

CHAPTER 7

THREAT STUDIES

7.1 Introduction

The threats facing the family Phasianidae are highest in the forests of southeast Asia, the Himalaya and China (McGowan 1996). The proportions of pheasants that are threatened as a result of man's activities is amongst the highest in any bird family

Of all the families of Galliformes, pheasants have probably made the most profound impact on man. As they are large birds, all along their range they have been shot and snared for food and sport, their eggs collected for high protein food and have also been a religious and cultural influence on man. Many of the threats faced by the pheasants is partly because of this close relationship with man.

Most of the Himalayan pheasants belong to the narrow temperate zone (50-100 km wide and 2000 km long) intermediate between the tropical and the palearctic zone (Gaston *et al.* 1983). This narrow temperate zone is fragmented by extremities of topography and anthropogenic pressures. During the past 150 years changes in agricultural practices, intensive grazing by domestic livestock and increased demand for timber due to increase in population has led to an increase in the loss of forest cover throughout the Himalaya (Cronin 1979, Schaller 1980). This reduction in forest area, together with the fragmented nature of the ecosystems has

made wildlife species like pheasants of these Himalayan forests particularly vulnerable to local extinction (Diamond 1974, Terborgh and Winter 1980).

There are 5 types of threats to pheasants identified by the WPA/Birdlife and SSC Pheasant Specialist Group (McGowan & Garson 1995). Out of these habitat loss and fragmentation and hunting for food, sport and trade are the ones that affect the Satyr Tragopan all along its distribution range.

Lying at the northwestern extremity of Darjeeling, the Singhalila National Park constitutes one of the most important forested areas of the already depleting forest cover of the Darjeeling district. These forests, prior to their protected area status were under fairly intense anthropogenic pressures in the form of removal of large quantities of timber, large scale construction of roads, presence of numerous cattle or yak stations and rampant poaching.

While studying the probable threats to Satyr Tragopan in particular and Singhalila National Park as a whole I have attempted to fulfill the following objectives:

1. Describe the socio-economic conditions of inhabitants in settlements around the Singhalila National Park.
2. Describe probable threats that may affect to the environment of Singhalila National Park.
3. Identify factors that may pose ~~to be~~ threats to the Satyr Tragopan .
4. Recommend measures that may serve as guidelines for formulating management plans.

7.2 Methodology

Details of anthropogenic activities of the past were obtained by interviewing local people residing in the various settlements all around the Singhalila National Park. Habitat disturbances like grazing, browsing, lopping and other pressures (vehicular disturbance, constantly used thoroughfare etc.) were measured by their levels of intensity i.e. none = 0, low = 1, medium = 2, high = 3 and intense = 4. These were measured at each animal and random habitat plots over a distance of 10 m from the centre of the plot. Presence of cattle dung pile_Λ^S were counted along the four compass bearings from the centre of the plots for 5 paces each on a bearing. Distance to the nearest human settlement, distance to any road or trail from the centre of each habitat plot were also approximated.

Analysis: Since all data collected on disturbance was by intensity measures or ranks I mostly used nonparametric statistics to analyse data. Mann Whitney U tests were performed to test if the various disturbance factors were significantly different between the animal and random plots. Spearman rank correlation coefficient was used to correlate the different disturbance activities in the habitat plots with distance from human habitation. Kruskal Wallis One Way Anova was used to compare the levels of disturbance at different distances from the nearest human settlements. T tests were used for differences between the ground cover species diversity and shrub cover species diversity across the animal and random plots. Frequency tables were created to get an over all idea about the possible disturbance activities in the Satyr Tragopan habitat.

