

**Assessment of biome restricted and globally threatened avian species and their
conservation awareness programs at Yangoupokpi-Lokchao WLS, a data
deficient IBA**

FINAL REPORT

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Introduction:

Manipur falls under the Endemic bird area of Eastern Himalayas which is considered one of the most important biodiversity hotspot harboring, wide varieties of animals inhabiting in diversified habitat mosaic (Stattersfield *et al.*, 1998). Situated on the far eastern corner of India bordering Myanmar, Manipur has nine Important Bird Areas (Islam & Rahmani, 2004). The Yangoupokpi Lokchao Wild life sanctuary is one among the nine IBA sites of Manipur where detailed avifaunal studies were lacking as a result Birdlife International (2010) has described it as a data deficient site. This part of Himalayas is particularly rich in restricted range (endemic) birds, and the genus *Sphenocichla* is endemic to this EBA (Islam & Rahmani 2004). Apart from these the site is one among the two areas in India where the endangered Green Peafowl are still occasionally seen (Choudhury 2000). Clarification of its status in India is a must (Birdlife International 2010).

Only very few studies on avian fauna were conducted on this important IBA of Manipur (Choudhury 2000, 2005b, 2009; Islam & Rahmani 2004). Since the site falls in the Indo-Burma biodiversity hotspot region, the Sanctuary must be supporting unique avifaunal assemblages from both the countries but its detail information is a mystery till date. Detailed investigation of the biodiversity of this site is urgently needed in view of its deteriorating condition (Islam & Rahmani 2004). At present, habitat degradation has taking a toll on the rich biodiversity of this IBA including the rare and biome restricted avian species, before being described properly.

Therefore, the research proposal was aimed at improving the limited knowledge on the abundance and status of threatened and endemic avian species within the IBA. Further, the study was initiated for starting awareness campaign involving the local communities in order to help to halt and conserve the local forests and their resources which continue to degrade at a concerning rate.

Objectives:

1. To assess the current abundance & status of endemic & threatened avian species of Yangoupokpi Lokchao WLS.
2. To assess the abundance and status of endangered Green Peafowl *Pavo muticus* in this site.
3. To initiate an awareness campaign involving local communities.

Study Area:

The Yangoupokpi- Lokchao Wildlife Sanctuary, an important IBA (Site No. IN-MN-08) is located on the Indo- Myanmar border, at Chandel district of Manipur which lies in the geographical area of 24° 20' 10'' N latitude and 93° 46' 50'' E longitude. The Sanctuary is 110 km from Imphal and covers an area 184 sq. km. and its altitude ranges between 200-750 m (Choudhury 2009). The eastern boundary of the Sanctuary is coterminous with the international border and Moreh town, a point of international trade, which is located on the fringe of the Sanctuary (Islam and Rahmani 2004). Vegetation is tropical moist deciduous forest and annual temperature ranges from 6°C to 32° C (Islam and Rahmani 2004). Due to logging and *Jhum* cultivation the habitat of the Sanctuary is degrading and large areas were fragmented into small patches with bamboo and scrub vegetations.

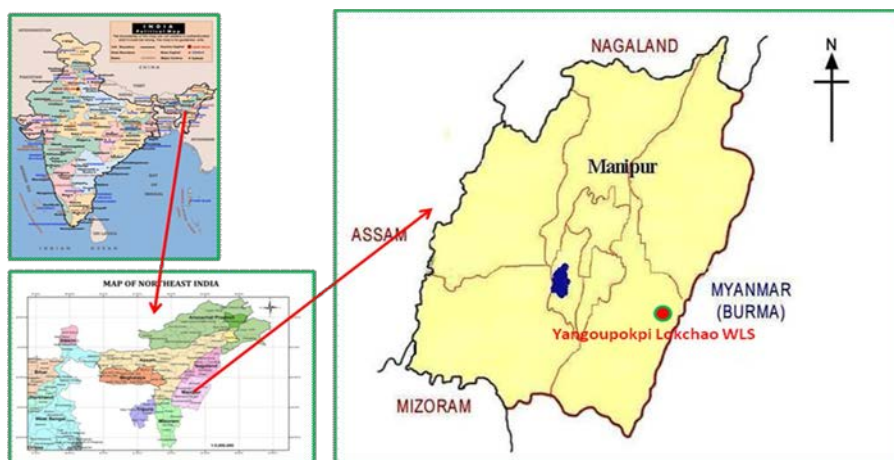


Fig: Location Map of Yangoupokpi Lokchao Wild Life Sanctuary, Chandel district of Manipur.

For this study, the entire forest habitats were categorized into three zones: disturbed (D), moderately disturbed (MD) and undisturbed (UD) in terms of the degree of disturbances such as logging intensity of trees and presence or absence of foot trails running through the area.

Some of the characteristic features of the habitat categories are as follows:

Disturbed (D)

The disturbed zone consists of abandoned cultivated lands, grazing grounds of cattle and scattered forest habitats and the presence of more than three foot trails in the area.

Moderately disturbed (MD)

The moderately disturbed habitat consist mainly clumps of trees and shrubs where canopy area coverage is not closed type. The existence of immature tree saplings in the gap area is a characteristic of this zone and presence of at least two or three foot trails in the area.

Undisturbed (UD)

The relatively undisturbed forest habitat had almost closed canopy cover in some areas. Artificial tree fall gaps are very scarce in this zone and habitat is characterized by dense undergrowth vegetations of trees and shrubs, climbers and various types of cane and creepers. Here the presence of free accessible foot trails are minimum.

Methods:

1. Avifaunal data collection

Bird data were collected using line transect method (Bibby *et al.* 1992) and random Point counts (Buckland *et al.* 1994) were conducted at difficult terrain where transects cannot be placed. The identification of birds followed available books (Ali and Ripley 1987; Grimmett *et al.* 2000). A total of 18 line transects systematically established at the three sites (6 each in undisturbed habitats, moderately disturbed habitats and

disturbed habitats) were spread out across forest habitats to cover the full range of possible habitats frequented by the Pea fowls and other rare and restricted range species.

Feeding guild of the birds was classified as per Ali & Ripley (1987). The identification of geographic distribution range followed, King & Dickenson (1975). The geographic distribution range was categorized on a scale of 1-5 (smaller to largest): (1) Eastern Himalayas, Yunan and Northern Indo-China; (2) north-eastern India and all Indo-China (3) Indo-Malayan regions (4) Indo- Australian region or Australasian tropics. (5) Palaeotropic and above.

The common and scientific names of the birds given in the checklist followed the Birds of the World, recommended English Names (Gill *et al.*, 2006). The threatened status of the birds given in the checklist was as per IUCN List of Threatened Taxa (Birdlife International, 2001). The Common-Rare, Resident- Migratory Status of the birds was classified as per Saikia & Kakati (2000). The abbreviation of the status such as C = Common species which were encountered frequently about 8 times during 10 survey trips, r = Rare species which are encountered less frequently about 1-2 times during 10 survey trips, R =Residents, species found in the study area throughout the year, WM = Winter Migrants, species found only during the winter, SM = Summer Migrants, species found during only in summer, LM = Local Migrants, species which migrate locally within the area.

