An investigation into the status and conservation requirements of evergreen forests and their avifauna in eastern Nepal, including Kosi Tappu Wildlife Reserve

1989.

Tim Dodman

SUMMARY

The forests of eastern Nepal are unique in the country and are at considerable risk of degradation and destruction. Within a relatively small area there is a high diversity of forest types and associated fauna ranging from tropical forest to different mosaics of temperate forest. The bird life is particularly prolific, with a number of species being unrepresented elsewhere in Nepal. Additionally, some forest types are not included in the present national protected area system; thus some species, for instance the Rufous-backed Sibia *Heterophasia annectans*, are totally unprotected in Nepal.

Inskipp (1989) highlighted the need for further research in the forests of eastern Nepal and their conservation. This project gathered information in light of these recommendations, particularly on bird species present and threats to particular forests. All the forests we visited were threatened to some extent, and we perceived an urgent need for their conservation and incorporation into the national protected areas system. A programme of integrated community development and conservation would seem to be most suitable, taking in the whole area encompassed by the Mai and possibly the Tamur valleys. Such a programme would need careful planning and research; this report is not the place for detailed recommendations. However, the area badly needs this initiative, as both wildlife and people depend on forests. Locals rely on a variety of forest products and the depletion of these resources would lead to a serious deterioration in their quality of life. Forests such as Hans Pokhari Danda are great assets to the local population, as well as the habitats and wildlife they support. Any further land use development programme in this area would be of limited and possibly negative value if it ignored the importance of these unique forests.

The status of the globally threatened Swamp Francolin *Francolinus gularis* at Kosi Tappu Wildlife Reserve was also investigated. The eastern bund of the reserve contained a density of about eight francolins per square kilometre. These endangered birds were threatened by changes in the river and in their habitat, and possibly by predation. No Bengal Floricans *Eupodotis bengalensis* were seen south of Kosi Barrage, nor any suitable habitat.

INTRODUCTION

This project was carried out in the light of recommendations made by Inskipp (1989) in an ICBP Monograph *Nepal's Forest Birds: their status and conservation.* It follows on directly from a similar project led by J.B. Halliday and G. McKnight between November 1988 and January 1989. Bird records from this project are included in their report (Halliday and McKnight 1990).

Inskipp (1989) highlighted the need for survey work in the remaining forests of types unrepresented in Nepal's protected area system, so that new areas suitable for protection could be identified. These included *Schima-Castanopsis* forests and subtropical and lower temperate forests in east Nepal, mostly between 26°45'N and 27°45'N and between 87°E and 88°15'. Inskipp (1988) also recommended surveys in Kosi Tappu Wildlife Reserve. These surveys were urgently needed as the forests faced severe threats, with only relatively small patches remaining.

This report obviously addresses similar issues to that of Halliday and McKnight (1990) and efforts have been made to avoid repetition.

PARTICIPANTS

The project was developed and implemented by Paul Deluce, Tim Dodman, Nick Goodyer and Yvonne Guinan. The results of Deluce and Goodyer are not included here, as our itineraries were somewhat different. All bird records are included in Halliday and McKnight (1990).

Tim Dodman
c/o The Chase
Puddington Lane
Burton
S.Wirral
L64 5SF

Yvonne Guinan
c/o 46 St. Benedict's Road
Small Heath
Birmingham
B10 9D

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BACKGROUND INFORMATION

Topography

Nepal can be divided topographically into four main physical belts (though these may be readily sub-divided) from south to north:-

a. the terai (low, flat fertile belt along southern border with India)
b. the Churia or Siwalik foothills and the inner terai zone (rises from the terai plains to the Mahabharat lekh range)
c. mid-mountain region (between Mahabharat lekh range and the outer Himalayas)
d. great inner Himalayan range.

From south to north there is an overall increase in altitude from about 70 m to over 8800 m.