7.3 Results

7.3.1 Socio-economic observations: The western border which fell within the core zone of Singhalila National Park also marked the International border with Nepal. This was represented by a 42 km unmetalled road built in the pre-independence times and was marked all along its course by small hamlets in the Nepalese territory. Towards the eastern border which is the buffer zone there were several settlements dotting the National Park border in the Indian territory. There were 2 forest villages within the core zone and 2 within the buffer zone of the National Park. Following were the activities carried on by the inhabitants of the settlements bordering Singhalila National Park for economic sustenance:

7.3.1.1 Cattle and Yak owners: Every family residing in the settlements owned a few heads of cattle while many owned up to 100 heads of cattle and yak. The yak mentioned here is a hybrid between the wild yak and the domestic cow and is locally known as "chauri". These animals were kept at yak stations high up in the mountainous territories of Nepal and Sikkim. Some were brought in the Park elevation during winter while many owners keep them permanently in the settlements. The cattle and yak were mainly kept for their milk and meat and the male of the 'chauri' is used as an excellent carrier of load. The milk of cows and yaks is used for churning out butter but mainly for making hardened cheese locally known as "churpi". The butter fetched a price of Rs. 80-100 per kg while the hardened cheese sold for Rs. 100-150 per kg. Sale of these commodities was brisk especially as business dealings were made through middle men and there were

buyers from Nepal, Bhutan and Arunachal Pradesh apart from catering to the demand of the urban population of the Darjeeling district.

7.3.1.2 Agriculture: In villages bordering the core zone of the National Park agriculture was the main occupation while most of the settlers bordering the core zone were small land owners. The main crops grown for their subsistence were millet, maize and potatoes. Potatoes, cardamom and vegetables like cabbage, carrots and peas were some of the cash crops that fetched a fair amount of money. Some of the people also farmed plants like *Swertia chirata* which was considered to have medicinal value and *Daphne cannabina* which was used for making paper.

7.3.1.3 Labourers: The residents of the settlements bordering Singhalila National Park also served as easily available cheap labour force. Some of them were involved in construction and maintenance of the existing road by the Public Works Department. The Forest Department used the labourers in their plantation making and maintenance, building construction and in construction and maintenance of forest paths and trails. The Tourism Department used this labour force for constructing and maintaining their trekking huts. Many of the people also worked as shepherds in the cattle stations of wealthy cattle and yak station owners.

7.3.1.4 Tourism: The Singhalila National Park served as one of the most popular trekking routes in West Bengal and attracted a fairly large number of domestic and foreign tourists. To cater to tourists the facilities provided by the Tourism Department were not always adequate. Therefore small tea shops, lodging and

boarding places were set up by the people in the settlements which did quite good business. Besides, many of the men folks also worked as porters and tourist guides some times earning as much as Rs 200 per day in peak seasons.

7.3.1.5 Liquor making: Almost every house in the fringe area was a tiny distillery brewing and distilling the local liquor which was quite high in demand. This was especially consumed by travellers from the surrounding villages involved in small business, tourists and also the residents themselves.

7.3.1.6. Government employment: Very few of the people in the settlements served as government employees. Teachers, soldiers in the armed forces, caretakers in the Tourism and Forest Departments, policemen, Forest Guards were some of the vocations observed among the settlers.

7.3.1.7 Trade: In most of the settlements here were shops set up to cater to the daily demands of the people. Business in these shops was lucrative because people from distant places in the Nepal where there were no proper communication and transport facilities often came to buy their supplies on a fairly regular basis.

7.3.2 Pressures: Presence of human settlements around any protected area is bound to result into some kind of pressures irrespective of the intensity and extent of such pressures. Enumerated here are some activities that probably influenced the habitat and animals of Singhalila National Park.

7.3.2.1 Grazing and browsing by livestock: All the cattle and yak present in the settlements were grazed in the National Park forests. Grazing and browsing was especially intense in areas which were less than 1 km from human settlements and in areas which had a good network of roads and trails enabling the easy movement of cattle and their herders. Yaks are stocky and sturdy animals with the ability to negotiate any type of terrain. While browsing yaks were observed to force themselves through thick clumps of bamboo, the main understorey of the Singhalila forests. In doing so clumps of bamboo were pulled down and the mature stems broke and eventually dried up. Thus the forest understorey and ground cover were severely affected by the grazing and browsing of livestock especially yaks.

