

Assessing the Mega Faunal Diversity of Overa-Aru Wildlife Sanctuary, Kashmir Himalaya, India

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Abstract

We report the preliminary results of field survey carried out in the Overa-Aru Wildlife Sanctuary (WS) focussing on the mega fauna of the area. The sampling recorded basic information on the occurrence, distribution and relative abundance of six species of mammals and two species of raptors. Among mammals highest sign encounter rate was observed for Himalayan brown bear *Ursus arctos* (0.23 ± 0.15) while, long-tailed marmot (*Marmota caudata*) was the most frequently sighted (0.24 ± 0.19). Raptor species showed an overlap in their elevational range and were distributed mainly in the coniferous forests and alpine habitats of the area. The study highlighted the conservation importance of the area. We therefore, propose a well-designed monitoring program using camera traps surveys that can be useful in generating robust information on population trends, to ensure efficient conservation of the species in the sanctuary.

Keywords: Conservation, encounter rate, Kashmir Himalaya, mega fauna and Overa-Aru

Introduction

Kashmir Himalaya, located in the north-western extreme of the Himalayan biodiversity hotspot (Rodgers *et al.*, 2000; Mittermier *et al.*, 2004) exhibits a rich repository of natural resources. Positioned at the junction of the Eurasian and Palaeotropical bio-realms, the region is endowed with teeming floral and faunal diversity (Mani, 1974; Dar *et al.*, 2001). It also represents a unique bio-region primarily owing to its complex topography and habitat heterogeneity along a wide elevational range (Dar *et al.*, 2001; Husain, 2001). More than 2000 plant species distributed in the region form diverse habitat types homing wide variety of life forms across its landscape (Dar *et al.*, 2002). Moreover, the complex topography and vegetation cover of the region plays a profound role in determining the climatic variability and influencing the ecosystem functioning in the entire Kashmir Himalayan landscape. In spite of such enormous significance, very little ecological information is available on the biodiversity this region. This is primarily due to the extreme weather conditions, rugged terrain and remoteness of the area challenging researchers in carrying out long-term studies (Schaller, 1977). Resultantly, most of the protected areas except a few even lack proper documentation of their faunal diversity (Sathyakumar and Bashir, 2013; Pal *et al.*, 2016). Therefore, as a preliminary step towards long-term ecological monitoring, we aimed at collecting baseline information on the status of the mega faunal assemblage of Overa-Aru WS, located in the south division of Kashmir Himalaya.

Material and Methods

Study area

Overa-Aru WS is located in the Anantnag district of Jammu and Kashmir between the latitudes of 33°55' to 34°20' N and 75°5' to 75°32' E (**Figure 1**). Its elevation varies from 2100 m to 5425 m (summit of Mt. Kolahoi). Overa-Aru is an old sanctuary declared under Dogra rule in 1945 covering 32 km² and later extended to 392 km². At present the sanctuary covers a total area of 457.39 km² declared by the state government including Overa (165.39 km²) and Aru

(292 km²). Due to variation in altitude, aspect and soil, a diversity of vegetation is discernible in the protected area. The vegetation of the Overa-Aru WS is mainly Fir (*Abies pindrow*) with Kail (*Pinus griffithi*) in the lower elevations near *Nullahs* (Suhail, 2000). Based on varied physical variations three major forest types found in the area include, riverine vegetation (1600-2300 m), coniferous forests (2300-3300 m), and alpine scrubs and pastures (above 3400 m), respectively.

Field sampling in Overa-Aru WS

Field activities in the Overa-Aru WS were carried out in the form of expeditions that included camping in different areas of the WS (**Plate 1a**). We first surveyed the Aru part of the WS during which field sampling and monitoring were done in two separate divisions. One division covered the areas of *Lidderwath*, *Khallen*, *Bod kholl*, *Muse kholl*, *Satlenjan*, *Royelle*, and *Surmasar* (2400-4000 m, **Plate 1b**) and the other part included areas of *Kote pathri*, *Geerwar*, *Gaddad pathri*, *Kanzal pathri*, *Aangun*, and *Danwath* (2700-3900), respectively. The surveys were administered from different halt points/base camps located at *Lidderwath* (2730 m), *Khallen* (3220 m), and *Gaddad pathri* (2900 m) areas.

