Estimating Snow Leopard (*Panthera uncia*) Density and Distribution in the Hissar Mountains, Tajikistan

TARA MEYER[1,2], Khalil Karimov[2], Zayniddin Amirov[3], Amy Vedder[1]

1 - Yale School of Forestry and Environmental Studies, New Haven, CT; 2 – Panthera, New York, NY; 3 - Institute of Zoology and Parasitology of the Academy of Sciences of Tajikistan, Dushanbe, Tajikistan

INTRODUCTION

Little is known on the status of snow leopards (*Panthera uncia*) and their prey in western Tajikistan. The Hissar Mountains geographically link snow leopard populations in the Pamirs and the Gissar Nature Reserve in Uzbekistan (Fig. 1). Major threats to snow leopards in Tajikistan include declining prey populations, habitat degradation, illegal hunting of snow leopards and their prey and climate change (Rosen 2012; Kachel 2014). Although summer grazing is very popular in the Hissar range, rates of conflict between snow leopards and domestic livestock have not been examined. It is thus an essential site for determining presence of snow leopards and, if present, begin to understand and mitigate threats to their continued existence.

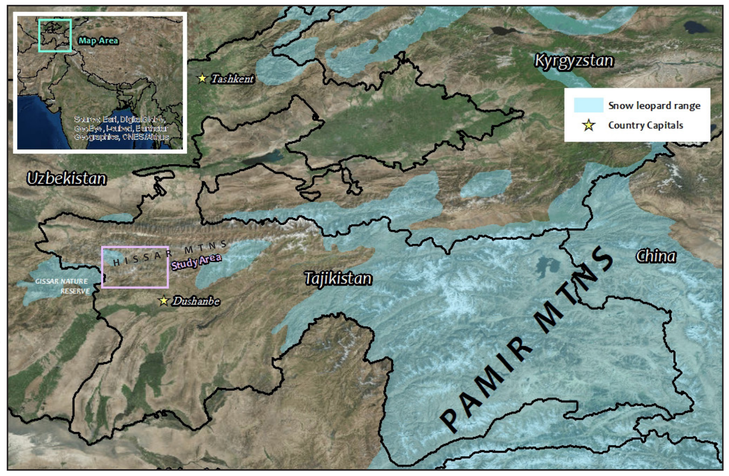

Figure 1. Documented snow leopard range in Tajikistan. The Hissar mountain range geographically connects the Gissar Nature Reserve in Uzbekistan with the Pamir Mountains in eastern Tajikistan, and could provide critical habitat and biological connectivity.

OBJECTIVES

- Document the minimum number and estimate abundance of snow leopards in the survey area, as well as examine genetic connectivity of snow leopards within the region
- Examine the socio-economic and cultural context for snow leopards in the region
- Quantify livestock depredation losses due to wild carnivores in the study area

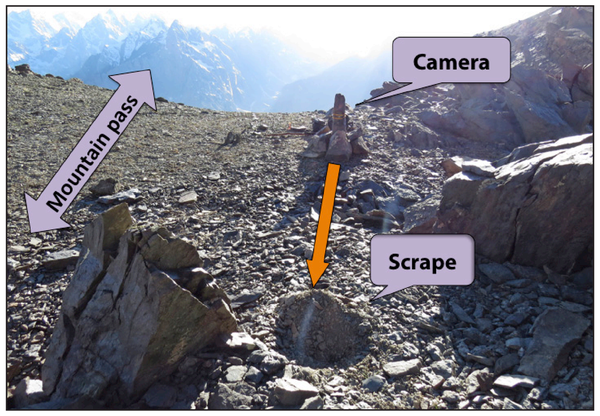

Figure 2. Example of ideal camera trap placement near snow leopard sign.

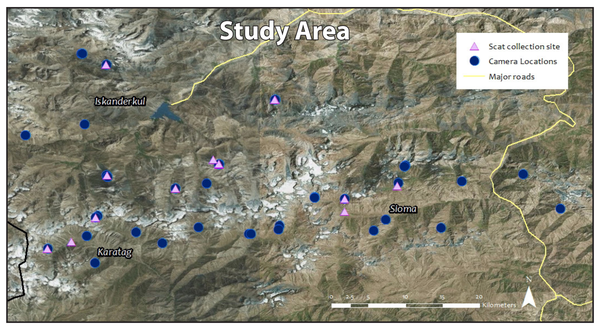

Figure 3. Map of study area in the Hissar range with camera locations and sites where potential snow leopard scat were opportunistically collected.

METHODS

Camera trapping: We placed camera traps (n=40) approximately 5 km apart in preferred snow leopard habitat and terrain (Jackson and Hunter 1996) while adjusting for human accessibility and snow leopard or ibex sign presence (Fig. 2). Camera stations (n=29) operated from June to August, 2014.

Fecal collection: We paired our camera survey with opportunistic fecal collection and subsequent genetic analysis (as cited in Paviolo et al. 2008; Foster and Harmsen 2011; Ale et al. 2014). We searched for sign including snow leopard scat, scrapes, and pugmarks. Site attributes and GPS locations were recorded (Fig. 3).

Interviews and surveys: We carried out key informant interviews (n=10) with residents in Karatag, Sioma, and Iskanderkul (including part of Zeravshan). We asked semi-structured questions about livestock grazing, native species, hunting, land uses, and livelihoods. Our results were then used to design and carry out a survey (n=38) that focused on quantifying livestock depredation events by carnivores.

