The Wildlife Conservation Society

-Report-

Identification of individual snow leopards camera-trapped in 2013 in the Hindu Kush mountain range of Wakhan District, Badakhshan Province, Afghanistan

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Background (S. Ostrowski)

The Wakhan District in northeast Afghanistan is an area known for the presence of a rare assemblage of charismatic mammal species of Central Asian highlands, including the Siberian ibex (*Capra sibirica*), Marco Polo sheep (*Ovis ammon polii*), urial (*Ovis orientalis*), brown bear (*Ursus arctos*) and possibly the most abundant population of snow leopards (*Panthera uncia*) in Afghanistan. In recognition of this outstanding wildlife and a unique assemblage of ecoregional diversity, the Government of Afghanistan declared the Wakhan District a National Park in March 2014.

The Wildlife Conservation Society (WCS) has been working in Wakhan since 2006, developing integrated management approaches for the large mammal and bird fauna of the area, involving local governance, protection by community rangers, education, conflict mitigation schemes between livestock and wild carnivores, research, promotion of eco-tourism and sustainable usage of natural resources. Research activities have been developed to support science-based conservation of snow leopards and other wildlife, and to assess the demographic trends of these key species as an indication of the effectiveness of conservation activities.

For nearly three years ending November 2013, WCS undertook an extensive camera trap survey in the Hindu Kush mountain range of the Wakhan District, Badakhshan Province, Afghanistan. The first surveys aimed to determine the presence of snow leopards in the area and train local rangers at using camera-traps. The final survey aimed to generate a dataset of snow leopard photographs, which would produce a robust population estimate for the species in the study area, the first of its kind for Afghanistan. Snow leopard photographed during this last survey need to be identified individually, and individual identities with date of the photographic event and location entered into a database in preparation for final population size modeling by collaborating biologists at Montana State University, USA. The present report describes the methodology and results of individual identification work carried out by Amber Gill, student at Montana State University, who was hired by WCS Afghanistan to complete this task during summer 2015.

Method (A. Gill and S. Ostrowski)

A field team of WCS installed 43 camera-traps across the central part of the Hindu Kush mountain range of the Wakhan District, between October 2012 and November 2013 (ca. 13 months). They were disposed at locations pre-determined according to a random grid applied over a topographic map of the study area, but with locational adjustments to maximize the detection of all possible snow leopards present in the area. About 55,000 photographs were taken, including 5,336 (ca. 10%) of snow leopards. Photographs were regrouped in 'events' per trap site location. An event corresponded to multiple photographs (or on rare occasions video sequences) of one to three individuals in a sequence. Seventy-one events concerned four radio-collared animals.

Comparisons of leopard phenotypes were done manually. Whatever body part had the clearest spot pattern was used, whether it be the head, side or legs. The spot patterns were compared to the existing spot profiles. If no match were made, a new profile would be created. Photos displaying different angles of each unique cat were periodically added to each profile (when a camera would photograph a different side that was not seen before), making them more complete. This process was very cumulative and required a second sweep through all the dataset to allow re-comparing all the events with the more 'complete' profiles.

Comparison were made at three geographical scales: 1/within each camera trap site, 2/within the East (Avgarch, Ishmorgh, Pak, Paquoy, Paquoy Shoopk, Pikut, Sarkand, and Sast trap sites) and the West (Khundud, Pigish, Regi Jurem, Wargan Payan, Wargan, Wargand Bala, Yamit, Yzik trap sites) 'sides' of the study site, and for uniqueness 3/between each sides' profiles.

Each event was given a date and recorded as either night or day. The night or day status was given based upon the light in the photograph, and not based upon AM or PM times recorded on photographs because of possible inaccuracies in time settings of camera traps. The dates were used to compare leopard profiles with the four collared leopards: Khani Wakhani, Pari, Pahlawan, and Malika (with known dates for collar installation and drop-off). The events with dates after the leopards' collar drop off dates were compared to the four collared leopard profiles. Drop off dates: Khani-July 5 2013, Pari-October 13 2013, Pahlawan-June 25 2013, Malika-October 13 2013.