2. Vegetation sampling:

The quantification of tree density followed methods suggested by James & Shugart (1970). At each site, two random 500m trails were established and three 50X 50 m plots were placed to record the disturbance parameters such as logging intensity of trees and total no. of foot trails through the plot.

3. Data analysis:

Diversity and abundance of birds in different transects of the study site were computed using Statistical software such as Species Diversity & Richness Software, Version 3.0. & SPSS Software, Version 17.0.1. Diversity was estimated in terms of species richness and evenness, as well as using the Shannon-Wiener index, which combines richness and abundance into a single measure (Magurran, 1988) and bootstrap method was used to calculate 95% confidence intervals for Shannon-Wiener's indices. In order to test for differences in diversity between habitats, pair-wise randomization tests were carried out based on 10,000 re-samples of species abundance data following Solow (1993). Percentage cumulative abundance was plotted (K dominance) against log species rank (Lambhead *et al.*, 1983) for comparing diversity between samples. The species richness was estimated using rarefaction (Heck *et al.*, 1975).

The transect data of three habitat studied (undisturbed (UD), moderately disturbed (MD) and disturbed (D) habitats) were computed to evaluate proportional to undisturbed habitats, by the use of the following formula: $ut/ut + mdt + dt$, where ut = total bird census data of habitat 'UD'; mdt = total bird census data of habitat 'MD'; and dt = total bird census data of habitat 'D'. The Propund data were arcsine transformed for analysis. The transformed data were filtered if it fulfilled the condition of $ut + mdt + dt \geq 5$ and only selected data were used for analysis. The independent variable ranked species distribution was compared with arcsine transformed data of species abundance in different habitat categories through analysis of variance (ANOVA). Pearson's correlation coefficient was also computed to test the significance between the variables. Only significant results were presented.

Results:

Species Assemblages:

A total of 169 bird species belonging to 37 families were recorded from the Sanctuary. Of these 71 are Rare and 98 are Common species. One Endangered, one Vulnerable and three Near Threatened species including 17 migrants among the list. In terms of feeding guild, the total composition includes 41 frugivorous, 14 carnivorous, 16 omnivorous, 4 picivorous, 5 Grainivorous and 89 insectivorous species. The five globally

threatened species recorded are Green Peafowl *Pavo muticus* (EN), Slender billed Babbler *Turdoides longirostris* (VU) Mrs. Humes Pheasant *Syrnaticus humiae* (NT), White cheeked Partridge *Arborophila atrogularis* (NT) and Great pied Hornbill *Buceros bicornis* (NT).

The seventeen migrant species include *Accipiter nisus*, *Circus melanoleucos*, *Falco tinnunculus*, *Surniculus lugubris*, *Heirococyx sparveriodes*, *Clamentor jacobinus*, *Clamentor coromandus*, *Pericrocotus roseus*, *Lanius cristatus*, *Motacilla alba*, *Motacilla cinerea*, *Motacilla citreola*, *Phyloscopus trochiloides*, *Saxicola torquata*, *Phoenicurus aureus*, *Zoothera citrine* and *Dicrurus leucophaeus*. Other notable species include *Arborophila rufogularis*, *Arborophila torqueola*, *Lophura leucomelanos*, *Turnix sylvatica*, *Turnix tanki*, *Gyps himalayensis*, *Treron curvirostra*, *Ducula aenea*, *Chalcophaps indica*, *Ninox scutulata*, *Aceros undulatus*, *Phylloscopus trochiloides*, *Zoothera citrine*, *Phoenicurus aureus*, *Garrulax leucolophus*, *Garrulax pectoralis* etc.

The Red-rumped Swallow *Hirundo daurica* recorded was a new distribution record for the area. There was also an unconfirmed record of Manipur Bush Quail *Perdica manipurensis*, which was a chance encounter and its distribution needs to be clarified further.

Diversity indices

Diversity Variations at the sampled Transects

The analysis of Shannon Wiener diversity indices at all the study samples shows that the indices were ranged between 3.606 and 2.697 (Table 1). Comparison of diversity between samples (transact data) shows that, the diversity indices were higher at T₉, T₁₂, T₂, T₅, T₇, T₁₀, T₁, T₆, and T₈ than T₃, T₁₁, T₁₃, T₄, T₁₄, T₁₈, T₁₆, T₁₅ and T₁₇ at 5% level (Fig. 1. 1 & Table 1). The analysis of diversity ordering (using right tailed sum methods) in different sample sites show that, the diversity was different in each sample site in which the highest diversity was found at sample T₉ (Fig.2). The percentage cumulative abundance was plotted (K dominance, Fig. 3) against log species rank for comparing

diversity between samples (T₁-T₁₈) showed highest diversity at Transect 9 habitat (lower line), but in all the habitats, K dominance line cross each other and thus shows ranked differently for different diversity indices (Fig. 3). The descriptions of the transects were given at Appendix I.

Table 1. Shannon Diversity Indices of f birds at Yangoupokpi Lokchao WLS (Letter bold in parenthesis indicates significantly higher diversity than the rest at 5% level).

Sampled Transects	Shannon Weiner Index 'H'	Variance H	Lower 95%	Upper 95%
T1	3.313	0.003158	3.123	3.335
T2	3.464	0.00302	3.263	3.477
T3	3.07	0.004498	2.829	3.098
T4	2.889	0.004464	2.686	2.935
T5	3.433	0.002771	3.231	3.438
T6	3.22	0.004103	3.009	3.262
T7	3.426	0.00429	3.155	3.418
T8	3.137	0.006407	2.849	3.146
T9	3.606	0.003134	3.391	3.619
T10	3.392	0.003257	3.163	3.393
T11	3.052	0.006815	2.762	3.083
T12	3.586	0.002745	3.333	3.539
T13	2.973	0.007595	2.639	2.994
T14	2.885	0.00556	2.59	2.891
T15	2.754	0.01011	2.339	2.738
T16	2.809	0.009036	2.472	2.827
T17	2.697	0.01411	2.24	2.718
T18	2.869	0.01221	2.45	2.869

Fig.1. Diversity indices of birds sampled at different transects of Yangoupokpi Lokchao wildlife Sanctuary.

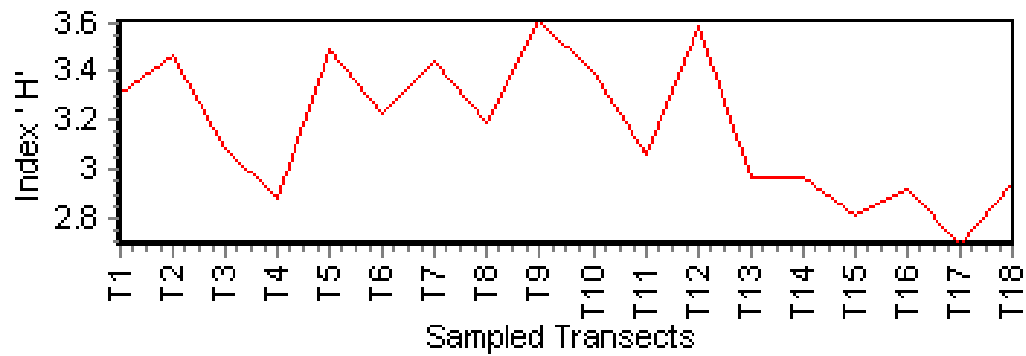


Fig. 2. Transact-wise Diversity Ordering in Right Tailed Sum against Species Rank of abundance.

