**Understanding snow leopard populations and their spatial ecology through Spatial Capture Recapture Analysis**

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Accurate estimates of ecological state variables such as population density provide key metrics for monitoring population changes over time in response to changes in environmental conditions or protection regimes. Habitat use by species is a hierarchical process that can be defined in terms of species distribution, home range placements within the distribution range, and space use within the home range. Snow leopards are known to have large home ranges of the order of 80-700 km2 in size, but also have strong spatial preferences to certain habitats where individual contiguous habitat patches can often be smaller than the known individual home range sizes. Density of a species is often strongly correlated with the habitat quality and availability of prey, whereas their movements, and hence detection are associated with availability of markable sites or sites with critical resource such as water bodies. Analyses can lead to biases in case sampling is done only in suitable habitats by trapping in the best possible sites accessible to the researcher without taking into consideration the factors that might be causing a spatial variation in density and detectability within sampled areas. We present density surfaces based on ecologically relevant covariates and use information theoretic approach to compare the three sites for snow leopard density as a function of habitat covariates whose responses could have varied between three neighbouring sites. Our results indicate that density varied positively as a function of ruggedness at the same rate between the three sites irrespective of their protection regime. Our top models chose a0 parameterization for detection probability indicating that animals moving in larger ranges were less likely to be detected at their activity centres and vice versa. Traps around water-bodies in the sampled sites had smaller effective area of ranging and higher detection probabilities, but this relationship varied between the three regions. Similarly, traps in canyons were more likely to have detected snow leopards as compared to those on ridgelines or steppe. Modelled density of activity centres of snow leopards ranged between nearly 0 to 5 per 100 km2, thus indicating the possibility of bias in selecting small sampling areas without considering the effect of covariates. Our results show that in the hierarchical order of habitat selection, availability of suitable habitat governs abundance of snow leopards, where they tend to be robust in their selection at the level of periodic placements of activity ranges, but are more sensitive to differences at the level of space use within activity ranges.