RESULTS

Camera trapping: Our cameras recorded 31,921 images, including 23 images of snow leopards. From these photos we identified three snow leopard individuals (Fig. 4).

Fecal collection: We collected 33 fecal samples. These are currently being processed by the Global Felid Genetics team at the American Museum of Natural History's Sackler Institute for Comparative Genomics (Shehzad et al. 2012).

Key interviews: Four people reported a dramatic decrease in ibex populations over the last two decades, attributing this trend to an increase in illegal ibex hunting. One hunter told us, "Modern guns make poaching much easier," while other people said, "everybody hunts illegally because legal hunting is very expensive" and "life is more difficult [than during the Soviet Union] so they shoot to make money." We spoke with a community leader about an episode in his village involving a snow leopard attack on his neighbor's livestock. The incident ended with them killing the snow leopard and selling its skin. Informants also noted that marmots have shifted their habitat up in elevation due to increased hunting and other anthropogenic impacts; and snow leopard numbers have increased in the region due to snow leopard hunting becoming illegal. Although more social and biological research is needed to document these reported trends and to better understand their drivers, we believe these narratives indicate a likelihood of the changes and negative impacts resulting from increasing human activity.

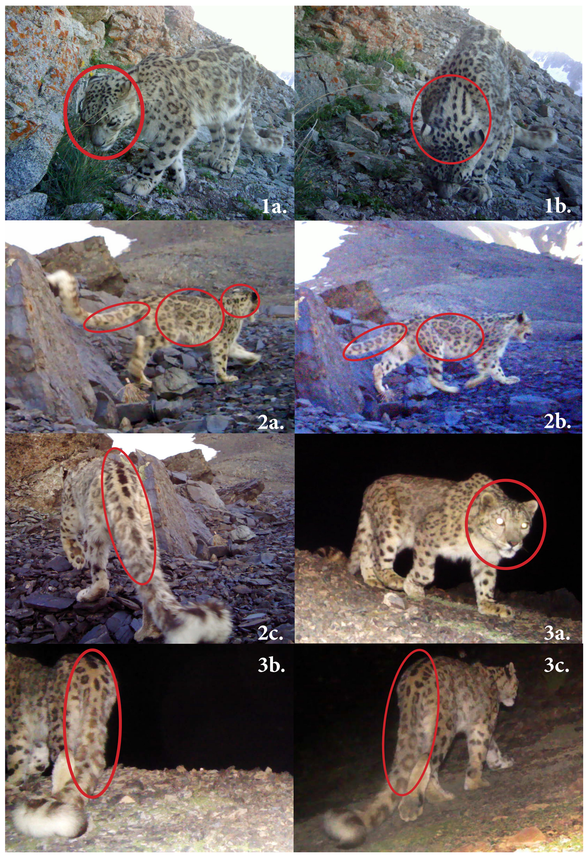

Figure 4. Three snow leopards (#1-3) identified by spot patterns on the face/forehead, neck/ears, torso and tail. Red circles indicate areas that were used to distinguish each individual.

Livestock depredation surveys: Survey results indicated livestock depredation problems with Himalayan brown bears (*Ursus arctos*) throughout the study area. Problems with snow leopards were only reported in Zeravshan (part of Iskanderkul) (Fig. 5). Average annual financial losses were over 2x higher for bears than other species (Fig. 6).

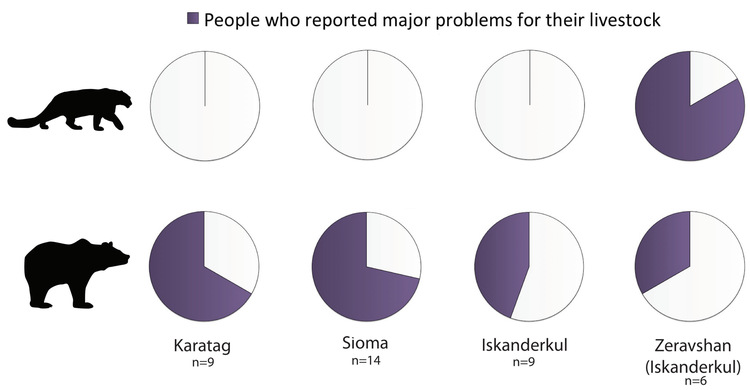

Figure 5. Livestock depredation problems by Himalayan brown bear and snow leoaprd as reported by people surveyed. (Note: lynx and wolf were rarely mentioned and are not shown.)

Figure 6. Average financial losses per person due to livestock depredations.

CONCLUSIONS

These results definitively document the presence of snow leopards in the Hissar mountain range, and thereby suggest the Hissar range may be part of a crucial landscape connecting snow leopard populations and important wildlife mountain habitat. Estimation of snow leopard abundance and genetic connectivity has not yet been established, but when subsequently determined, will provide justification for the importance of creating a wildlife management plan to protect genetic diversity and connectivity of snow leopards and other high alpine species in Tajikistan. In addition our results indicate livestock depredations by carnivores such as bears and snow leopards are a big problem in some areas. Retaliatory killings by people in response to these events are a major threat to carnivore conservation, and livestock depredations are a major economic threat to the livelihoods of pastoralist peoples. In order to both conserve snow leopard populations and protect people's livelihoods, the underlying causes of livestock depredation must be better understood and reduced.

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