

**Radio-tracking of western tragopan (*Tragopan melanocephalus*)  
in Great Himalayan National Park, India**



**Final Report**

*(A collaborative project of Wildlife Institute of India, Dehradun  
and World Pheasant Association, U.K.)*

**K. Ramesh, S. Sathyakumar and G. S. Rawat**



**भारतीय वन्यजीव संस्थान  
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# CONTENTS

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Acknowledgements

Contents

Abstract

**Introduction ..... 1**

**Study area and methods ..... 2**

Fall-net

Leg-hold noose

Trap efforts

Home range estimation

Habitat use

**Results ..... 7**

Home range

Habitat use

**Discussion ..... 12**

**Literature cited**

## ABSTRACT

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*Attempts were made to radio-tag western tragopan (Tragopan melanocephalus) to study the habitat use and movement pattern in Great Himalayan National Park, India. Fall net and leg-hold noose were used to trap birds. One female tragopan was caught in the leg-hold noose in May 1999, and was radio-tagged using necklace type collar. Both home-in and triangulation methods were adopted to record radio-locations and the home range was estimated using Minimum Convex Polygon method. The habitat use was studied by overlaying radiolocations and home range polygons on the spatial layer on vegetation, digital elevation model, aspect and slope, and also by studying random plots. Though trapping was tried for three months (April - June) with total trap efforts of 256 man-days and 6694 trap hours, trap success was very low for western tragopan (of just one bird). The overall home range of the radio-tagged bird was estimated to be 31.6 ha and for summer and autumn, the home range was 20.5ha and 4.7ha respectively. The bird moved between the elevation ranges 2530m and 2710m in summer and between 2440m and 2530m in autumn, and in both the seasons the bird was using broad leaf dominated forests with moderate level of canopy cover and shrub density. Though conclusive results could not be drawn from a study based on just one individual, the findings appear to largely concur with the earlier studies on the species and its congeners.*

## 1. INTRODUCTION

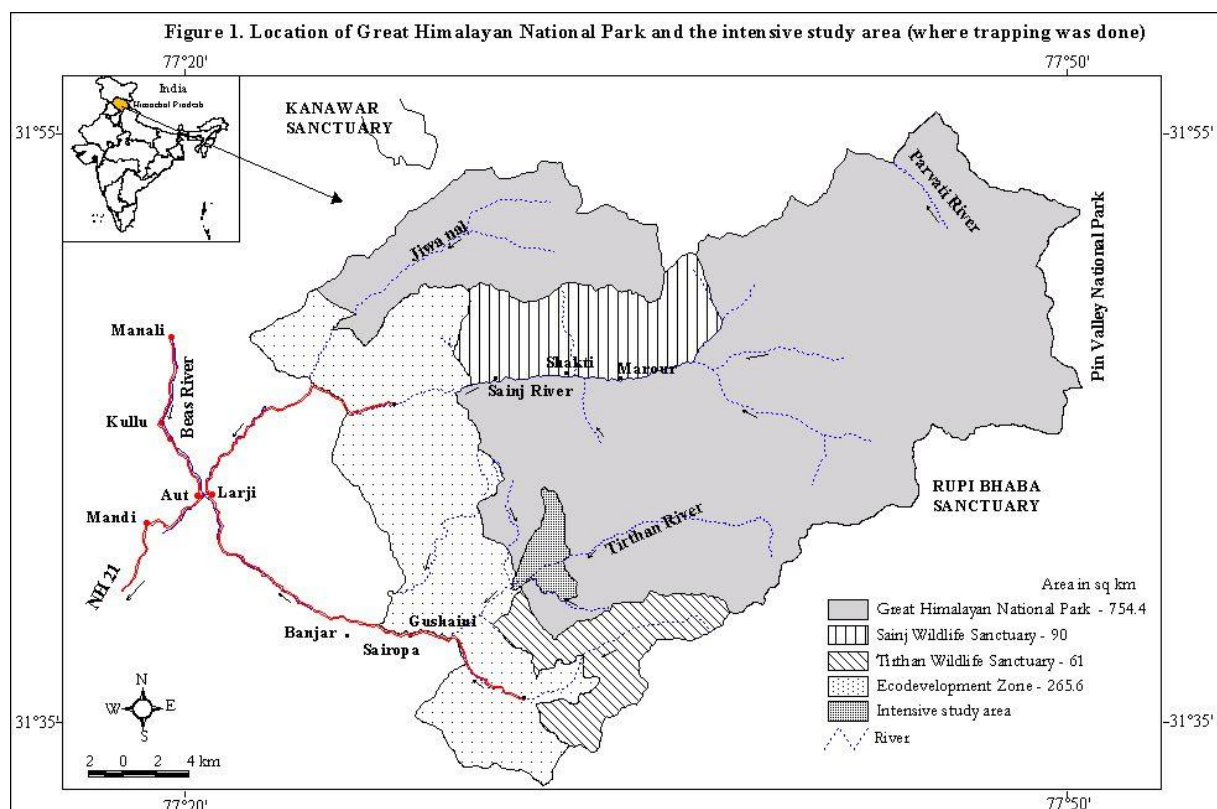
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The western tragopan (*Tragopan melanocephalus*) is a little known endangered pheasant, confined to a narrow and discontinuous range in the Himalaya, between Kohistan district of Pakistan and the western part of Uttaranchal in India (Fuller and Garson 2000). With only 2000–3000 sq. km area of potential habitat available, it is hardly surprising that the estimated world population of this species to be fewer than 5000 individuals (Gaston et al. 1983a, Birdlife International 2001). By virtue of its low population and limited distribution range, the western tragopan is considered to be one among the high priority species for conservation (Fuller and Garson 2000). The available options for evolving conservation strategies are, however, constrained by inadequate scientific information on the species. The dearth of knowledge is conspicuous from the fact that the six months study by Islam (1985) in Pakistan was the only intensive effort to study the ecology of the species. Prior to the just completed two independent studies in India (Ramesh et al. 1999, Bashir et al. 2000), there had been several surveys carried out in both India and Pakistan, but most of the attempts were towards documenting spatial distribution and population status of the species (Mirza et al. 1978, Islam 1982, Gaston et al. 1983b, Duke 1989, Duke 1990, Gaston and Garson 1992, Prasad 1993, Pandey 1994, Jandrotia et al. 1995, Whale 1996, Jandrotia 1999 and Nawaz 1999).