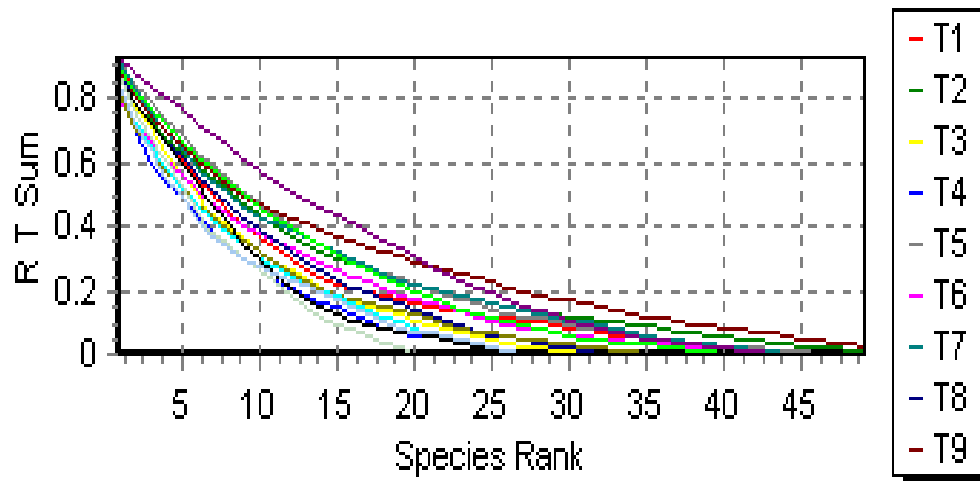
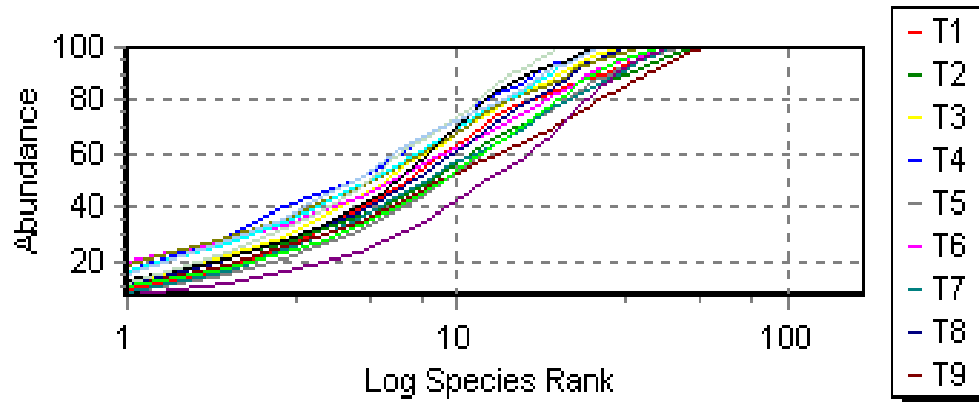


Fig. 3. K dominance curve plotted for comparing the diversity among transacts. The line T₆ and T₂ goes lower which indicates the higher diversity than the rests.



Diversity Variations of bird species sampled at different habitat categories:

A total of 3078 individuals from 169 species belonging to 37 families were recorded in the relatively undisturbed (UD), moderately disturbed (MD) and disturbed (D) forest habitat types (Table 2). The number of species was highest at moderately undisturbed forest ($n = 143$) than disturbed ($n = 130$) and relatively undisturbed ($n = 89$) forest (Table 2). Comparison of diversity between habitat samplings showed that, species richness was different among habitats ranging from 89 to 143 species (Table 2; rarefaction method was used separately for species richness). The Simpson Index of diversity were highest in moderately disturbed habitat compared with disturbed habitat at 5% level (Table 2 ; moderately disturbed versus disturbed randomization test, $\Delta = 27.87$, $P = 0.01$), again, it was also higher in moderately disturbed habitat compared with relatively disturbed habitat (Table 2; moderately disturbed versus relatively disturbed randomization test, $\Delta = 19.7$, $P = 0.007$), but the comparison was similar amongst relatively undisturbed and disturbed habitat ($\Delta = 8.16$, $P = 0.12$). Similarly, the Shannon Weiner estimate of diversity were highest in moderately disturbed habitat

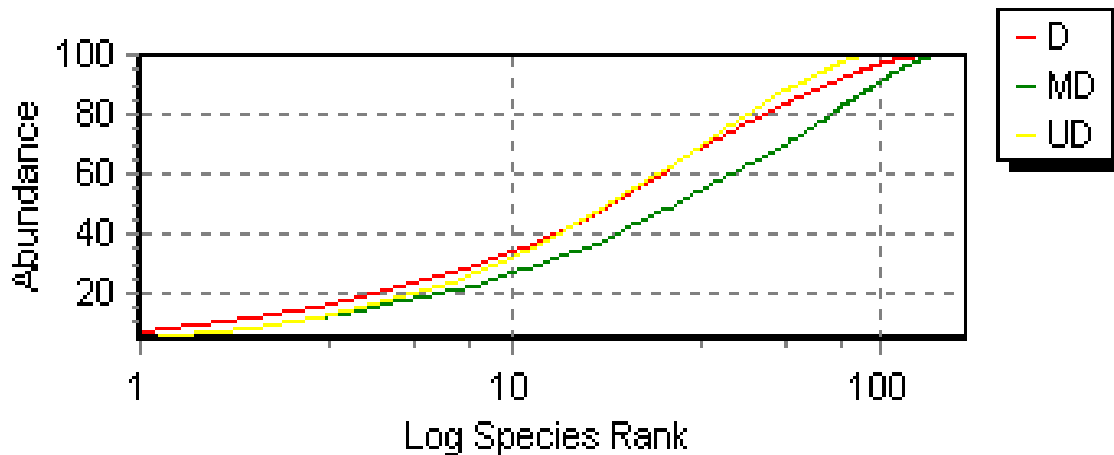
compared with disturbed habitat at 5% level (Table 2 ; moderately disturbed versus disturbed randomization test, $\Delta = 0.318$, $P = 0.01$), again, it was also higher in moderately disturbed habitat compared with relatively disturbed habitat (Table 2; moderately disturbed versus relatively disturbed randomization test, $\Delta = - 0.435$, $P = 0.01$), but the comparison was similar amongst relatively undisturbed and disturbed habitat ($\Delta = 0.117$, $P = 0.01$). The percentage cumulative abundance plotted (K-dominance; Fig. 4) against log species rank for comparing diversity between samples (UD, MD & D) showed that diversity of moderately disturbed habitat (lower line) was higher than the disturbed habitat but for UD habitat and D habitat K- dominance line crossed each other and therefore showed to rank differently for different diversity indices.