During surveys, natural trails, ridges and *nullahs* were walked and information on sightings and evidences of occurrence of wild mega fauna were recorded. Nine such trails of lengths varying from 2.9 to 6.3 km were identified and marked during the surveys (**Figure 1**). Each trail was monitored four times during the survey period. In case any animal evidence (sighting/sign) was encountered, information on its GPS location, elevation, and habitat type was recorded. The presence locations of animal evidences were later plotted on the digital elevation model (DEM) of the study area to represent their distribution using ArcGIS 9.3. Sign encounter rate (index of animal abundance) was calculated using the formula: $ER = n/L$; where 'n' is the total number of sightings/scats/pellet groups encountered and 'L' is the total linear length covered during trail sampling (Marques *et al.*, 2001; Sathyakumar, 1993a and Sathyakumar, 1993b).

Results

During sampling, we recorded the presence (sighting/evidence) of charismatic species including Himalayan brown bear, Asiatic black bear *Ursus thibetanus*, common leopard *Panthera pardus*, Bearded vulture *Gypaetus barbatus*, Himalayan vulture *Gyps himalayensis*, and many species of birds. The most frequently sighted mammal was the long-tailed marmot (n = 9) with an encounter rate of 0.24 ± 0.19 individuals/km. The sign encounter rate was highest for Himalayan brown bear followed by Asiatic black bear and common leopard, respectively (**Table 1**). The Himalayan brown bear evidences were recorded above 2900 m primarily covering the alpine scrub/pasture habitats, while the black bear evidences were distributed mainly in the coniferous habitat below 3200 m (**Plate 1c & 1d**). Among mammals, long-tailed marmot was recorded at the highest elevation of 3611 m and black bear at the lowest elevation of 2694 m. Distribution range of both the species of vultures (raptors) recorded were overlapping covering both coniferous and alpine scrub/pasture habitats (**Plate 1e & 1f**).

Table 1: Encounter rate (ER/km), elevation range (m) and habitat type (R = riverine, C = coniferous, ASP = alpine scrubs and pastures) of different species recorded during trail sampling in the Overa-Aru WS.

S. No	Species (with IUCN status)*	Evidence	ER \pm S.E	Elevation (m)	Habitat
1.	Himalayan brown bear (CR)	Sign	0.23 \pm 0.15	2904-3425	C, ASP
2.	Asiatic black bear (VU)	Sign	0.18 \pm 0.08	2694-3019	C
3.	Common leopard (VU)	Sign	0.02 \pm 0.02	2936	C
4.	Long-tailed marmot (LC)	Sighting	0.24 \pm 0.19	3326-3611	ASP
5.	Yellow throated marten (LC)	Sighting	0.06 \pm 0.06	2730	R, C
6.	Himalayan stoat (LC)	Sighting	0.03 \pm 0.03	3046	C
7.	Bearded vulture (NT)	Sighting	0.05 \pm 0.03	2972-3696	C, ASP
8.	Himalayan vulture (NT)	Sighting	0.10 \pm 0.06	3068-3480	C, ASP

* CR = Critically Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern

Discussion

In this study, we were able to obtain very useful information on the occurrence of mega faunal species, their distribution, and relative abundance in Overa-Aru WS. Species recorded in the survey were of global conservation significance including two vulnerable, two near threatened and one critically endangered as listed in IUCN (IUCN, 2017) validating the conservation potential of the area. Distribution patterns of the species recorded were in accordance with their habitat preferences reported elsewhere (**Figure 2**). Brown bear being an alpine species known to occur primarily above treeline (Sathyakumar, 2001) was recorded mostly in the alpine scrubs and pastures above 2900 m, whereas the occurrence of black bear primarily in the coniferous forests complemented its forest dwelling habit (Sathyakumar and Choudhury, 2007). The occurrence of long-tailed marmot at the highest elevation compared to other species was also in accordance with its habitat preference elsewhere including rough grasslands and alpine meadows covered with rocks and dwarf junipers (Molur *et al.*, 2005). On the contrary, the occurrence of leopard and yellow-throated marten, the habitat generalist species below treeline indicated their affinity for forested habitats. Stoats known to prefer coniferous and mixed woodlands, although they occupy a wide range of habitats and are often found in forest-edge habitats, scrubs, alpine meadows and marshes (Pulliainen, 1999), their occurrence in the *krummholtz* zone validated their adaptability to different habitat types. The occurrence of both the species of raptors near and above treeline was typical of their high-altitude habitat specificity however the scavenging records of Himalayan vulture on animal carcasses at lower elevations indicated their broad habitat niche. Although, the encounter rates of signs/sightings of the species recorded during the surveys provided a general overview of their relative abundance in the area, it is less feasible to compare these indices with the estimates reported elsewhere because of the low sample size. Moreover, due to the time and logistic constraints of our study we were unable to record the presence of other species reported from the area (Suhail, 2000), including Hangul (*Cervus hanglu*), Kashmir musk deer (*Moschus cupreus*) and Himalayan serow (*Capricornis thar*).