The secretive behaviour, low population density and the kind of terrain the bird lives in are perhaps the major confounding factors that have collectively contributed to the paucity of ecological knowledge on the species. To counter such impediments, we chose to adopt radio-telemetry technique, envisaging that it would enable better understanding on the bird's movement and habitat use without the necessity to observe the birds directly. This paper presents the methods adopted to live trap western tragopan and the ecological information obtained by radio-tracking one female bird during summer and autumn 1999 in Great Himalayan National Park (GHNP), India. Incidentally, the GHNP is one of the very few known areas that support substantial population of western tragopan in India (Gaston and Garson 1992). This study was part of the research work carried out from 1997 to 1999 in this park on the ecology of three sympatric pheasant species including western tragopan, Himalayan monal (*Lophophorus impejanus*) and koklass pheasant (*Pucrasia macrolopha*).

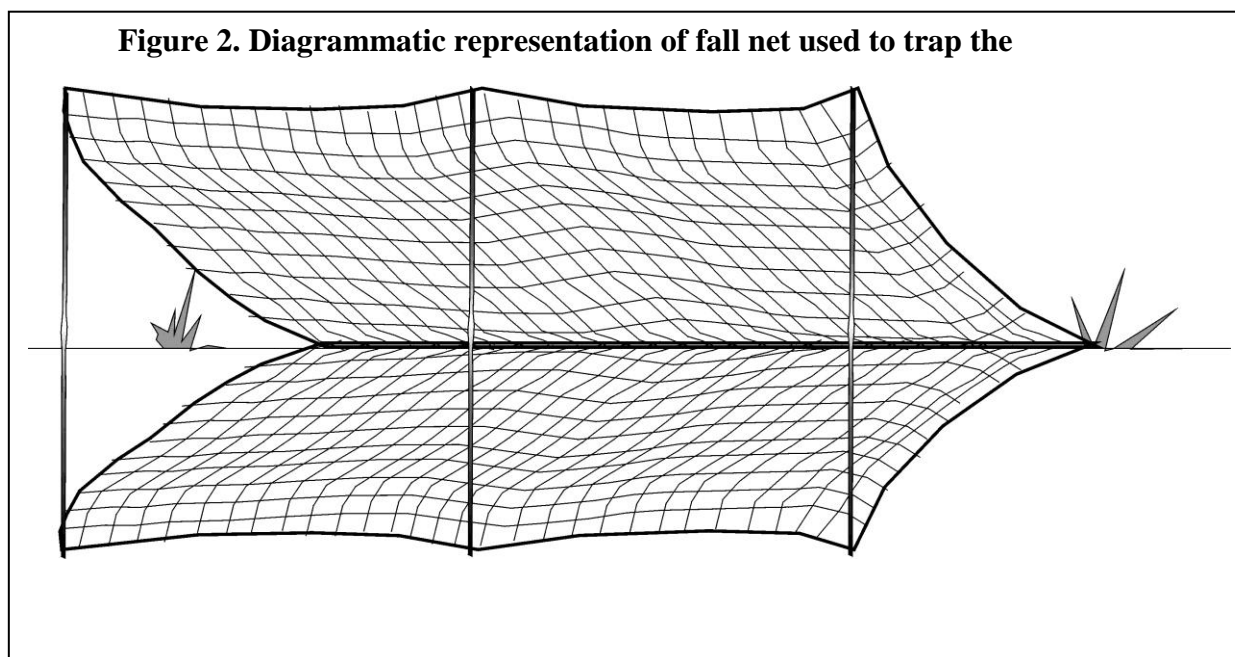
## 2. STUDY AREA AND METHODS

The GHNP is located about 40km east of Kullu town in the state of Himachal Pradesh, India ( $31^{\circ} 33' 00'' - 31^{\circ} 56' 56''\text{N}$ ,  $77^{\circ} 17' 15'' - 77^{\circ} 52' 05''\text{E}$ ). It covers an area of 754.4 sq. km constituted by four major watersheds viz. Tirthan, Sainj, Jiwa and Parvati. The GHNP along with other adjacent protected areas, Tirthan Wildlife Sanctuary and Sainj Wildlife Sanctuary, and the ecozone (established for implementation of conservation based development activities for the dependent local people) form the major conservation unit popularly known as Great Himalayan National Park Conservation Area (Fig.1). The altitude of the area ranges from 1,344m to 6,248m, which indicates the diverse vegetation types from subtropical forests to alpine meadows. Singh and Rawat (1999) have recognised nine vegetation types based on intensive field sampling undertaken during the same time the present study was carried out. These vegetation types are temperate broad-leaved forests, temperate conifer forest, upper temperate broad-leaved and mixed conifer forest, sub alpine birch-rhododendron forest, alpine scrubs, alpine meadows and *thaches*, riverine forest, temperate grassy slopes and temperate secondary scrub. The understory vegetation in the middle altitude (the distribution range of western tragopan) is dominated by shrub species such as *Thamnocalamus spathiflorus* and *Viburnum nervosum*.