The area considered as east Nepal in this report is that part of the country lying east of the 87^0 longitude line (Map 1). It has an area of 15,475 km^2 and is characterised by the Arun and Tamur river basins, which join the Sun Kosi, a tributary of the Ganges. Three meridional crest lines separate the river basins, and it is these that have primarily given rise to the high degree of endemism and originality of the flora, fauna and human life.

Climate

Rainfall varies considerably within the region from about 1000 mm per year around Dhankuta to over 4000 mm per year around Num and the Barun valley. Humidity is high, the annual average exceeding 70%. The driest period falls in March and April before the onset of the monsoon, which lasts through to September. Temperature decreases with an increase in altitude; the terai averages around 30^0C in the hottest month, May.

Vegetation types

More than half the vegetation types are endemic to the eastern Nepal province, with the flora including over 3500 species of higher plants, 400 pteridophytes and 1000 bryophytes. These are often restricted to vegetational zones, which are largely dependent on the altitude. These zones and their dominant native vegetation types are illustrated in Table 1.

Table 1: **Climate/vegetational zones of east Nepal**

ZONE	ALTITUDE	MAIN VEGETATION TYPES
TROPICAL	70 - 1000m	1. Lower tropical forest of *Shorea robusta* (sal) 2. *Acacia catechu/Dalbergia sissoo* forest (grows in narrow strips on alluvium along streams and rivers) 3. Tropical humid evergreen forest (multi-species) (grows in narrow belts in sal forest) 4. Pseudosteppes with tall elephant grasses and shrubs
SUBTROPICAL	1000 - 1700m	1. *Schima/Castanosis* and *Castanopsis* forests 2. *Pinus roxburghii* (Chir pine) forest (on dry South-facing slopes) 3. *Alnus nepalensis* (alder sp.) forest (grows within 1 and 2 along streams or in ravines) 4. Subtropical evergreen forest (eg *Eugonia tetragona* with an understorey of *Ostodes paniculata*)
LOWER TEMPERATE	1700 - 2400m	1. *Quercus lamellosa* (oak sp.) forest 2. *Quercus lanata* (oak sp.) forest 3. Lower temperate mixed broadleaved forest, with abundant *Lauraceae*
UPPER TEMPERATE	2400-3000m	1. *Quercus semecarpifolia* (oak sp.) forest 2. Upper temperate and deciduous mixed broadleaved forest *(Rhodedendron arboreum, Acer, Lauraceae)* 3. *Rhodedendron cinnamomeum* forest 4. *Tsuga dumosa* forest 5. *Lithocarpus pachyphylla* forest 6. *Daphniphyllum himalayense* forest
SUBALPINE	3000 - 3800m	1. *Abies spectabilis* with rhododendron understorey 2. *Betula utilis* forest with rhododendron understorey 3. Rhodedendron shrublands 4. Rhodedendron/Juniper shrublands 5. *Larix griffithiana* forest
ALPINE	over 3800m	1. Alpine slopes with *Gramiineae* and *Cyperaceae* 2. Shrublands with rhododendrons and other bushes 3. Pastures of *Primula, Caltha* and other species 4. Rhododendron/Juniper shrublands

The tropical evergreen forest in south-east Nepal is considerably more widespread and floristically richer than in any other part of Nepal; the predominant tree species are shown in Table 2.

Table 2: **Predominant tree species of tropical evergreen forests in east Nepal**

Tree species	Lower tropical level	Upper tropical level
Shorea robusta	*	*
Heynia triguna		*
Castanopsis indica		*
Quercus lanceaefolia		*
Duabanga grandiflora	*	
Meliosma pinnata	*	
Cycas pectinata	*	
Gnetum montanum	*	
Mallotus albus	*	
Lagerstroemia parviflora	*	
Adina cordifolia	*	

The dominant elephant grasses of the terai riverine plains are *Saccharum spontaneum* and *Phragmites kharka*. Only a few shrub species manage to withstand the alternating floods and drought of these plains, such as *Phyllanthus emblica, Ziziphus rugosa* and *Ziziphus mauritiana*. The typical riverine forest of *Acacia catechu* and *Dalbergia sissoo* is particularly hardy and provides an important refuge for some of the larger mammals, including the endangered Wild Asiatic Buffalo and roost sites for terai birds.