Table 2. Species richness, abundance and diversity of birds sampled in three habitat categories (UD, MD & D). Simpson and Shannon means followed by the same letter are not significantly different at the 5% level (pair wise randomized test based on 10,000 random samples). Rarefaction test was done for species richness based on present absent data of each transect of the habitat UD, MD & D.

	Habitat category		
	UD	MD	D
Individuals	472	1109	1497
Species (total = 169)	89	143	130
Richness (SE)	89 (0.07)	143 (0.003)	130 (0.01)
Simpson D	58.94 (± 12.05)	78.65 (± 14.7)	50.78 (± 9.16)
Shannon-Weiner(H') (Variance)	4.182 (0.001326)	4.618 (0.0006655)	4.29 (0.000678)

UD = Undisturbed Habitat; MD = moderately disturbed Habitat; D = Disturbed Habitat.

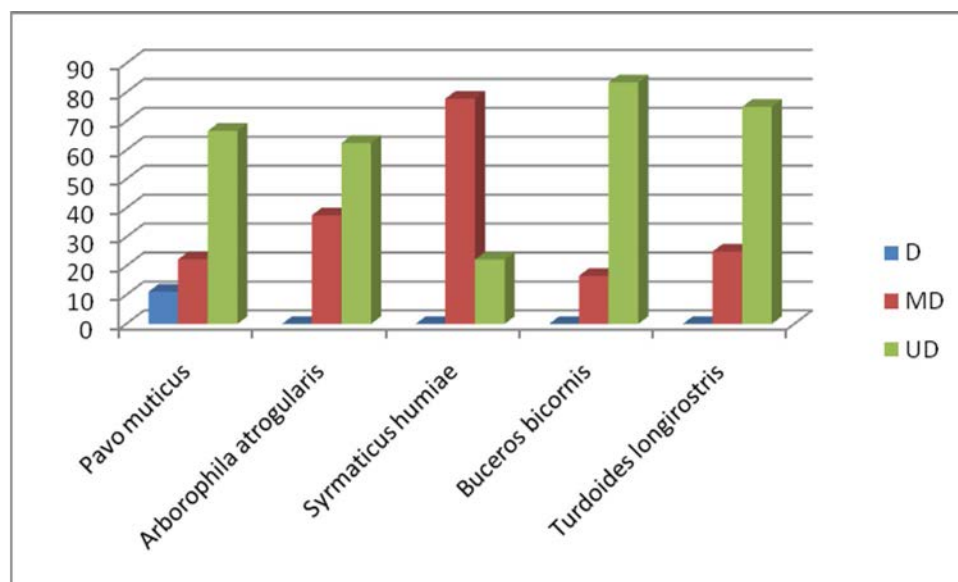
Fig. 4. K- dominance plotted for comparing diversity among UD, MD & D habitat samples. MD line goes lower which indicates the higher diversity than the other two.



Diversity Variations of globally threatened species sampled at different habitat categories:

A total of five globally threatened species were recorded from the study site during the study period. Of these, only *Pavo muticus* was encountered in all the three habitat categories and other four species were encountered only at the moderately disturbed and relatively undisturbed forest habitats. The percentages of occurrences of all these species were maximum at relatively undisturbed (UD) habitat. Of the total, 66.7% encounter rates of *Pavo muticus* were at UD habitat, 22.3% were at MD habitat and 11.1 % were at D habitat categories. Similarly, 62.5% of encounter rates of *Arborophila atrogularis* were at UD habitat and 37.5 % were at the MD habitat. For *Buceros bicornis* encounter rates were 83.4 % and 16.6% respectively at both the UD and MD habitats and for *Turdoides longirostris*, the percentages were 75% and 25 % respectively at both the habitat categories. But in case of *Syrmaticus humiae* 22.2 % of encounter rates were at UD habitat and 77.8% were at MD habitat.

Fig. 5. Distribution of globally threatened bird species at different habitat categories (UD, MD & D habitats).



Geographical distribution:

For estimating the geographical distribution of birds sampled at different habitat categories, the hypothesis “Undisturbed Forest habitat supports more rare & restricted range species than the moderately disturbed and disturbed habitat” has been tested. There was a significant relationship between undisturbed (UD) habitat preferences and their geographical distribution ranges ($r = 0.183$, $P < 0.05$; Table 5). However, birds species sampled at moderately disturbed habitat were also found to have significant relationship with geographical distribution ranges ($r = 0.235$, $P < 0.05$; Table 5) but bird species sampled at disturbed habitat were not significant with geographic range (Table 5). The result shows that species with smaller geographical ranges tend to confine within undisturbed habitat and moderately disturbed habitat, whereas, species with larger ranges were more often found in disturbed habitat, thus it support the presumed hypothesis.

Table 5. Pearson's Correlation between species encountered in different habitat categories with their geographical distribution range.

Habitat Category		Range
Disturbed (D)	Pearson Correlation	0.276
	Sig. (2-tailed)	0.122
	N	169
Moderately Disturbed (MD)	Pearson Correlation	0.235*
	Sig. (2-tailed)	0.036
	N	169
Undisturbed (UD)	Pearson Correlation	0.183*
	Sig. (2-tailed)	0.045
	N	169

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 7. Checklist of bird species recorded at the study site with feeding guild, ranked species distribution range and their present status.

Sl. No.	Family	Scientific name	Status	Feeding Guild	Geographic Range
1	Phasianidae	<i>Gallus gallus</i>	R, C	O	3
2		<i>Pavo muticus</i>	R, r (RDB-EN)	O	3
3		<i>Arborophila atrogularis</i>	R, r (RDB-NT)	O	1
4		<i>Arborophila rufogularis</i>	R, r	O	2
5		<i>Arborophila torqueola</i>	R, C	O	2
6		<i>Lophura leucomelanos</i>	R, r	O	2
7		<i>Syrmaticus humiae</i>	R, r (RDB-NT)	O	2
8		<i>Turnix sylvatica</i>	R, C	O	2
9		<i>Turnix tanki</i>	R, r	O	2
10	Accipitridae	<i>Accipiter nisus</i>	WM, C	C	5
11		<i>Accipiter trivirgatus</i>	R, r	C	2
12		<i>Circus melanoleucos</i>	WM, r	C	3
13		<i>Milvus migrans</i>	R, r	C	5
14		<i>Accipiter badius</i>	R, C	C	5
15		<i>Gyps himalayensis</i>	R, r	C	2