Trapping was attempted during April – June 1999 in Tirthan valley within 16 sq. km area, which was identified as ‘intensive study area’ for carrying out the major study on the ecology of the sympatric pheasant species (Fig.1). This area was chosen primarily because the logistics and infrastructure facilities had already been established in this area by the major project, besides the fact that this particular area was identified to be holding considerable population of western tragopan. Six fall nets and nine leg-hold snares were used to trap the birds.

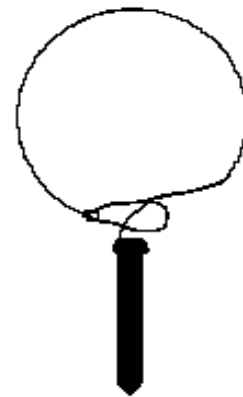
**2.1. Fall net:** The fall net used in this study was a combination of ‘automatic fall net’ and ‘walk-in trap’ described by Bub (1991). The nets were considerably long ranging from 15 to 18m, 6m width and the mesh size was 40 x 40mm, and all the nets were coloured to black and dark green using stains, in order to make it camouflaged with the forests. The nets were placed in such a way that 3m of the net was set lying on the ground and the remaining 3m standing at 50° angle supported by triggers which, in this case, were bamboo sticks (Fig. 2). The net would fall down upon the release of the trigger when disturbed by the bird while walking into the trap.



**2.2. Leg-hold noose:** It is an indigenous trap method used by villagers to trap large birds in some part of north India (*pers. com.* Abrar Ahmed). The leg-hold noose has a series of 40 –

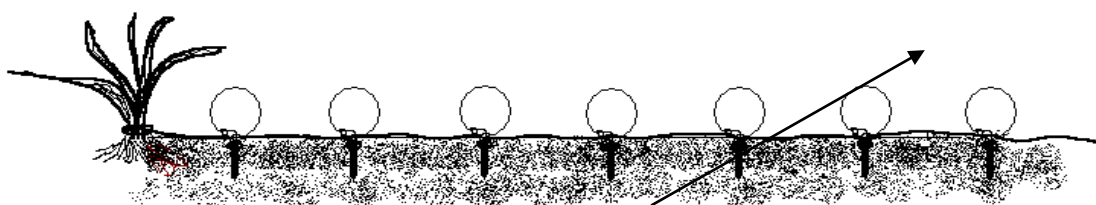
50 independent nooses fixed at 15cm interval in a thin and strong rope (Fig. 3). The noose was made up of nylon measuring about 30cm diameter, fixed with a bamboo or any other stick at the base of the noose. The stick, which is 10cm long and 2cm girth, is pressed inside the soft soil, leaving only the noose part on the ground sticking out at 90° angle. One end of the trap is tied with a nearby pole or any shrub that hold back the trap when the trapped bird tries to pull away from the trap, where as the other end is left loose. This set up prevents the bird from breaking away from the trap, while enabling the bird to move around without