The pattern of native vegetation is very diverse and many plants and communities are often restricted to small areas. Associated with most of the forest trees are large numbers of epiphytes and lianas and a dense and varied understorey. This understorey supports a wide variety of fauna, the bird life being particularly rich, especially in the tropical zone.

The utilisation of natural resources

East Nepal is more densely populated than the country as a whole. The population is unevenly distributed, with the terai supporting the highest density, over 160 people per km^2. The people are predominantly farmers (about 90%) and there are no large towns outside of the terai. Thus they are almost entirely dependent on the land for their immediate resources.

Rice and jute are the main crops of the terai, where a third of the land is irrigated. Maize is the major crop in the hills, along with potatoes, rice, millet, buckwheat, wheat and barley. There is relatively little slope management. There are also some established tea gardens in Ilam District. There has been a general movement of people from the hills to the terai, which is more suitable for agriculture. The rate of deforestation has thus been most severe in the tropical and sub-tropical zones.

Direct usage of forest

a. Grazing
There is extensive grazing in many remaining forests, the most common livestock animals being buffalo, cattle, goats and sheep. Pig herds also feed in forests. In general cattle and sheep in the hills ascend slowly to the higher forests around February, after spending the winter near the villages. Yaks are the only domestic grazing animals that remain in the high Himalayas throughout the year. As the cow is sacred in much of Nepal (Hindu religion), many areas have an excess of animals which exert added pressure on forests.

b. Fodder
Many forest plants, especially bamboo shoots and understorey plants, are gathered as animal fodder. This is particularly important for milk-producing cattle.

c. Food and drink
Many forest plant products are eaten, and others are used for such purposes as the distilling of alcohol. Typically fruit, nuts and the leafy stems and young shoots of a variety of plants are gathered for local consumption, especially in the hill regions. Hunting and honey-gathering are also important.

d. Fuel
Wood is the primary fuel throughout east Nepal, with diesel-generated electricity available in only a few towns. Wood is used mostly for cooking and heating. Kerosene is available sometimes, but is relatively expensive and only sold in larger villages.

e. Construction
Wood is used in the construction of all buildings and for other purposes (e.g.bridges, furniture, baskets). Favoured tree species are *Castanopsis* and *Michelia*, although these and other forest species are more difficult to obtain now. Bamboo is used extensively, especially for roofs of houses. It, and other plants, are used in basket weaving. Many household and agricultural appliances are made out of wood and forest plant material.

f. Medicine and religion
Forests supply people with medicinal plants, often associated with religion, and poisons. Many plants are worshipped in the Hindu religion: sal *Shorea robusta* is regarded as the seat of God and bamboo is also sacred.

Forest fauna

Mammals

Mammals are very depleted in the area, especially the larger carnivores, such as Tiger, Leopard and bears. Smaller cats probably still survive and other carnivores include mustelids and viverrids, mongooses and members of the dog family. Some deer, Wild Boar, pangolin, squirrels, flying squirrels and three species of monkey still remain.

The primary reason for decline in mammals and many birds is loss of habitat, resulting in isolated populations which are too small to survive. Hunting has also been a major factor in

their decline. Musk Deer are selectively hunted for the prized secretion used in the manufacture of perfume.

Birds

The avifauna of east Nepal is still prolific with a large number of species not represented elsewhere in Nepal. Around 436 breeding forest bird species have been recorded east of the Kali Gandaki valley, 109 for which Nepal may hold significant populations. There are an additional 20 species whose range is restricted to forests east of the Arun valley.