16	Falconidae	<i>Falco tinnunculus</i>	WM, C	C	5
17	Columbidae	<i>Treron phoenicoptera</i>	R, C	F	3
18		<i>Treron curvirostra</i>	R, r	F	2
19		<i>Ducula aenea</i>	R, C	F	4
20		<i>Ducula badia</i>	R, C	F	3
21		<i>Streptopelia chinensis</i>	R, C	F	3
22		<i>Streptopelia orientalis</i>	R, r	F	5
23		<i>Streptopelia tranquebarica</i>	R, r	F	4
24		<i>Chalcophaps indica</i>	R, r	F	4
25		<i>Streptopelia decaocto</i>	R, r	F	5
26	Psittacidae	<i>Psittacula himalayana</i>	R, C	F	2
27		<i>Psittacula alexandri</i>	R, C	F	3
28		<i>Psittacula krameri</i>	R, C	F	5
29	Cuculidae	<i>Surniculus lugubris</i>	SM, r	I	3
30		<i>Hierococcyx sparveroides</i>	SM, r	I	5
31		<i>Hierococcyx varius</i>	R, r	I	3
32		<i>Cuculus micropterus</i>	R, C	I	4
33		<i>Cacomantis merulinus</i>	R, r	I	2
34		<i>Clamator jacobinus</i>	SM, r	I	5
35		<i>Clamator coromandus</i>	SM, r	I	3
36		<i>Phaenicophaeus tristis</i>	R, r	O	3
37		<i>Centropus bengalesis</i>	R, C	I	4
38	Strigidae	<i>Athene brama</i>	R, C	C	3
39		<i>Glaucidium brodiei</i>	R, r	C	2
40		<i>Glaucidium cuculoides</i>	R, r	C	3
41		<i>Ketupa zeylonensis</i>	R, r	C	3
42		<i>Otus spilocephalus</i>	R, r	C	5
43		<i>Phodilus badius</i>	R, C	C	3
44		<i>Ninox scutulata</i>	R, C	C	3
45	Coraciidae	<i>Coracias benghalensis</i>	R, C	I	5
46	Alcedinidae	<i>Halcyon smyrensis</i>	R, C	P	5
47		<i>Alcedo atthis</i>	R, C	P	5
48		<i>Ceryle rudis</i>	R, C	P	5
49		<i>Halcyon capensis</i>	R, r	P	3
50	Meropidae	<i>Merops orientalis</i>	R, C	I	5
51		<i>Nyctornis athertoni</i>	R, r	I	3
52	Bucerotidae	<i>Anthracoceros albrostris</i>	R, C	F	3
53		<i>Aceros undulatus</i>	R, r	F	3
54		<i>Buceros bicornis</i>	R, r (RDB-NT)	F	2
55	Megalaimidae	<i>Megalaima haemocephala</i>	R, C	F	3
56		<i>Megalaima asiatica</i>	R, C	F	2
57		<i>Megalaima lineata</i>	R, C	F	3
58	Picidae	<i>Dendrocopos macei</i>	R, r	I	3
59		<i>Picus flavinucha</i>	R, C	I	2

60		<i>Picus chlorolophus</i>	R, C	I	3
61		<i>Celeus brachyurus</i>	R, C	I	2
62		<i>Gecinulus grantia</i>	R, r	I	3
63		<i>Dendrocopos cathpharius</i>	R, r	I	3
64		<i>Picus canus</i>	R, r	I	2
65		<i>Dinopium shorii</i>	R, C	I	3
66		<i>Chrysocolaptes gutacristatus</i>	R, r	I	3
67		<i>Sasia ochracea</i>	R, r	I	3
68		<i>Picumnus innominatus</i>	R, r	I	5
69	Campephagidae	<i>Pericrocotus roseus</i>	WM, r	I	3
70		<i>Pericrocotus flammeus</i>	R, C	I	4
71		<i>Pericrocotus solaris</i>	R, C	I	2
72		<i>Pericrocotus ethologus</i>	R, C	I	5
73		<i>Coracina macei</i>	R, C	I	4
74		<i>Tephrodornis gularis</i>	R, C	I	3
75		<i>Hemipus picatus</i>	R, r	I	2
76	Lanidae	<i>Lanius cristatus</i>	WM, r	I	5
77		<i>Lanius tephronotus</i>	R, r	I	2
78	Motacillidae	<i>Motacilla alba</i>	WM, C	I	5
79		<i>Motacilla cinerea</i>	WM, r	I	5
80		<i>Motacilla citreola</i>	WM, C	I	5
81		<i>Anthus rufulus</i>	R, C	I	3
82	Paridae	<i>Parus major</i>	R, C	I	5
83		<i>Melanochlora sultanea</i>	R, C	I	5
84		<i>Parus monticolus</i>	R, r	I	3
85	Timaliidae	<i>Malacocincla abbotti</i>	R, C	I	2
86		<i>Stachyris ruficeps</i>	R, C	I	3
87		<i>Timalia pileata</i>	R, C	I	3
88		<i>Pomatorhinus schisticeps</i>	R, C	I	3
89		<i>Pomatorhinus ruficollis</i>	R, C	I	3
90		<i>Turdoides earlei</i>	R, C	I	3
91		<i>Turdoides striatus</i>	R, C	I	2
92		<i>Turdoides longirostris</i>	R, r (RDB-VU)	I	3
93		<i>Heterophasia annectans</i>	R, C	I	3
94		<i>Alcippe rufogularis</i>	R, C	I	3
95		<i>Yuhina nigrimenta</i>	R, r	I	3
96		<i>Yuhina flavicollis</i>	R, C	I	3
97		<i>Yuhina gularis</i>	R, C	I	3
98		<i>Liocichla phoenicea</i>	R, C	I	3
99		<i>Garrulax leucolophus</i>	R, r	I	3
100		<i>Garrulax albogularis</i>	R, r	I	3
101		<i>Garrulax pectoralis</i>	R, C	I	2
102		<i>Garrulax monileger</i>	R, C	I	2
103		<i>Orthotomus sutorius</i>	R, C	I	4

104	Phyllocopidae	<i>Seicercus poliogenys</i>	R, C	I	3
105		<i>Seicercus xanthoschistos</i>	R, C	I	3
106		<i>Phylloscopus trochiloides</i>	WM, r	I	5
107	Cettidae	<i>Abroscopus schisticeps</i>	R, C	I	3
108		<i>Cettia flavolivacea</i>	R, r	I	2
109	Muscicapidae	<i>Culicicapa ceylonensis</i>	R, r	I	5
110		<i>Ficedula westermanni</i>	R, r	I	3
111		<i>Eumyias thalassina</i>	R, C	I	5
112		<i>Muscicapa unicolor</i>	R, r	I	5
113		<i>Ficedula hyperythra</i>	R, r	I	3
114		<i>Saxicola ferrea</i>	R, C	I	3
115		<i>Tarsiger indicus</i>	R, r	I	3
116		<i>Tarsiger cyanurus</i>	R, C	I	5
117		<i>Copsychus saularis</i>	R, C	O	5
118		<i>Saxicola torquata</i>	WM, r	I	5
119		<i>Copsychus malabaricus</i>	R, r	I	2
120		<i>Enicurus immaculatus</i>	R, C	I	3
121		<i>Chaimarrornis leucocephalus</i>	R, r	I	5
122		<i>Phoenicurus aureus</i>	WM, r	O	4
123		<i>Rhyacornis fuliginosus</i>	R, C	O	3
124	Turdidae	<i>Myophonus caeruleus</i>	R, C	O	2
125		<i>Zoothera citrina</i>	SM, r	F	2
126	Chloropseidae	<i>Chloropsis cochinchinensis</i>	R, C	F	2
127	Pycnonotidae	<i>Pycnonotus cafer</i>	R, C	F	4
128		<i>Pycnonotus jocosus</i>	R, C	F	4
129		<i>Alophoixus flaveolus</i>	R, C	F	2
130		<i>Hemixos flava</i>	R, C	F	2
131		<i>Pycnonotus leucogenys</i>	R, r	F	2
132		<i>Hypsipetes leucocephalus</i>	R, r	F	3
133	Sittidae	<i>Sitta castanea</i>	R, C	I	3
134		<i>Sitta frontalis</i>	R, C	I	3
135	Saturnidae	<i>Acridotheres tristis</i>	R, C	F	5
136		<i>Sturnus contra</i>	R, C	F	3
137		<i>Acridotheres fuscus</i>	R, C	F	2
138		<i>Gracula religiosa</i>	R, r	F	3
139	Oriolidae	<i>Oriolus xanthornus</i>	R, C	F	4
140		<i>Oriolus traillii</i>	R, C	I	2
141	Dicruridae	<i>Dicrurus macrocercus</i>	R, r	I	5
142		<i>Dicrurus aeneus</i>	R, C	I	3
143		<i>Dicrurus hottentottus</i>	R, C	I	3
144		<i>Dicrurus remifer</i>	R, r	I	3
145		<i>Dicrurus paradiseus</i>	R, r	I	4
146		<i>Dicrurus leucophaeus</i>	WM, r	I	3
147	Corvidae	<i>Dendrocitta vagabunda</i>	R, r	F	3