**Figure 3. Diagrammatic representation of leg-hold noose used to trap the western tragopan.**

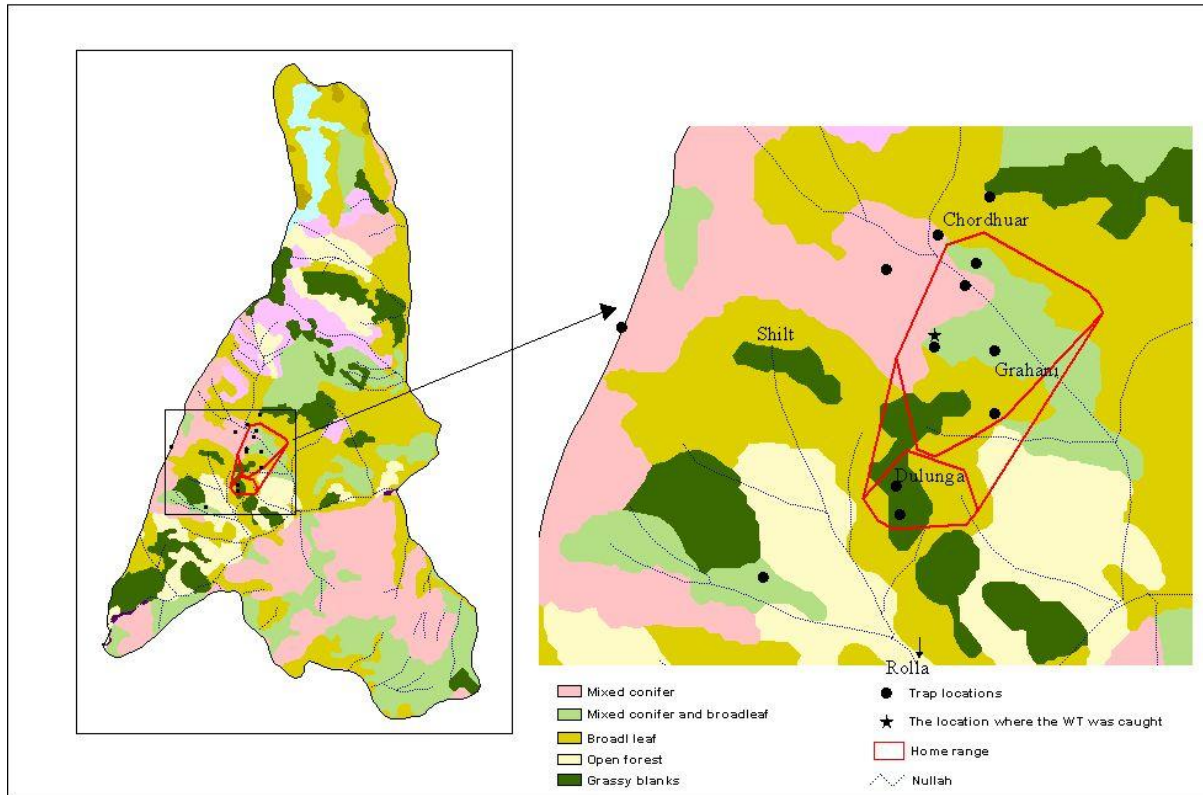


inflicting any sort of damage to the leg.

**2.3. Trap efforts:** Traps were set in a total of 12 locations representing different forest types ( $n = 6$ ), *thaches* (forest clearing used as campsite by pastrolists) ( $n = 2$ ) and *nullahs* (small streams of both perennial and seasonal) ( $n = 4$ ) (Fig. 4). The traps were placed on the ground in the previously identified sites such as water holes, roost sites and daily movement area, and were monitored periodically. Besides, on locating or hearing the bird, the net was set at 200m above the bird and was chased towards the net by 3 – 4 persons from different directions. A total of 256 man-days (4 persons x 64 days in three months) were spent in the



altitudinal range between 2600m and 3000m, where we had maximum sightings of western tragopan during the past three years of fieldwork. Considering the number of traps and the amount of time spent each day, the total trap hours amounted to 6694 during the trapping exercise, contributed by 3924 net hours and 2767 noose hours.



**Figure 4. Locations where trapping was attempted in the intensive study area**

**2.4. Home range estimation:** The trapped bird was fitted with a radio transmitter using standard Biotrack necklace type collar weighing about 50g, which had the potential life span of minimum 12 months. Three element Yagi antenna and Mariner 57 biotag receiver were used to record the radiolocations. Home-in method to locate the bird was discarded after three consecutive sampling days, as the movement of the bird was found to be influenced by the observer. Rest of the data collection was based on triangulation method recorded at three times sampling (6 – 11 hrs, 10 – 15 hrs and 15 – 18 hrs) every third day. The bird was radio-tracked until November 1999 covering both summer (May – September) and autumn (October and November) seasons, after which there was no signal obtained perhaps due to transmitter failure or the radio tagged bird had been taken away by predators far away from

the study area. Locations were plotted on 1: 50,000 topographic map and the home range was estimated based on Minimum Convex Polygon (MCP) method using Arcview software.

**2.5. *Habitat use:*** Spatial database developed for GHNP by the Wildlife Institute of India (Mathur and Naithani 1999) on vegetation (using LISS II satellite data), digital elevation model, aspect and slope were used to study the different habitat parameters used by the bird. The location data and the home range polygon were overlaid on these existing maps, and the analysis was done in GIS domain using Arc/info and Arcview software. Random plots (n = 9) were laid to study the microhabitat features used by the radio tagged-bird within the home range area. Within the random plots, number of trees, % canopy cover of trees, different cover categories on vertical scale (>5m, 2-5m, 1-2m, 0.1 -1m and 0-0.1m), number of fallen logs and distance to water sources were quantified in circular plot of 10m radius, species composition and abundance of shrub species were quantified in 5m radius plot, and 1 x 1m quadrat was laid to record ground parameters such as litter cover and litter depth. The data collection on the microhabitat features was restricted to only summer season due to time constraints.