About 65% of Nepal's breeding birds utilise forests; 28 species are associated with tropical evergreen forests only, of which seven occur only in the far eastern forests. Due to the depletion of tropical forest in Nepal, 27% of tropical forest birds are considered at risk, many of them very locally distributed. A further 20 species are now probably extinct in Nepal (Inskipp 1989).

The main threat to forest birds is loss of habitat. Many species are dependent on particular micro-habitats within in forests. For instance the Long-billed Thrush *Zoothera monticola* is restricted to shady forest streams. Birds such as laughingthrushes *Garrulax* are highly dependent on forest undergrowth, and cannot survive in forests with a depleted understorey. It is the most specialised species that are at greatest risk. When forest conditions are disrupted or removed they simply disappear, unless they are competitive adaptors.

Some birds are hunted, especially larger ones such as Kalij Pheasant *Lophura leucomelanos* and Red Junglefowl *Gallus gallus*. Raptors are sometimes persecuted near villages, and other birds are kept as pets e.g. Jungle Myna *Acridotheres fuscus*.

Bird zonation
The tropical and sub-tropical zones are the most species-rich, though the subalpine and upper temperate zones have the highest percentage of breeding birds which may have internationally significant populations in the country. The lower temperate forests contain the greatest proportion of breeding birds that are restricted to east Nepal.

Other fauna

East Nepal contains several amphibians not encountered elsewhere in the country.

Of invertebrates, bees are particularly important, notably *Apis laboriosa*, the world's largest honeybee. Honey-gathering is an important economic asset to the forests and also provides wax, which can be sold in larger markets for use in the lost-wax process of casting bronze. Wax has about six times the value of rice.

Survey areas

1. Kosi Tappu Wildlife Reserve/Kosi Barrage

The Kosi Barrage is recognised as the most important wetland region of Nepal for birds and is visited by large numbers of waders and wildfowl, as well as raptors. The Kosi Tappu Wildlife Reserve, granted in 1976, is situated in the Sapta-Kosi River Plain, and is bounded to the west and east by artificial embankments. It has an area of 175 km^2 and an altitude of approximately 100 m above sea level.

The climate is typically that of the terai, characterised by the breaking of the monsoon. The whole area has been in a state of flux over recent years due to the course of the river changing dramatically. As recently as February 1987 the river was reported as running 3-4 km west of the eastern embankment (J. Roberts, *in litt.* 1988), whereas during this study it ran more or less parallel to it about 300 m away. South of the barrage the river has moved westwards, bringing much inundation. The whole area is within the earthquake zone of 1988.

The vegetation along the eastern embankment consists primarily of reed grasses with a small patch of *Dalbergia sissoo* woodland to the north, and intermittent *Acacia catechu* trees. To the west of the eastern embankment is a large island, whose western side consists of sandy areas recently covered by water, riverine forest (*Acacia, Bombax* and *Dalbergia*) and tall elephant and reed grass areas (e.g. *Saccharum spontaneum, Phragmites kharka*).

Around the reserve the land is either grazed or cultivated and interspersed with wet areas. Locals are permitted to enter the reserve once a year, usually in March, to cut grass for livestock and thatch material for roofing. South of the barrage there is much grazing and shifting cultivation.

The reserve additionally contains around 1200 domestic cattle which roam freely. These animals cannot be slaughtered for religious reasons and it would be difficult to remove them as this would involve crossing the river. There are some introduced plants, most noticeably *Casuarina* along the eastern embankment, which may threaten the habitat of the Swamp Francolin if it becomes too well established.

The reserve was gazetted primarily to protect a relict Asiatic Wild Buffalo *Bubalus bubalis* population the only one in Nepal. It is rich in other wildlife: the number of bird species recorded is 295 (Inskipp 1989). This includes several globally and nationally threatened species, such as Greater Adjutant *Leptoptilos dubius*, Swamp Francolin and Bengal Florican.