7.3.2.2 Firewood collection: Climatic conditions in the Singhalila National Park vary from temperate to sub-alpine thus cold weather conditions prevailed throughout the year. In all houses besides cooking, fire was kept burning for keeping warm which consumed a large amount of fire wood. The consumption of fire wood further increased by the making of milk products and liquor which required a continuous supply of heat. In almost all houses there were large stockpiles of firewood for the monsoon and the winter. Snags (dead standing trees) were cut and dry twigs were collected mainly by the women and the children. The Rhododendron forests in the upper reaches of Singhalila National Park were under severe threat of lopping for firewood collection. The subalpine forests in this area comprised of Silver Fir with Rhododendron and birch in the understorey. Since Silver Fir was not considered a good fuel wood, there were areas where the other two particularly Rhododendron were cut rampantly to meet the fuel wood demand

of the area. Lopping was less severe in the mixed oak forests because of the availability of snags and twigs.

7.3.2.3 Forest produce collection: Collection of bamboo shoots, immature ferns, various kinds of mushroom and some other edible plants (*Arisaemia* sp., *Rheum australe*, *Actinidia strigosa* etc) by the locals were observed in the Singhalila National Park. Severe depletion of the understory was caused mainly by the collection of mature bamboo stems. These were used for constructing houses and numerous other implements of daily use.

7.3.2.4 Poaching: During my interviews with the local people, almost everyone agreed that poaching activities were severe in the Singhalila Forests prior to the Park being declared a Protected Area. When logging activities were carried out in the Singhalila Forests by the West Bengal Forest Development Co-operation there was large scale road construction for removal of timber. This also led to the presence of a large labour force living within the forests who were involved in snaring and poaching small animals particularly pheasants. There were also reports about supply of animals like the Red Panda and pheasants like Satyr Tragopan to the local zoo.

I have seen groups of poachers with pipe guns and hunting dogs in the National Park forests during my study. I recorded many old snares for birds like pheasants and partridges and large traps for deer, wild boar and deer within the study area.

During the months of July to August butterfly and beetle collectors were reported from within the National Park area.

7.3.2.5 Tourism: The impact of tourism was not manifested directly on the environment of the Park. The impact may be indirect because to cater to the increased number of people visiting the National Park the dependence of locals on forest resources especially firewood was bound to increase.

7.3.3 Habitat pressures: It was observed that grazing, browsing and other pressures were either low or absent altogether in the animal plots while lopping of trees and bamboo appeared as the major potential disturbance activity in these plots (Table 7. 1)

Table 7.1: Showing percentage of animal plots with various levels of disturbances

Disturbances	None	Low	Medium	High
Grazing	65.8	8.8	14	11.4
Browsing	71.9	8.8	9.6	9.6
Lopping	20.2	36.8	29.8	13.2
Others	70.2	13.2	13.2	3.5

Similar to the animal plots, in the random plots levels of grazing, browsing and other pressures were absent or low (Table 7.2). Here too lopping was identified as one of the disturbance factors occurring in a high percentage of plots. Therefore lopping seemed to be one of the major disturbance activities occurring in the habitat of Satyr Tragopan as in 79.8% of the animal plots and 87.3% of the random plots this disturbance was recorded at different intensity levels.

Table 7. 2: Showing the percentage of random plots with various levels of disturbances

Disturbances	None	Low	Medium	High
Grazing	71.1	7.4	10.5	11
Browsing	82.5	5.5	6.9	4.8
Lopping	12.7	37.3	34.2	15.8
Others	85.4	9.1	5.3	0.2

Mann Whitney U tests showed significant difference in the number of cattle dung piles ($U_{109,418} = 20186.500$, $p = .000$), browsing ($U_{109,418} = 20098.500$, $p = .006$) and other disturbances ($U_{109,418} = 19259.500$, $p = .000$) between the animal and the random plots. Thus lopping was a major source of disturbance in both the animal and the random plots but browsing, other disturbances and number of dung piles was found to be higher in the bird or animal sites than in the non-bird or random sites. (Table 7.3)

Table 7.3: Ranks of various disturbances of animal and random plots.

