ranges and other spatial attributes. Overall the collars are performing well with a mean uplink success rate of 72% (range: 65-87%). Exact coordinates are kept confidential and are not shared with the broader public.

GPS Collaring Frequently Asked Questions

Do the snares scientists use pose a risk of injury to the cat and is there a better way?
Any type of capture poses some risk, though we take every precaution to minimize these risks wherever possible and we have yet to see a serious snare-related injury during our captures. Captures are only conducted by staff with extensive training in snare building, trap site selection, and chemical immobilization. Our snares are built with several safety features. First, the snare-cable is of the highest quality with a diameter that will not cut the cat's skin. Second, there is a large spring of highest quality (an exact tension) between the snare and the anchor that prevents the animal from coming to a solid stop if jolting as this could injure its leg. We place one swivel between the snare and the spring and another swivel between the spring and the very sturdy anchor to make sure that the animal does not get tangled in the cable. Most important, we have developed a monitoring system that alerts us as soon as an animal is caught so that it does not have to spend more time in the snare than absolutely necessary. Using this system, no cat has spent more than 45 minutes in a snare and the average time from the cat getting caught until it is darted is 28 minutes. In earlier studies, the snares were checked twice daily and the cats could spend up to 12 hours in the snare. The cats are anaesthetised by using a drug combination that was developed by wildlife veterinarians and we are monitoring the vital rates of the cats (temperature, heart rate, and oxygen level) throughout the collaring process.

In earlier studies, researchers attempted to use box traps and cage traps to try and capture snow leopards, but they were not successful. Snow leopards would not go into them no matter what incentives were offered, such as meat. The only bait that would likely work is live goats. We will not use such baits as we find it unethical and do not want to encourage snow leopards to kill livestock. So for now, snares are the most reliable and safe way to capture snow leopards.

Does placing collars stress the animal?
The snow leopard must be sedated during radio-collaring. This is necessary to minimize the stress to the captured animal and to ensure the safety of our field-staff. The drug combination we use have been developed by wildlife veterinarians and have undergone extensive testing for safety on captive animals in controlled settings such as zoos and animal parks before being used on wild cats. The drug is administered by dart injection using a dart rifle. The drug combination we use has proven to facilitate safe and effective immobilization and allows for a quick reversal. Once sedated, the snow leopard's temperature, heart rate, and oxygen level (i.e. respiration) are monitored throughout the process, and an ophthalmic ointment is applied to its eyes. Hair and blood are collected for genetics and pathological studies. Sex, weight and other parameters are recorded. Finally, the collar is placed on the cat and the teeth are examined to assess age from tooth wear and coloration. After completing the careful handling of the cat, the snow leopard is left in a quiet, safe area and (depending on ambient temperature) kept warm using sleeping bags and hot water bottles until alert and mobile. Our Senior Scientist, Dr. Orjan Johansson, who has now immobilized more snow leopards than any other biologist, has found that the cats wake up naturally with ease. We constantly discuss with colleagues, evaluate ourselves, and try to find ways to improve our collaring even further.

GPS Collaring Frequently Asked Questions

Does the collar hinder the cat in any way?
That is something we very carefully consider, and it is why we closely follow advancements in technology. We use collars that have been designed and honed to fit the animals as well as possible. For each cat, we adjust the size of the belt to ensure a snug fit to the neck. We also consider the sex and age of the snow leopard when fitting the collar. Adult males are somewhat larger than females and males also develop muscular necks as they become adults. When we capture a young individual that have not yet reached their full size, we fit the collar according to the size of an adult cat of that sex. This ensures that the animal can grow to its full size without hindrance, even in the very unlikely event that the drop-off would malfunction, and we cannot re-capture the snow leopard to remove the collar. Because of our team's extensive experience, we make a call on whether to collar a cat or not at each occasion rather than sticking to rule of thumbs. Young snow leopards that are so small that collars fitted to an adult's size are considered too loose are released without collars. Should we capture a snow leopard in poor condition or with injuries, even small cuts in the neck area, we would also release it without collaring it. We have removed more than 25 collars from snow leopards at re-captures and have never observed any injuries, scathing, worn down fur or similar.

Before we began collaring snow leopards in the wild, we wanted to do everything we could to ensure the collars would not interfere with the cat's instinctual behaviors. To assess how a cat in the wild might react, we partnered with Seattle's Woodland Park Zoo to test these collars on their resident snow leopards. Before we placed the collar on the zoo cat during their regular annual exam, we had volunteers take behavioral observations of the cat every 20 seconds for 6 hours a day for 3 weeks. We then repeated that for 3 weeks after the collar was placed on the cat. That amounted to over 45,000 behavioral observations. We watched specifically for any indication that she was irritated by the collar, or was attempting to remove it. We did not observe any change in her behavior and never saw her try to remove the collar or show any indication she was even aware of it.

In 2006, we piloted a collaring project in Pakistan where we successfully collared one female in Chitral Gol National Park. In an interesting twist, this female ended up being the same cat that a film crew from BBC had been following for years as part of their Planet Earth documentary. This afforded us with many hours of footage of a wild snow leopard before wearing the collar, as well as footage after she was collared as the BBC production continued. This gave us the unprecedented opportunity to be able to compare data of behaviors before and after collaring on a wild cat, and our team determined that the collar did not seem to cause undue stress as the snow leopard exhibited the same behaviors that she did prior to collaring and continued to hunt and take down prey. Several of our collared females have reproduced and raised their litters successfully.