The reasons for incorporating a visit to Kosi Tappu Wildlife into this project were to:

a. estimate the status of and determine threats to the Swamp Francolin;
b. produce a bird inventory;
c. look for Bengal Florican south of the barrage

2. Lower Mai valley

There is one main, though fragmented block of tropical evergreen forest at the lower tropical level (<400 m) in east Nepal, about 30 km long and 5 km wide (Map 1). It is used

extensively for timber and much has been converted to agriculture. The forest falls in the Ilam and Jhapa Districts. There are also 'tongues' of mixed tropical evergreen forest at the upper tropical level (400-1000 m) along the southern foothills of the Siwalik range. This forest type is distinct from the much wider-ranging sal-dominated forest of similar altitude. This small area of forest south of Ilam is one of the most floristically rich areas in Nepal and is presently unprotected (though national tree-cutting laws apply). The forest is enhanced by a series of streams and rivers, and north of Soktim is part of the Mai valley.

3. Upper Mai valley

The upper Mai valley watershed contains lower and upper temperate forest between 1800 m and 3050 m. Like the lower Mai valley, its continued existence is severely threatened by encroachment, especially at the lower altitudes, and degradation. The avifauna is particularly rich, including 34 breeding species considered at risk in Nepal. Additionally, the forests contain seven of the 29 breeding species which have not been recorded within protected or proposed protected areas. The forests are also important for winter migrant birds, including 12 which may have significant breeding populations in Nepal.

4. Hans Pokhari Danda

Near the village of Hans Pokhari there is an isolated forest of approximately 13 km^2, consisting of two distinct forest types, *Eugenia tetragonia/Ostodes paniculata* forest to the north and *Castanopsis tribuloides* forest both in pure patches and mixed with *Schima wallichii, Rhododendron arboreum* and others to the south. The forest has a large variety of birds, many of which are localised in separate valleys or ridges. It is one of perhaps two or three forests in Nepal where White-naped Yuhina *Yuhina gularis,* Hill Prinia *Prinia atrogularis* and the Yellow-cheeked Tit *Parus spilonotus* are found. It contains many other bird species which are at risk in Nepal.

5. The Tamur valley

Like the Mai valley, the Tamur valley comprises of a variety of forest types, though most natural vegetation is restricted to the ridges of the higher valleys. Thus there is a series of isolated forest patches, some quite extensive and others very small remnants. These forests contain a similar avifauna to the Mai valley.

METHODS

Carol Inskipp advised on the survey work. John Halliday also provided useful information to enable successful planning of the project. The itinerary of field work was planned by the four project members in Kathmandu, when the relevant permits were obtained for travel in eastern Nepal. Field work was carried out between 4 March and 22 April 1989. Further bird records were collected in the Royal Chitwan National Park between 2 and 10 May 1989.

Ornithological and habitat surveys were conducted in the five main areas already listed with the following dates:-

1. Kosi Tappu Wildlife Reserve/Kosi Barrage	5-11 March & 22 April
2. Lower Mai	12-19 March

3. Upper Mai	20 March - 6 April
4. Hans Pokhari Danda	7-12 April
5. Tamur valley	13-20 April

Bird (and mammal) recordings were made each day, and any evidence of breeding noted. Inventories were then produced for each area or habitat type. Information recorded for simple habitat surveys were: the type and extent of forest (or grassland at Kosi), forest crown cover, quality of the understorey and forest utilisation. Altitude and aspect were also recorded.

Another important part of fieldwork was the investigation of forest use by people. Although we did not have an official Nepalese counterpart (due to lack of funding) we were able to communicate with or through several Nepalis who spoke some English and by very basic use of Nepali and books. Information on forest use, farming, hunting and re-afforestation have been gathered for all five main areas, both when in the field and by subsequent literature reviews.