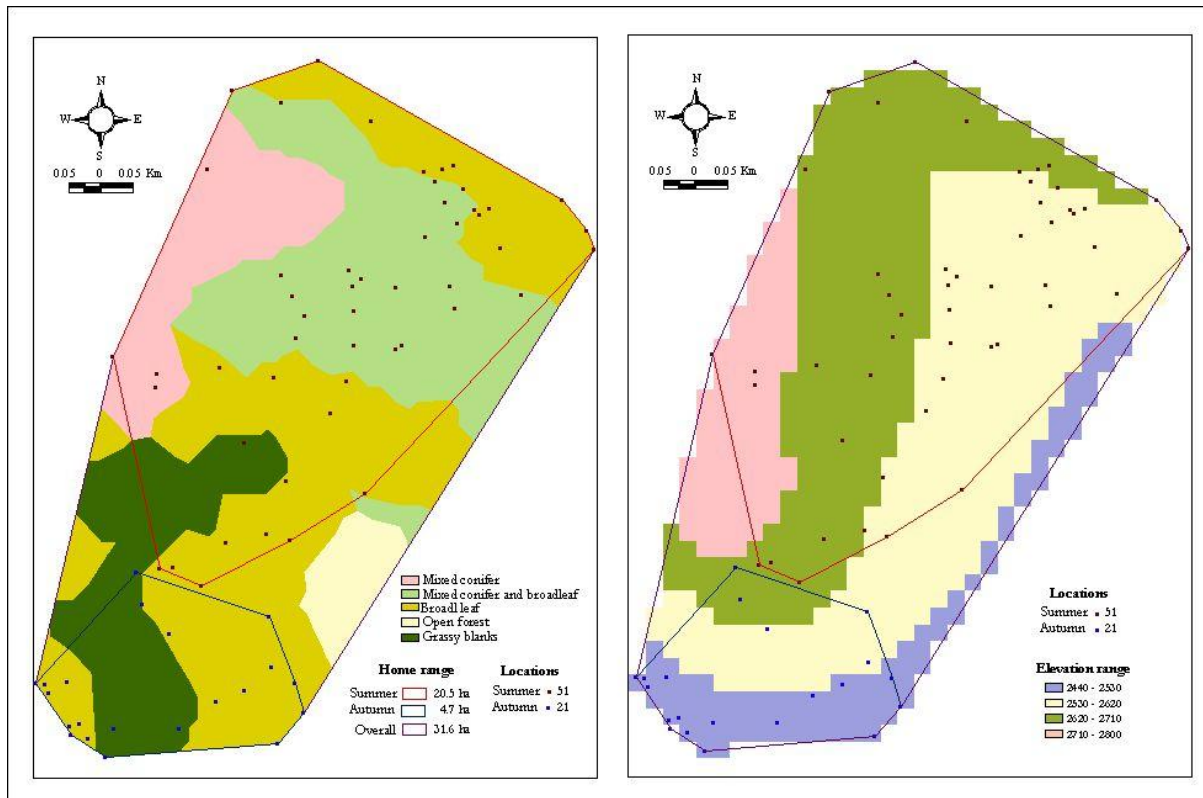
### 3. RESULTS

**3.1. Home range:** One female western tragopan was caught on 14<sup>th</sup> May 1999 in a leg-hold noose set on *nullah* within mixed broadleaf and conifer forest above Grahani *thach*. The bird was released on the same spot after radio-tagging and taking necessary morphometry measurements. During the course of trapping, 12 other bird species including koklass, hill partridge and woodcock were also caught, most of which were in nets (Table 1). A total of 72 radio-locations representing summer (51 locations) and autumn (21 locations) seasons were obtained during the study period. The estimated home range of the female tragopan for the entire study period was 31.6ha, and for summer and winter home ranges were 20.5ha and 4.7ha respectively (Fig. 5). The bird moved to lower elevation area between Rolla and Dulunga *thach* in the month of October and remained there till we lost the signal in later November 1999. In spite of its limitations, we preferred MCP method, primarily because of low sample size (of just one bird) and also to allow comparison of the homerange estimate with other galliformes studies used this method.

**Table 1. Frequency and number of bird species caught in different traps**

S. No	Species	Frequency	Total number	Trap
1.	Eurasian wood cock <i>Scolopax rusticol</i>	3	4	Net
2.	Koklass pheasant <i>Pucrasia macrolopha</i>	1	1	Net
3.	Hill partridge <i>Arborophila torqueola</i>	3	4	Net
4.	Western tragopan <i>Tragopan melanocephalus</i>	1	1	Noose
5.	Mountain scops owl <i>Otus spilocephalus</i>	1	1	Net
6.	Grey headed woodpecker <i>Picus canus</i>	1	1	Noose
7.	Spotted nutcracker <i>Nucifraga caryocatactes</i>	1	2	Net
8.	Blue whistling thrush <i>Myphonus caeruleus</i>	2	2	Net
9.	White-collared black bird <i>Turdus albocinctus</i>	1	1	Net
10.	Plain backed thrush <i>Zoothera mollissima</i>	1	1	Noose
11.	Scaly thrush <i>Zoothera dauma</i>	2	2	Noose/Net
12.	Mistle thrush <i>Turdus viscivorus</i>	2	2	Net
13.	Black-and-yellow grosbeak <i>Mycerobus icteroides</i>	2	3	Net
	<b>Total</b>	<b>21</b>	<b>25</b>	

**Figure 5. Vegetation types and elevation used by the radio-tagged western tragopan during summer and autumn seasons**



**3.2. Habitat use:** The radio-tagged bird used five broad vegetation types *viz*, mixed conifer forest, mixed conifer and broadleaf forest, broadleaf forest, open forest and grassy blanks (Fig. 5). The conifer forests used by the bird were dominated by *Abies pindrow* and *Taxus baccata*. The broadleaf forests in higher altitude were dominated by *Acer caesium* and *Quercus semecarpifolia* and the lower altitude forests by *Juglans regia*, *Ulmus wallichiana* and *Corylus colurna*. The area represented by each vegetation types and the number of radiolocations obtained in summer and autumn seasons are presented in Table 2. The bird used high tree density ( $8.4 \pm 1.2/\text{plot}$ ) and shrub density ( $8.7 \pm 1.5/\text{plot}$ ) area, and interestingly, the shrub species in all the nine plots was dominated by *Thamnocalamus spathiflorus*. The canopy cover ranged between 25 and 40%, with mean percentage of  $30 \pm 1.9$  (SE). The descriptive statistics on the other microhabitat variables are given in Table 3.