148		<i>Dendrocitta formosae</i>	R, r	F	3
149		<i>Corvus macrorhynchos</i>	R, C	O	3
150		<i>Corvus splendens</i>	R, C	O	5
151		<i>Rhipidura albicollis</i>	R, r	I	3
152	Passeridae	<i>Passer domesticus</i>	R, C	G	5
153		<i>Passer montanus</i>	R, C	G	3
154		<i>Melophus lathami</i>	R, C	G	3
155	Cisticolidae	<i>Prinia hodgsonii</i>	R, C	I	3
156		<i>Prinia criniger</i>	R, C	I	3
157	Hirundinidae	<i>Hirundo daurica</i>	R, r (NR)	I	2
158	Zosteropidae	<i>Zosterops palpebrosus</i>	R, C	I	5
159	Estrildidae	<i>Lonchura punctulata</i>	R, C	G	2
160		<i>Lonchura striata</i>	R, C	G	2
161	Dicacidae	<i>Dicaeum cruentatum</i>	R, C	F	3
162		<i>Dicaeum concolor</i>	R, C	F	3
163	Nectariniidae	<i>Nectarinia zeylonica</i>	R, C	F	3
164		<i>Anthreptes singalensis</i>	R, C	F	3
165		<i>Aethopyga ignicauda</i>	R, r	F	3
166		<i>Aetopyga saturata</i>	R, C	F	2
167		<i>Arachnothera magna</i>	R, r	F	2
168		<i>Arachnothera longirostra</i>	R, C	F	3
169	Aegithalidae	<i>Aegithalos concinnus</i>	R, C	I	3

Abbreviations: R- Resident, C- Common, r- Rare; WM- Winter Migrant, SM- Summer Migrant; EN- Endangered, VU- Vulnerable, NT- Near Threatened; P- Picivorous, O- Omnivorous, F- Frugivorous, C- Carnivorous, G- Grainivorous, I- Insectivorous.

Geographic Range: (1) Eastern Himalayas, Yunan and Northern Indo-China; (2) north-eastern India and all Indo-China (3) Indo-Malayan regions (4) Indo- Australian region or Australasian tropics. (5) Palaeotropic and above.

Conservation Awareness Programmes

1. Field Training program of local Youths:

As part of involving the local communities in the conservation campaign, field training programme of local youths were conducted at Moreh batch wise on 27th and 28th October, 2012. More than 30 youths from the seven forest villages of Satang, Nungkam, Saikul, Govajang, Bongjang, H. Mongjang and Kwatha villages take part at the training programme. The theme of the training was “Bird survey techniques & uses of field equipments”. During the programme, a brief introduction of our rich avian fauna and why we need to conserve them were shared with the youths. Further they were trained with different bird census techniques such as line and point transects methods, camera trapping methods and Mist-netting of birds. The youths were also taught how to use a binocular, GPS, Range finders and compass etc. also they were taught to measure Girth of trees (GBH) and finally installation of camera traps.

The training program proof successful, that five of the youths were assigned as field guides at different locations in their villages. They monitor the birds when PI was absent. They also help me with arranging meetings with village chiefs and people in their communities.

2. Community meetings with forest villagers:

As mentioned earlier, there are seven forest villages inside the sanctuary. The work itself was one of its kinds in the area and people were not aware of the present scenario of the sanctuary and its degrading biodiversity. Meetings with these communities and their chiefs help me in achieving the past and present distribution records of some rare and threatened birds. By interacting with them, I was able to aware them about the importance of endemic and globally threatened birds recorded from the sanctuary. Most of the chiefs assure me that poaching and selling of threatened birds will be stop in their respective villages and their vicinity. Some of the villagers of Kwatha reported that the endangered Green peafowl called locally as *Wahong Asangba* were reared in their village earlier.

3. Essay & Painting Competition for school children:

As part of the continuing conservation campaigns, a school level Essay and Painting Competition was held on 22nd February, 2013 on the theme “**Importance of birds and their conservation needs at Yangoupokpi Lokchao WLS**” at Moreh Higher Secondary School and Eastern Shine School of Chandel district, Manipur. More than 50 students participated at the Essay competition which was meant for Class IX-XII students and about 80 students take part in the Painting competition which was meant for Class V- X students but on request few students of Class III & IV were also included.

For encouraging the students, prizes were distributed category wise and 1st, 2nd, 3rd position and five consolation position holders were presented with a memento, a certificate and cash prizes. Apart from these, all the participants were presented with a participation certificate.

4. Awareness Workshop:

A Community Awareness Workshop on the theme " **Yangoupokpi Lokchao Wild Life Sanctuary: a Unique data Deficient IBA of Manipur, its present Status and Conservation needs**" was organized on 23rd February 2013 at Moreh Khunou Community Field. Mr. Salam Rajesh, Executive Director, Manipur Nature Society and Mr. Nangest Thongam, Assistant Professor, Department of Geography, Manipur College were the Resource persons at the event. More than 100 participants such as school students, local *Meira paibi* clubs, members of *Meitei Council*, members of *Minority council* participated the one day workshop. Mr. Rajesh in his address brief about the rich biodiversity of the Yangoupokpi Lokchao WLS and its linkage with livelihood. Few local elders also share their knowledge about the sanctuary with the participants. There were interactions among the students and the resource persons. The PI also addresses about the bird life and their conservation issues.

5. Awareness campaign materials:

A Poster on *Rare and threatened birds of Manipur* and a pamphlet & leaflet about the Sanctuary and its importance in local language with logos of funding agencies were also distributed among local people and school children to spread awareness among them.