Kosi Tappu

A total of 7 days was spent at the Kosi Tappu Wildlife Reserve in March, and a visit made to the south of the barrage in April. The main area of study was along the eastern embankment of the reserve, from where notes were taken on the location and numbers of Swamp Francolin seen, and other species recorded. Visits were also made to sandy islands and the main island of the reserve, hiring a local boatman and his dugout canoe. We stayed at Kusaha, the reserve headquarters, in the guesthouse there.

Mai valley

The route taken was from Birtamod to Sunischare by bus, thence along the route suggested by Inskipp (1988) to Ilam on foot, staying at Sukhani, Garuwa and Soktim. We then walked to Hanga Tham, making excursions from there to surrounding forests. A tent was used regularly.

Hans Pokhari Danda

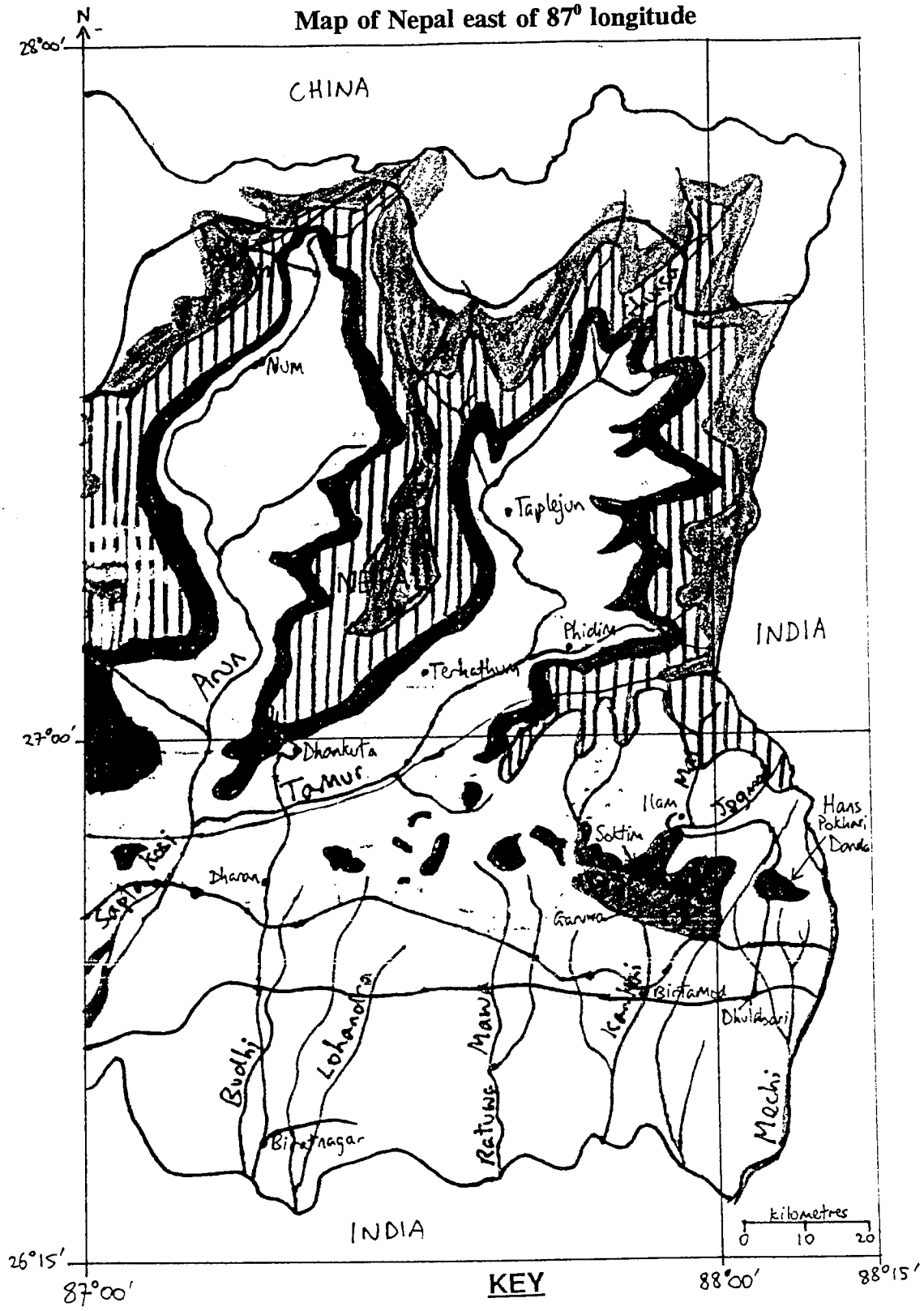
We travelled by bus from Ilam to reach this forest and stayed at the headquarters of the road construction project.