**Table 2. Area (in ha) covered by different vegetation types within the home range area during summer and autumn 1999 (number of locations obtained in each vegetation types are given in parentheses).**

Vegetation types	Summer	Autumn	Overall
Mixed Conifer	3.7 (4)	0.0 (0)	3.8 (4)
Mixed Conifer and Broadleaf	7.8 (21)	0.0 (0)	8.7 (21)
Broadleaf	7.6 (25)	2.8 (17)	13.1 (42)
Open Forest	0.0 (0)	0.0 (0)	1.2 (0)
Grassy Blanks	1.5 (1)	2.0 (4)	4.8 (5)
<b>Overall</b>	20.6 (51)	4.7 (0)	31.6 (72)

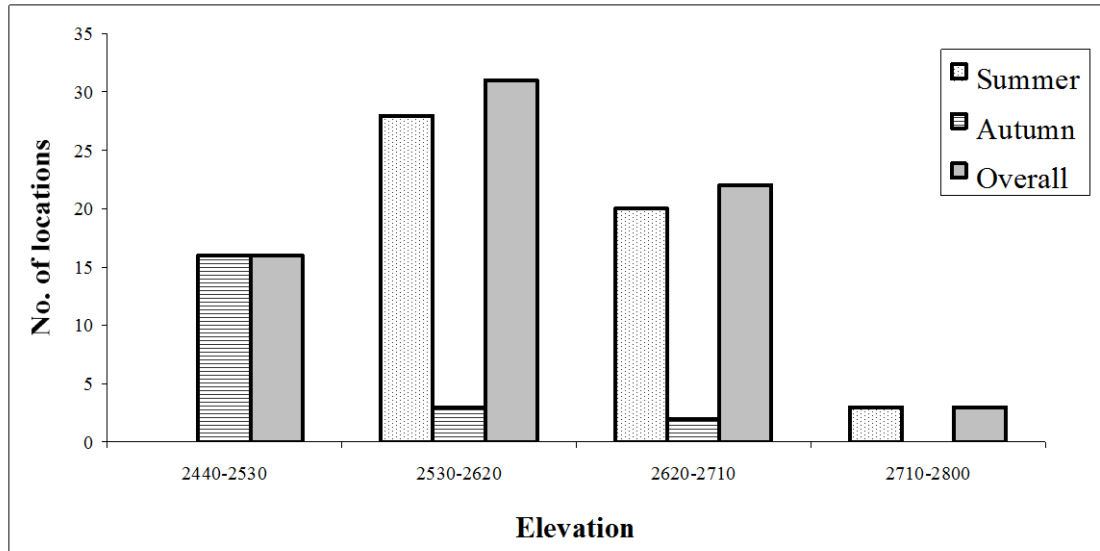
**Table 3. Descriptive statistics on the microhabitat features used by the radio-tagged bird during summer 1999 (n = 9).**

Habitat variables	Minimum	Maximum	Mean	Standard Error
Distance to water (m)	5	90	30.6	10.32
No. of fallen log	0	2	0.9	0.26
Tree cover (>5 m) (%)	5	10	7.2	0.88
Shrub cover (2-5m) (%)	20	40	30.0	2.89
Herb cover (1-2m) (%)	0	5	1.9	0.80
Grass cover (0.1-1m) (%)	10	43	22.6	3.48
Ground cover (0-0.1m) (%)	10	35	20.6	3.28
Litter cover (%)	65	90	77.8	3.24
Litter depth (cm)	1	2	1.5	0.08