Disturbances	Plot type	Mean Rank
Number of cattle dung piles	Animal	287.80
	Random	257.79
Grazing	Animal	274.31
	Random	261.31
Browsing	Animal	288.61
	Random	257.58
Lopping	Animal	248.46
	Random	268.05
Other disturbances	Animal	296.31
	Random	255.58

The mean species diversity of ground cover was found to be higher for animal plots ($.3182 \pm 0.018$) than the random plots ($.2628 \pm 0.011$) and this difference was

statistically significant ($t_{525} = 2.405$, $p = .017$, t -Test). The shrub species diversity was not significantly different between the animal and random plots ($t_{525} = -0.491$, $p = .624$, t - Test) though the diversity was higher in the random plots ($.3006 \pm .173$) than in the animal plots ($.1277 \pm .045$).

Since all the disturbances were related to human activities it was assumed that the distance to nearest human settlements from any particular point in the habitat would be appropriate to measure the affects of these disturbances. The Satyr Tragopan habitat was located in areas that were more than 1 km form any settlements (Fig.7. 1)

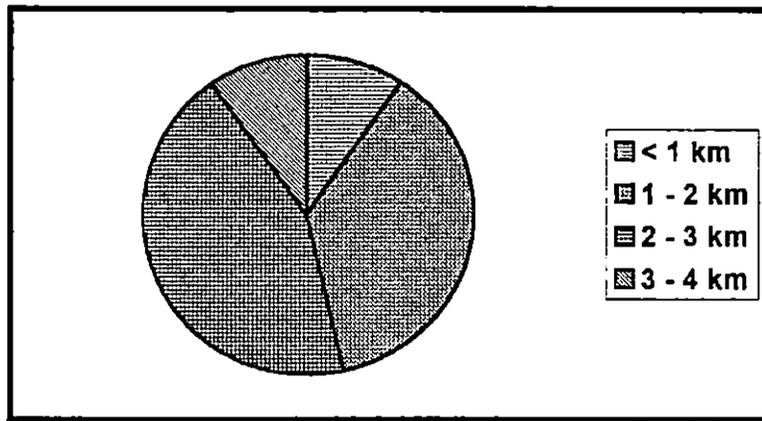


Fig. 7.1 Distance of habitat plots of Satyr Tragopan from nearest human settlements.

Levels of grazing, browsing and lopping were all found to be negatively correlated to the distance from the nearest settlement (grazing: $r_s = -.400$, $p < .001$, $n = 527$; browsing: $r_s = -.260$, $p < .001$, $n = 527$; lopping: $r_s = -.252$, $p < .001$, $n = 527$,

Spearman Correlation Coefficient) indicating that the effects of these probable disturbance factors were greater near human settlements. Kruskal- Wallis One Way ANOVA showed that the levels of grazing, browsing, and lopping differed significantly across plots located at different distances from human habitation while levels of other pressures did not differ across the distances (Table 7.4).

Table 7. 4 Showing the χ^2 values (d.f. = 3) of the levels of various disturbances recorded in the habitat plots of Satyr Tragopan located at different distances from human habitation

Disturbances	χ^2	p
Grazing	91.634	.000
Browsing	42.466	.000
Lopping	35.813	.000
Other activities	6.298	.000

These results indicate that the levels of disturbance due to presence of human settlements in the vicinity of Satyr Tragopan was affected by the distance from human settlements, with the disturbances getting reduced in intensity as one moved away from these settlements.

7.4 Discussion

One interesting observation while studying the disturbances that may be potential threats to the Satyr Tragopan habitat in the Singhalila National Park was that the number of dung piles of cattle, level of grazing, level of browsing and other pressures were higher in the animal plots than in the random plots. Before making any inferences on this observation one point to be taken into consideration is that

in 65-85% of both the animal and random plots there were no disturbance activities at all. The results here indicated that most of the habitat of the species was free from any pressures and the disturbances manifested in the remaining 15-35% of the plots were higher for the animal plots than the random plots. The only threat factor that seemed to be quite distinct in the habitat was lopping which occurred at medium to high intensity levels in both kinds of plots. Various studies (Grubb 1976, During and Willems 1986, Hobbs and Hueneke 1992, Howe 1994, Saberwal 1996 etc.) have shown that suppression of grazing was associated with decreasing species diversity and intense grazing was associated with high levels of floristics diversity. To explain the results of the present study in this perspective would perhaps be too immature owing to the nature of the data. Therefore the presence of greater livestock activity in the animal plots than in the random plots can perhaps be attributed to the large variety of tall and short ground cover species present in these plots. In the present studies shrub species diversity can be considered quite negligible because ringal bamboo formed the main understorey in most of the study area.