Our study clearly indicates the enormous potential and need for research and conservation initiatives in the area though a much comprehensive study and a long-term monitoring exercise. We therefore, propose a well-designed monitoring program using camera traps supplemented by local knowledge that can provide robust data to wildlife managers to monitor the long-term population or biodiversity trends. We also believe a higher initial outlay of funds and training for a camera trap based monitoring system will provide the framework needed for conservation programs in Overa-Aru WS to move forward.

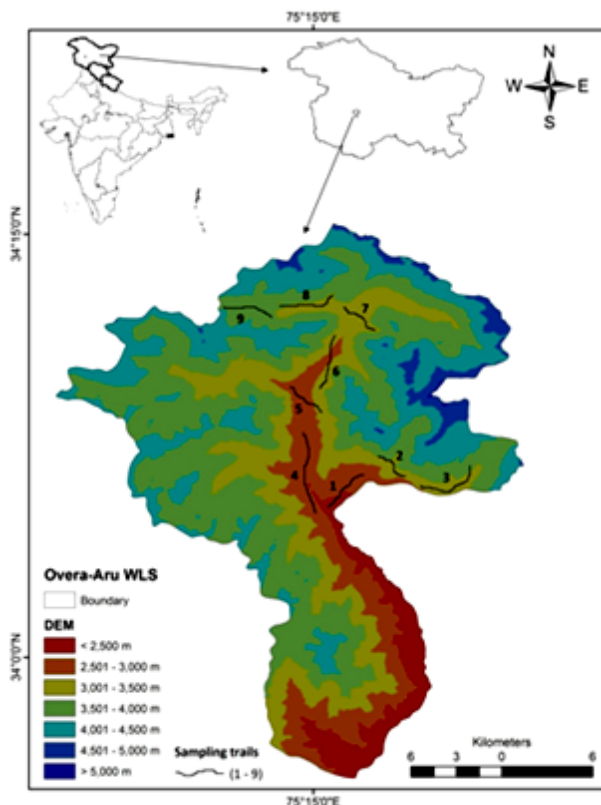


Figure 1: Location and DEM of the study area (Overa-Aru WS) along with the distributions of trails walked during sampling.

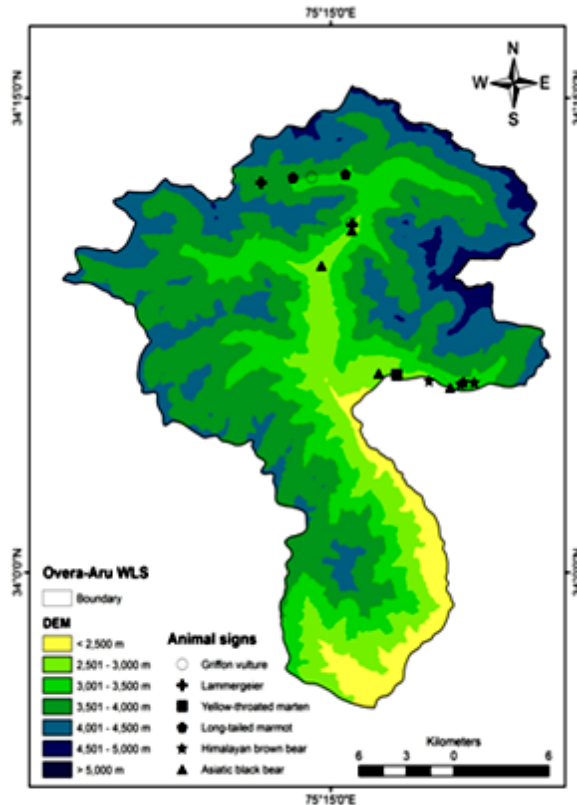


Figure 2: Map showing locations of animal presence (evidences) recorded during sampling in Overa-Aru WS.

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Plate 1: (a) Camping in the study area, (b) Landscape of Surmasar area, (c) Den of Himalayan brown bear, (d) Brown bear scat/feces, (e) Sighting records of Himalayan vulture, & (f) Bearded vulture.

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