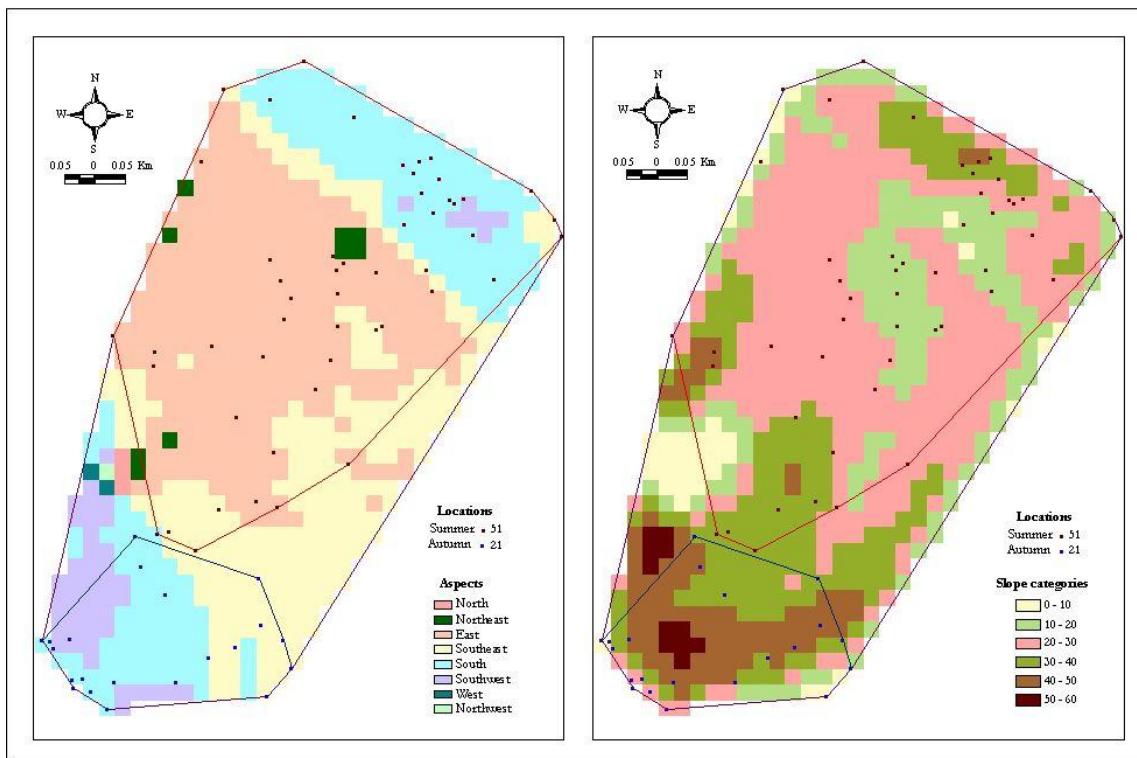
The elevation of the home range area ranged between 2440m and 2800m (Fig. 5). Considering the radiolocations as representative of the bird use, the higher number of location obtained in the elevation range 2530 -2620m (n = 31) and 2620-2710m (n = 22) indicates higher use by the bird in this elevation areas irrespective of seasons. During autumn, 16 locations, which are 76% of the total locations obtained in this season, was distributed between the elevation range from 2440 and 2530m (Fig. 6). The different aspect and slope categories represented in the home range area both in summer and autumn are presented in Figure 7. The bird was found to be frequenting in the east, southeast and southern aspects

(Fig. 8). It did not use steep slopes, and majority of the location (57) was in the 10 - 40° slope angle (Fig. 9).

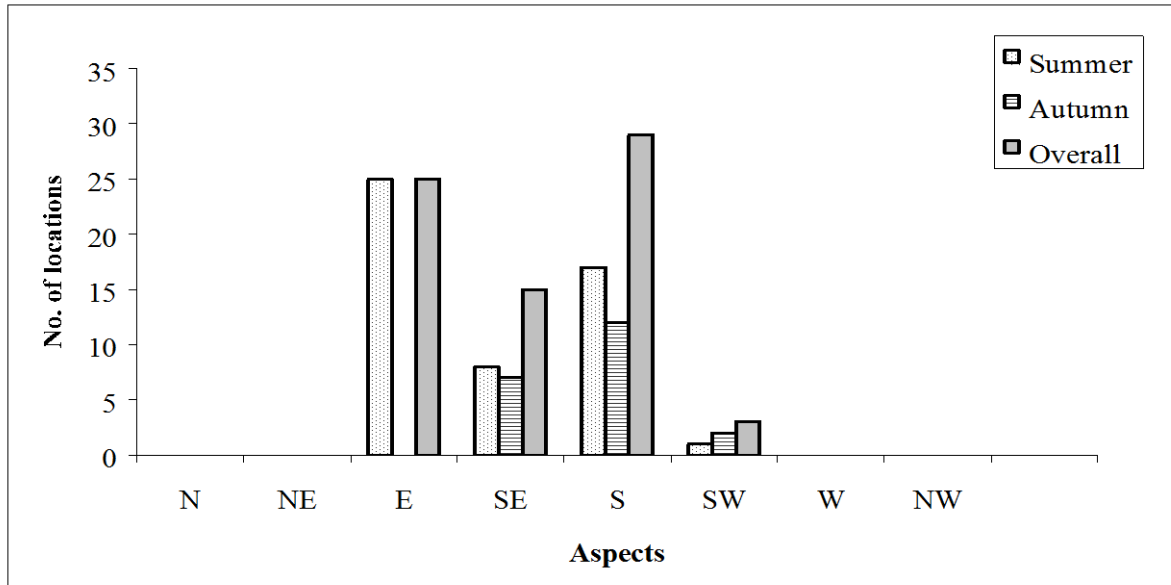
**Figure 6. Radiolocations recorded in different elevation categories.**