Few links of News items about the awareness programmes:

1. http://www.thesangaiexpress.com/images/Page-2_793.pdf.
2. http://www.poknapham.in/current/Page_7.pdf.
3. <http://thepeopleschronicle.in/?p=12369>.
4. <http://www.rediffmail.com/cgi-bin/red.cgi?red=http%3A%2F%2Fwww%2Ethesangaiexpress%2Ecom%2Ftseitm%2D23559%2Dyangoupokpi%2Dlokchao%2Dwild%2Dlife%2Dsanctuary%2Dan%2Dimportant%2Ddata%2Ddeficient%2Diba%2Dof%2Dmanipur%2Dits%2Dpresent%2Dstatus%2Dand%2Dconservation%2Dneeds%2F&isImage=0&BlockImage=0&rediffng=0>.
5. https://www.google.com/url?q=http://e-pao.net/epSubPageSelector.asp%3Fsrc%3DConservation_Awareness_on_Avian_Fauna_of_Yangoupokpi_Lokchao_Wild_Life_Sanctuary_20130224%26ch%3Dnews_section%26sub1%3DPress_Release%26sub2%3DPress_Release_2013&sa=U&ei=B3IIUvarFsTlkgXT54DQCw&ved=0CAcQFjAA&client=internal-uds-cse&usg=AFQjCNGjuAYxpx80nitFF8jM-tuAxEzKWQ.
6. https://www.google.com/url?q=http://e-pao.net/epSubPageSelector.asp%3Fsrc%3DYangoupokpi_Lokchao_Wild_life_Sanctuary_An_important_data_deficient_IBA_of_Manipur%26ch%3Deducation%26sub1%3DScience_and_Technology&sa=U&ei=B3IIUvarFsTlkgXT54DQCw&ved=0CAoQFjAB&client=internal-uds-cse&usg=AFQjCNHFC34J7tbP13FK0r1pghsTm5EHjQ.

Discussion & Conclusion:

Accurate estimates of bird density are essential for many studies including diversity- abundance relationships, biomass and ecological productivity (Wiens, 1989; Terborgh *et al.*, 1990; Thiollay, 1994). The present study reveals the diversity and abundance of avian fauna at a data deficient IBA of Manipur. Out of the total species of birds (169) encountered so far during the study period, 41 species turns out to be frugivorous and 89 species were insectivorous in their feeding guild, which accounts for about 24.3 % and 52.7% of the total avian diversity of the forest respectively. Five globally threatened species were also included among the species encountered during the study period. The high diversity of frugivorous and insectivorous birds reveals the fact that the forest harbors sufficient fruiting trees to support these avian populations and that the forest is in good health. The occurrence of three species of hornbills and nine species of columbids including four exclusively frugivorous pigeon species of the genus *Treron* and *Ducula* also add to the above fact and that the forest still supports a viable population of frugivorous birds which required large home ranges. The study also records nine *Galliformes* species including the endangered Green Peafowl, White-cheek Partridge and Kaleej Pheasant which add to the fact that the forest still harbours suitable habitat for these rare and threatened birds.

Since the forest have undulating terrain, there were differences in the diversity indices calculated among the eighteen permanent line transects (T1- T18) that were placed randomly, six each across the three main habitats of the forest. The abundance and diversity of birds also vary at different habitat categories. Different degrees of habitat disturbances have discernible effects on the bird community such as reduction in bird species richness, abundance, diversity and changes in species composition (Raman, 2001). The present study record highest number of species at moderately undisturbed forest habitat (143 species), rather than the relatively undisturbed (89 species) and disturbed (130 species) forest habitats. Raman (2001) reported that birds that were rare and those that were large-bodied tended to be more susceptible to habitat changes, a pattern consistent across the different forms of habitat disturbances. The occurrence of wide ranging and large bodied frugivores species such as hornbills and

fruit pigeons only on the undisturbed and moderately disturbed forest habitat was proof enough that degree of habitat disturbances have positive impact on the bird species richness in different habitat categories. It was evident also from the study that, the species with smaller geographical ranges confine within undisturbed habitat and moderately disturbed habitat, whereas, species with larger ranges were more often found in disturbed habitat.

Here mentioned may be made that the five globally threatened species encountered during the study were recorded from only undisturbed habitats except for the Green Peafowl which sometimes comes out to the paddy field near the forest edges. It was also evident from the study that some viable population of Green Peafowl still occurs at the sanctuary and to confirm their present status continuous monitoring and long term study is required immediately. Since the adjacent Myanmar forests also harbours a viable Green Peafowl population, there exist possibilities that these species might cross over to the Indian side of the border at the Yangoupokpi Lokchao WLS for foraging purpose and goes back again. Monitoring the species will require constant monitoring of the population but due to difficult terrain and restricted entry to the sanctuary, the task at hand is very difficult at the moment. Same is also the case for other threatened and restricted range species recorded at the sanctuary as the site suffers from insurgency problems.

Under the above mentioned circumstances, the active participation of local communities is greatly essential at this point if we are to initiate conservation action plans of these threatened species at this IBA site. Not only awareness is required for the local communities but an alternate source of livelihood must be generated to minimize the exploitation of forest resources. Until and unless the communities are benefitted from our conservation programs they are not going to leave their daily chores and take part in the protection of this IBA ideal for a number of rare and restricted range avian fauna and other such rare floral and faunal composition still waiting to be discovered. Therefore, long term studies are required along with conservation awareness programs to educate the people and organize them into small groups that can protect and monitor their forests themselves in the long run.

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Plate-I
Few birds of Yangoupokpi Lokchao WLS



**The endangered Green Peafowl- *Pavo muticus*
(Locally called Wahong Asangba)**



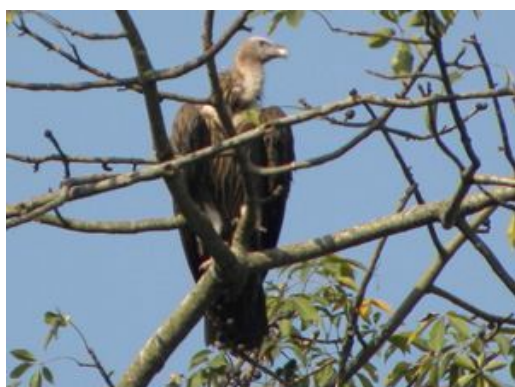
**Mrs Hume's pheasant- *Syrmaticus humiae*
(State Bird of Manipur – called locally as Nongin)**