Tamur valley

The route taken was from Ilam to Phidim by bus, thence by foot to Basantpur, stopping at the villages of Sankranti, Khamlalung, Akase, Jirikimti and Basantpur (Map 1). A tent was used most nights.

Map 1

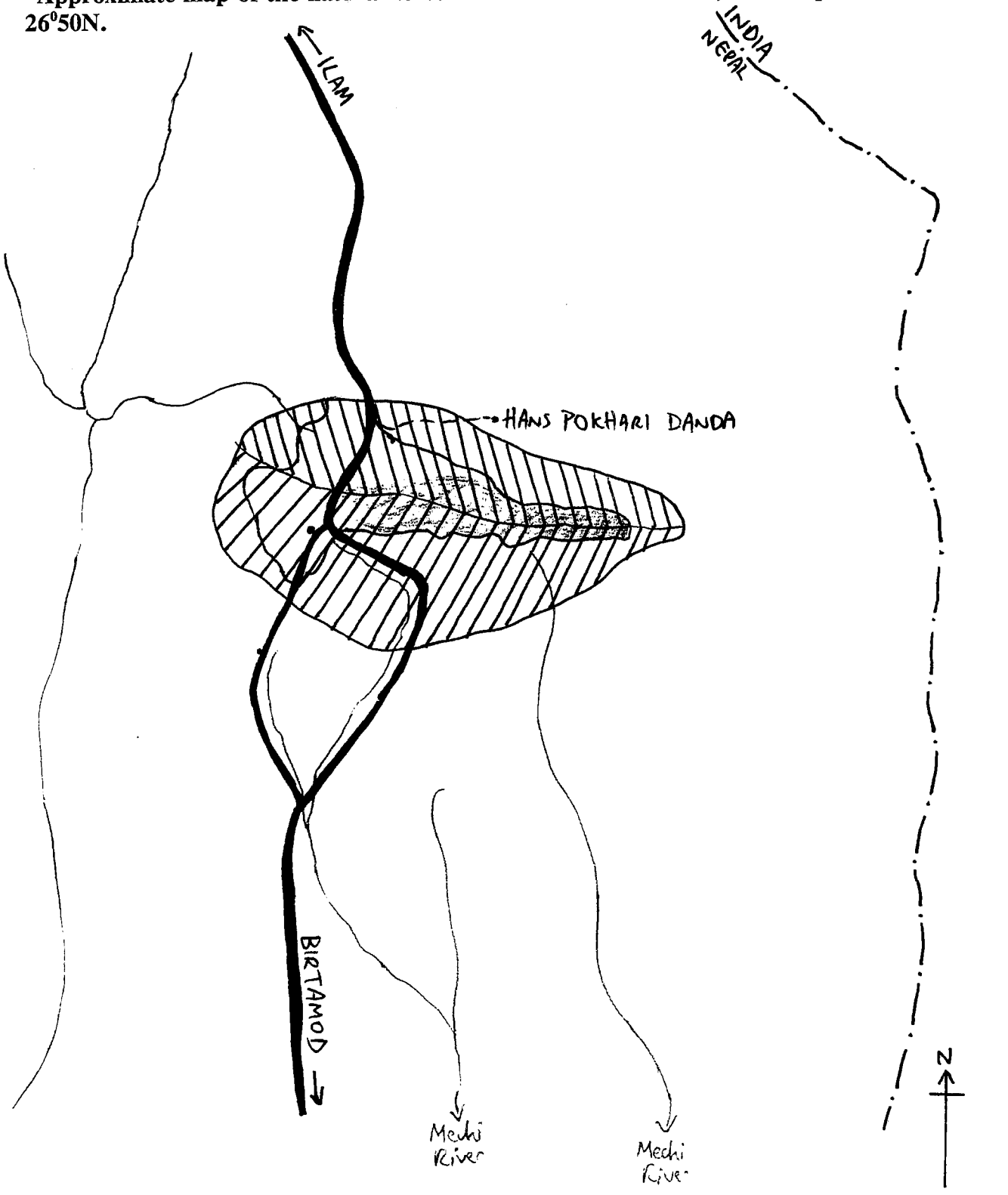
Map of Nepal east of 87^0 longitude



- Northern Limit of Terai
- Northen Limit of Mid Mountain Region
- Sal Forest
- Mixed Tropical Forest
- Lower and Upper Temperate Forest
- Northern Limit of Churia Hills
- Road
- Tropical Evergreen Forest
- Subtropical Evergreen Forest
- Alpine and Subalpine Forest

Map 2

Approximate map of the natural forest at Hans Pokhari Danda, East Nepal 88°06'E 26°50N.



RESULTS

Bird species inventories for all four forest areas surveyed and Kosi Tappu are recorded in the Appendix. This lists all birds seen during the fieldwork. Status is not included as it may be found in Halliday and McKnight (1990).

Further information on all species recorded in east Nepal forests may found in Inskipp (1989) and Halliday and McKnight (1990).

Kosi Tappu

A total of 140 bird species was seen at Kosi, all recorded within the reserve except two, Red-crested Pochard *Netta rufina* and Marsh Sandpiper *Tringa stagnatilis*, which were seen in wetland close to the barrage. A further nine species were recorded which are additions to the checklist in Inskipp (1989) (Table 3).

Table 3: New bird species for Kosi Tappu Reserve

Species seen:	**Date recorded**	**Number**
Eurasian Spoonbill *Platalea leucorodia*	5 & 10 March	5 (1 & 4)