In the present study the distance from human settlements seemed to affect the intensities of disturbance in the Satyr Tragopan habitat and most of the habitat plots were between 1-3 km from the outskirts of settlements which implied that the Satyr Tragopan did not occur at close proximities to human activities. Lelliott (1981) observed that cheer pheasants lived close to human activities like livestock grazing, fuel wood collection and arable farming and suggested that the birds were adapted to all these activities. In Singhalila National Park activities like grazing

and browsing occurred at close proximity to Satyr Tragopan habitat in only a few sites while the rest of the sites as revealed by the results were free from any such disturbance related to live stock. This happened perhaps because there was a very good nexus of roads, forest and bridle paths within the forests and the cattle could travel to a greater distance for foraging. Apart from this in my intensive study area there were relatively lesser heads of cattle in the settlements and the more destructive animals like yaks and goats were completely absent.

The level of grazing and browsing prevalent in Singhalila National Park did not seem have a very great impact on the habitat of Satyr Tragopan at the sites I took up for intensive studies. Gaston *et al.* (1983^a) in their surveys in the high altitudes of Himachal Pradesh observed that grazing modified the understorey vegetation considerably and reduced the amount and diversity of shrubs and ground cover vegetation. Along grazing routes they observed ~~the~~ large areas of meadows which consisted of entirely *Rumex* sp. and other nitrophilous herbs. One of the reasons for the decline in the number of Western Tragopan in its range was interference from grazing livestock (Gaston *et al.* 1981^b). Domestic stock are also believed to cause changes in the patch work of semi-natural habitats and produce monocultures which are typical of most agricultural areas (Hill and Robertson 1988a).

Lopping seemed to be the main disturbance activity in the Satyr Tragopan habitat and was found to occur in almost all the plots. Lopping here referred not only to cutting of trees for firewood and construction purposes but also to the harvest of

bamboo stems from the forest. Bamboo harvest was observed all over the habitat of the Satyr Tragopan irrespective of the distance from the human settlements. This was probably because for harvest of mature bamboo stems collection had to be made in areas that were farther from human settlements. Habitat studies have shown that the vegetation at the understorey level was an important part of the Satyr Tragopan habitat thus harvest of bamboo may be detrimental to the Satyr Tragopan habitat. Gaston *et al.* (1983[~]) in their surveys of the Western Himalayas have suggested that habitat destruction was the most important threat to pheasants. The greatest levels of pressure were observed in the lower parts of the temperate forest zone and the most susceptible were species that required dense undergrowth. On the other hand Picozzi (1985) while studying the human impact on pheasant habitats in Pipar in central Nepal suggested that bamboo harvest was important to the pheasants for the maintenance of continuous ground cover. It is also probable that the continuous presence of bamboo harvesters may cause disturbance to the birds and there is every possibility of the birds being snared. Though harvesting of bamboo at a low level may not produce much of an impact on the Satyr Tragopan repeated harvesting in the same area and cutting of yearling shoots may completely destroy the bamboo clump and clear openings may be formed in the habitat.

Among pheasants 44 taxa (64%) are currently considered to be suffering from over hunting for food and sport (McGowan and Garson 1995). Katti *et al.* (1992) observed that pheasants were among the worst hit by hunting and concluded that this may be part of the reason for the paucity of information on these birds. Studies on the Western Tragopan (Gaston *et al.* 1983⁶) have attribute the decline in the

number of the species in its range among other factors to human predation in the form of trapping and collection of eggs. The over hunting of pheasants amongst the many large forest dwelling birds and mammals was observed to be the main problem in northeast India (Kaul *et al.* 1995).