A second pass was done through the data to add certainty levels to the profiles. Leopard sightings were organized in profiles with certainty of identification: Level 1, Level 2, and Level 3. The Level 1 profiles were the most certain. The Level 2 profiles were less certain than Level 1. There was a small chance that some leopards recorded as Level 2 might not be unique and

previously identified in Level 1 profiles due to a fewer visible spots. Finally Level 3 profiles were the least certain. They contained profiles with isolated spot patterns (position on leopard known, but with low visibility) and single-sided views. The spot patterns present were compared to, and unsuccessfully matched to previously identified leopards. There was a high chance that Level 3 leopards were not unique and had likely been previously identified as Level 1 and 2 profiles due to the lack of visible spots. Finally an event was classified as unknown due to little to no spot visibility and completely isolated spot patterns (position on body was unknown), differing from Level 3 profiles which had visible spot patterns which gave them a possibility of being matched with an existing profile or becoming unique individuals.

This second sweep through the dataset was critical in the identifications. Previously unknown events could be more confidently compared with the identified leopard profiles. All of the events were also compared with the four known collared leopard profiles. This caused more events to be labeled with the four collared leopards' profiles. It is important to note that some of those events occurred during the period that the leopards were supposed to be collared, but no collar was seen on the photographs. These events were noted in the comment section on the data sheet.

When cubs were spotted, they were labeled as cubs or, for example, 'Isabel's cub' if that was the adult the cub was captured with. Cub events were not counted in any of the profiles and were recorded with Level 3 certainties at captured events.

Results (A. Gill)

There were a total of 394 leopard sightings that were organized into 62 leopard profiles. Twenty-one (four of which were collared) of the 62 profiles identified were categorized as Level 1 (ie. snow leopards named Bktail, Smoosh, Trix, Khani Wakhani, Malika, Pahlawan, Pari, Ace, Bat, Chloe, Cole, Jerry, Kix, Kyle, Possy, Prancer, Sam, Sym, Tats, Tine, and Val). Thirteen profiles were Level 2 (ie. Riley, Brute, Mask, Raz, Sunset, Triplel, Xion, Pace, Glance, Star, Strike, Isabel, and Swan). Twenty-eight profiles were Level 3 (ie. Sassy, Pam, Que, Shanti, Slic, Vids, Buc, Comps, Fluffs, Hopps, Pride, Side, Snaps, Snips, Taz, Terri, Billy, Tree, Checkers, Cils, Snow White, Cross, Drake, Lins, Odis, Smurf, Trek, and Harts). Eventually there were 52 unknowns.

There were six events, where a collar was expected to be seen but was not recorded. Three were labeled 'Malika' and three were labeled 'Pahlawan'. All three Malika events were Level 1 certainty and her neck was clearly visible supporting that the photograph date was erroneous. One of the Pahlawan identifications was only a Level 3 certainty and could therefore

be disregarded. The other two were Level 1 certainties but on one event the neck was not clearly visible supporting that the collar could have been missed.

Recommendations (A. Gill and S. Ostrowski)

Overall, the 21 Level 1 profiles and the 13 Level 2 profiles should be used for analysis. The Level 3 profiles are extremely uncertain and could result in an inflated snow leopard population estimate; they should therefore not be used for further population abundance analyses.

In the future, two complimentary cameras should be used at each camera trap site, and arranged so that both sides of the animal are photographed simultaneously. This would greatly help in identifications and would likely decrease the number of Level 3 leopard profiles.

Results of analyses also show that there might have been some inaccurate date/time programming of camera traps upon installation. This information is of importance to derive accurate population abundance estimates with the most advanced capture-recapture models. It is therefore recommended to provide additional training to rangers operating camera traps as well as continuing technical supervision.

Two types of camera traps were used during the study. The Reconyx PC800 and Bushnell M camera traps provided photographs of comparable quality during daytime, but night photos were much sharper and more usable for individual identification with Reconyx compared to Bushnell traps (both used infra-red non visible flashes). Although Bushnell camera traps were allegedly more complicated to use than Reconyx, erroneous date/time programming were observed with both models. For identification of snow leopards, we recommend whenever possible to use Reconyx PC800 camera traps over Bushnell M because of the higher quality of night photographs with the former model.

Acknowledgements (S. Ostrowski)

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