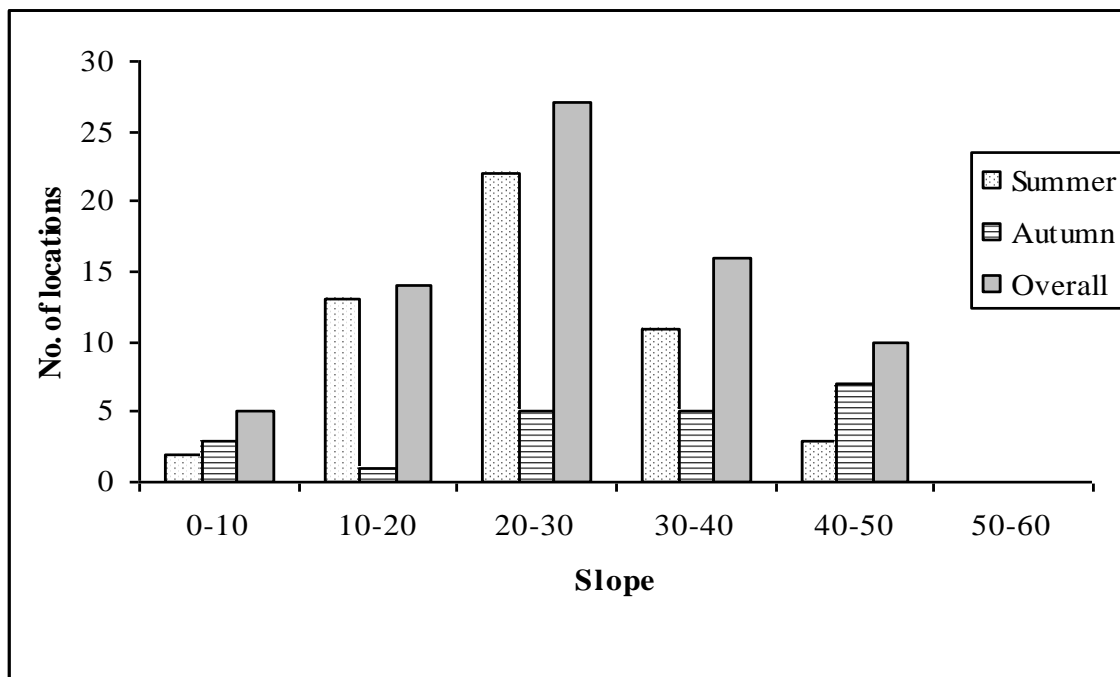
**Figure 7. Aspect and slope categories used by the radio-tagged western tragopan during summer and autumn.**



**Figure 8. Radiolocations recorded in different aspect categories.**



**Figure 9. Radiolocations recorded in different slope classes.**



#### 4. DISCUSSION

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The traps (fall net and leg-hold snare) used in the study were apparently safe and effective in terms of catching ground dwelling birds. Although the trap success for western tragopan was very low with just one individual in three months, the number of other ground dwelling birds such as koklass (n =1), woodcock (n = 4) and hill partridge (n = 4) caught using the traps indicates the effectiveness of the traps. The trap success perhaps could have been increased if attempted in winter, when the birds descend to a narrow belt in the lower elevation areas due to resource crunch (both food and habitat) caused by winter snow at higher altitudes (Johnsgard 1986, del Hoyo et al. 1994, Ramesh et al. 1999). Summer being the breeding season of the western tragopan, trapping and subsequent radio-tagging in this period is likely to affect the breeding success of the bird, at the same time trapping becomes less effective due to dispersion of the bird into wide areas. This was evident in this case that the female bird did not breed during this season, although the clear brood patch found in the bird indicated the breeding ability, and the trapping success was extremely low, considering trapping efforts. The only advantage in this season was the breeding calls produced by males, which enabled to locate and follow the movement of the male to some extent.

Considering the endangered status of the bird, necessary care was taken in trapping and attaching the transmitter on the bird so as to protect from predators and to minimize negative effect on the bird. The radio transmitter attached on the bird weighed less than 3% of the body weight of the bird (1.5kg), as recommended by Kenward (1987). The home-in method, though found to be far less biased method to estimate the home range and to study the habitat use, could not be adopted. It was primarily because, the bird was found to be skulking under bush and upon reaching the location by the observer, it flushed down hill. This act seemed to influence to actual movement area of the bird. The information gathered on home range and habitat use needs to be viewed with caution as it was based on very low sample size (n =1) and is not representative of both the sexes. The home range estimate is, however, comparable with the estimates obtained for Cabot's tragopan (*Tragopan caboti*) in China during winter 1987 (Young et al. 1991) and spring 1992 (Changqing and Guang-mei 1993), which were also based on single female bird. Interestingly, the empirical data collected on the habitat use by the species in Pakistan by Islam and Crawford (1987) and the recent study in India (Ramesh et al. 1999) have had similar observation on the use of different habitat features

such as vegetation types, elevation, canopy and shrub cover by the western tragopan. The general observation of high altitude bamboo (*Thamnocalamus spathiflorus*) being the important cover for the species in India has been supported by the radio-tagged bird, and apparently the *Viburnum sp.* has replaced the bamboo in Pakistan.

Due to its rarity, trapping of tragopan was a great challenge, particularly during the breeding season when they were largely secretive. Few local trappers, who claimed to have trapped the birds in earlier days, were of the same view and were unambiguously pessimistic on trap success in this season. We strongly feel that the traps used in this study would certainly increase the trap success if attempted in winter as the birds are concentrated in lower elevation areas and perhaps baiting can also attract the birds to the traps due to resource crunch in this season. Future study with adequate number of radio-tagged bird would not only help to arrive at decisive inference on the home range and habitat preference of the species, but might also reveal several interesting facets on its ecology and social behaviour. The interesting observation that was overlooked during trail monitoring (Ramesh et al. 1999) was the frequent use of montane bamboo by the species. The information gathered from recent studies and past surveys compounded with the data generated through telemetry study would greatly benefit conservation of the species.

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