Though hunting was not quantified or recorded in the present habitat studies it cannot be ruled out. As already mentioned elsewhere in the chapter snares and traps were wide spread throughout the study area which were probably operational prior to the protected area status of the Singhalila forests. During my tenure in the field I did not record any new snares and traps although I did see groups of hunting parties within the National Park forests. Besides, the Satyr Tragopan require very little time and effort to be caught in snares if one knows their sites of occurrence and since they are not too large the game can be easily concealed from the notice of the Park authorities

7.5 Conclusion

The current land use situation of the Darjeeling Himalaya is considered to be unviable and full of long run dangers because of high settlement densities (Sankritiyana 1997). Compared to all the northeastern states the Darjeeling Himalaya have a very high human population which is estimated to be 413/ km² (Anon 1996). The Singhalila National Park which comprises an important part of the already dwindling forest cover plays an important role in the environment of the Darjeeling Himalaya.

Though there were no immediate threats to the survival of the Satyr Tragopan in the Singhalila National Park the change in scenario is imminent in the coming years. Thus with increasing trend in the density of human and livestock population in the fringe areas of the National Park the anthropogenic pressures are certain to be more intensive in future. Livestock activities within the Satyr Tragopan habitat did not have much effect on the bird because of low cattle density in the study area. Lopping of wood and harvesting have however manifested themselves as threats leading to habitat destruction and were found to be quite wide spread in the habitat. Direct threats like hunting and snaring also cannot be ruled out completely. Therefore to preserve the Satyr Tragopan in the Singhalila National Park it is essential to preserve its habitat and prevent any hunting of the species. Conservation of Satyr Tragopan in the Singhalila National Park therefore will not only ensure the safety of this beautiful, rare and threatened species but will also in turn conserve the environment and biological diversity of the Singhalila National Park as a whole.

7.6 Recommendations

Important populations of birds, animals and plants are known to occur in the Singhalila National Park. It is therefore essential that within the depleting forested areas of Darjeeling Himalaya adequate areas with undisturbed forest like Singhalila National Park are conserved.

Following are some conservation and management recommendations for the Satyr Tragopan that have emerged after intensive studies on some aspects of ecology and behaviour of the species. It is hoped that by conserving the Satyr Tragopan habitat the biological diversity of Singhalila National Park would also be conserved.

1. Regular monitoring of areas through the numerous trails and paths that criss cross the forests of Singhalila National Park should be undertaken to record all animals and pheasants encountered in the area.
2. Periodic monitoring of the Satyr Tragopan through call counts during the calling season should be organised to estimate the number of calling birds and comparisons with figures obtained earlier could provide useful information.
3. Number of livestock using the National Park forest should be checked from increasing. Care should also be taken to ensure that yaks from the numerous stations all along the border are not grazed in the forests of Singhalila.
4. Harvesting of bamboo should be controlled by ensuring that they are used for personal use and not exported for sale elsewhere. Care should be taken to see that harvest does not take place from only one site as these may give rise to open patches in the forest.

5. Collection of firewood should be strictly restricted to dry twigs, fallen trees and snags. Rampant felling of trees especially *Rhododendron* spp. and *Betula utilis* in the higher reaches should be brought under control.

6. Collection of medicinal plants should be permitted only for personal use of the inhabitants and a regular check should be maintained to prevent these plants from being exported outside the Park. Collection of bird eggs especially those of pheasants should be prohibited.

7. Hunting or poaching of any animal species in the Park should be strictly prohibited. An information network should be maintained among the field staff of the Forest Department to uncover any clandestine plans of hunting and trading activities. Regular monitoring for traps and snares should be carried out and when discovered should be destroyed completely.

8. Tourism does not directly cause any threats yet indirectly to cater to the needs of the tourists and for the revenue involved the use of forest resources especially increases substantially especially in the form of fuel wood collection and hoarding. This is very intense in the Sandakphu area where the *Rhododendron* forests have almost completely been removed. Since most of the infrastructure have^s been set up by the Tourism Department, recommendations should be made for alternative sources and supply of fuel in this area.

9. Many aspects of the environment of Singhalila National Park are yet to be studied. Scientific research should be encouraged in the National Park.