Common Hill Partridge- *Arborophila torqueola*



**Kaleej Pheasant- *Lophura leucomelanos*
(Female locally called Yerik)**



Himalayan Griffon- *Gyps himalayensis*



Lineated Barbet- *Megalaima lineata*

Plate-II
Habitat photos of Yangoupokpi Lokchao WLS



Aerial View of YLWLS near Khudenthabi



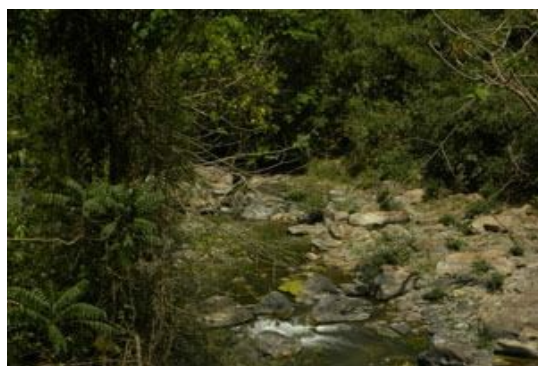
Glimpse of Forest habitat near Moreh



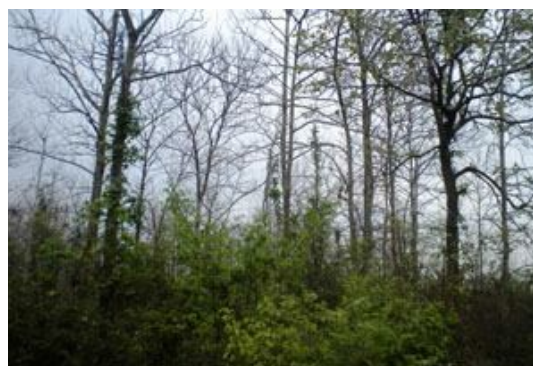
Illegal burning of Forest near Khudenthabi



**One of the forest villages inside the sanctuary
(Govajang)**



A glimpse of Lokchao River near Lokchao gate



Glimpse of forest vegetation at Kwatha village

Plate-III
Conservation awareness photographs



Field Training of Local Youths at Moreh



Community meeting at Kwatha Village



Essay Competition at Moreh Hr. Sec. School



Painting Competition at Eastern Shine School



**Awareness Workshop at Moreh Khunou
Community Hall**



Mr. Salam Rajesh addressing the Workshop

Plate-IV
Few rescued bird photographs



A rescued Brown Hawk Owl



Eurasian Sparrow Hawk



Common Hill Partridge rescued from Market



A dead Mrs. Humes Pheasant recovered from Market (State Bird of Manipur)



An Oriental Pied Hornbill recovered from a house near Moreh



PI Interacting with a bird seller at Namphalon Bazar, Moreh

Plate-V

Conservation Awareness Campaign Materials



Awareness Poster distributed among local people



Awareness Poster used during Field Training



Leaflet in local Language Page 1



Leaflet in local Language Page 2

Appendix I. Description of the eighteen t Line transects placed randomly at the study site.

Line Transects	GPS Location (Lat/Long)	Descriptions
Transact no.1(T1)- Moreh Kunou pt.1	24° 15' 18'' N and 94° 17' 42'' E	This transect degraded forest patches throughout its length. Habitat consists of Open fields, degraded hedges etc.
Transact no. 2 (T2) Moreh Pt. 2	24° 15' 48'' N and 94° 17' 40'' E	This transect consists of disturbed & moderately disturbed forest patches. Terrain is undulating. Habitat is bamboo thickets and degraded scrub forest patches also.
Transact no. 3 (T3) Lokchao pt. 1	24° 19' 08'' N and 94° 14' 03'' E	This transect consists of hill streams and disturbed forest patches. The terrain is hilly and undulating. Habitat is scattered Bamboo thickets.
Transact no. 4 (T4) Khudengthabi Pt.1	24° 18' 41'' N and 94° 15' 28'' E	Hilly undulating terrain consisting of degraded Scrub forest patches plus scattered woodlands dominated by <i>Dipterocarpus turbinatus</i> .
Transact no. 5 (T5) Govajang Pt.	24° 14' 37'' N and 94° 18' 21'' E	Somewhat undulating forest patches with Scrub hedges and few large trees like <i>Dillenia pentagyna</i> , <i>Terminalia tomentosa</i> etc. and scattered bamboo patches.
Transact no. 6 (T6) Kampang Khunou pt.1	24° 24' 35'' N and 94° 16' 54'' E	Plain area with mainly scattered forest patches and paddy fields along the edges.
Transact no. 7 (T7) Khudengthabi Pt.2	24° 18' 55'' N and 94° 16' 21'' E	Moderately disturbed secondary forest patches with mixed vegetation comprising of <i>Gmelina arborea</i> , <i>Duabanga sonnoroeoides</i> etc with patches of bamboo thickets.
Transact no. 8 (T8) Lokchao Pt.2	24° 19' 19'' N and 94° 14' 33'' E	Moderately disturbed habitat with Streams and small Nalas, somewhat moist. Vegetation is Woodland plus under storey hedges.
Transact no. 9 (T9) Kwatha pt. 1	24° 21' 18'' N and 94° 17' 05'' E	Partly plain area inside the Forest undisturbed, somewhat damp, with undulating terrain, woodlands dominated by <i>Dipterocarpus spp.</i> <i>Tectona grandis</i> and <i>Terminalia spp.</i> Also, under storey hedges and Bamboos.
Transact no. 10 (T10) Saikul Pt. 1	24° 21' 09'' N and 94° 23' 49'' E	Undulating Hilly terrain totally of dry Bamboo thickets moderately disturbed. Under storey hedges also present sometimes few large fig trees sparsely distributed.

Transact no. 11 (T11) T. Mongjang pt.	24° 16' 18'' N and 94° 16' 41'' E	Degraded secondary scrub forests with bamboo thickets mixed with large woods like <i>Melonarrhoea usitata</i> , <i>Bauhinia spp.</i> etc.
Transact no. 12 (T12) Kwatha Pt. 2	24° 21' 05'' N and 94° 16' 03'' E	Partly plain area with mixed vegetation. Jhum paddy cultivation along the edges. Small streams & nalas also present.
Transact no. 13 (T13) Saikul Pt. 2	24° 21' 09'' N and 94° 23' 40'' E	Undulating area totally undisturbed; habitat consists of woodlands, scrub forests, Bamboo Thickets and under storey hedges. Somewhat moist and the trail is very difficult to walk during rainy seasons. Streams and Nalas are also present.
Transact no. 14 (T14) Kampang Khunou Pt. 2	24° 25' 22'' N and 94° 17' 30'' E	Moderately disturbed sloping hillside. Area is dry dominated by Bamboos. Varieties of Bamboo thickets are present; Scrub hedges are also present.
Transact no. 15 (T15) Kampang Khunou Pt. 3	24° 25' 54'' N and 94° 16' 32'' E	Undisturbed sloping hillside. Area is dry dominated by varieties of Bamboo thickets; Scrub hedges are also present.
Transact no. 16 (T16) Kwatha Pt. 3	24° 21' 58'' N and 94° 17' 32'' E	Undulating forest patch. Undisturbed Area somewhat damp consisting of Woodlands and secondary scrub forest. Bamboo thickets are also present. Primary large wood varieties are dominated by <i>Dipterocarpus spp.</i> , <i>Tectona grandis</i> , <i>Terminalia spp.</i> etc.
Transact no. 17 (T17) Sating pt.1	24° 21' 28'' N and 94° 19' 42'' E	Undulating area totally undisturbed; habitat consists of woodlands, scrub forests, Bamboo Thickets and under storey hedges. Streams and Nalas are also present
Transact no. 18 (T18) Leibi pt. 1	24° 23' 12'' N and 94° 15' 55'' E	Partly plain area with mixed vegetation. Not much disturbed. Small streams & nalas also present. Few fig trees are also sparsely distributed.

Appendix II. Location Map of Yangoupokpi Lokchao Wildlife Sanctuary