Pallid Harrier *Circus macrourus*	6 March	1 (male)
Imperial Eagle *Aquila heliaca*	8 March	2 (adult, juvenile)
Ruddy-breasted Crake *Porzana fusca*	6 March	1
Common Coot *Fulica atra*	5-11 March	4
Eurasian Curlew *Numenius arquata*	5-11 March	5
Great Black-headed Gull *Larus ichthyaetus*	9 March	1
Common Black-headed Gull *L. ridibundus*	5 & 9 March	3(1 &2)
Orphean Warbler *Sylvia hortensis*	9 March	1

Other records of particular note included Greater Adjutant (one on 5 March), two species which are vulnerable in Nepal, Swamp Francolin and Brown Fish-Owl *Ketupa zeylonensis* (one sighting) and one which is rare in Nepal, Orange-breasted Green-Pigeon *Treron bicincta*.

Swamp Francolin

Swamp Francolins occurred in vegetation along the eastern embankment of the reserve. A total of 23 sightings probably represented 18 individuals. The total area of habitat deemed as suitable for the species was approximately 2 km^2 (Figure 1), giving a density of about 8.5/km^2 (only one bird recorded outside this area).

Favoured Swamp Francolin habitat were areas of thick clumps of grasses less than 1 m in height interspersed with bare dusty patches, scattered bushes and pools of water. Francolins were seen on several occasions walking along narrow sandy paths within the grass. Once, one flew into and remained in a low thick bush. No francolins were seen in either wooded or very open areas. The main periods of activity were early morning and late afternoon. They called frequently at these times or when flushed.

Threats

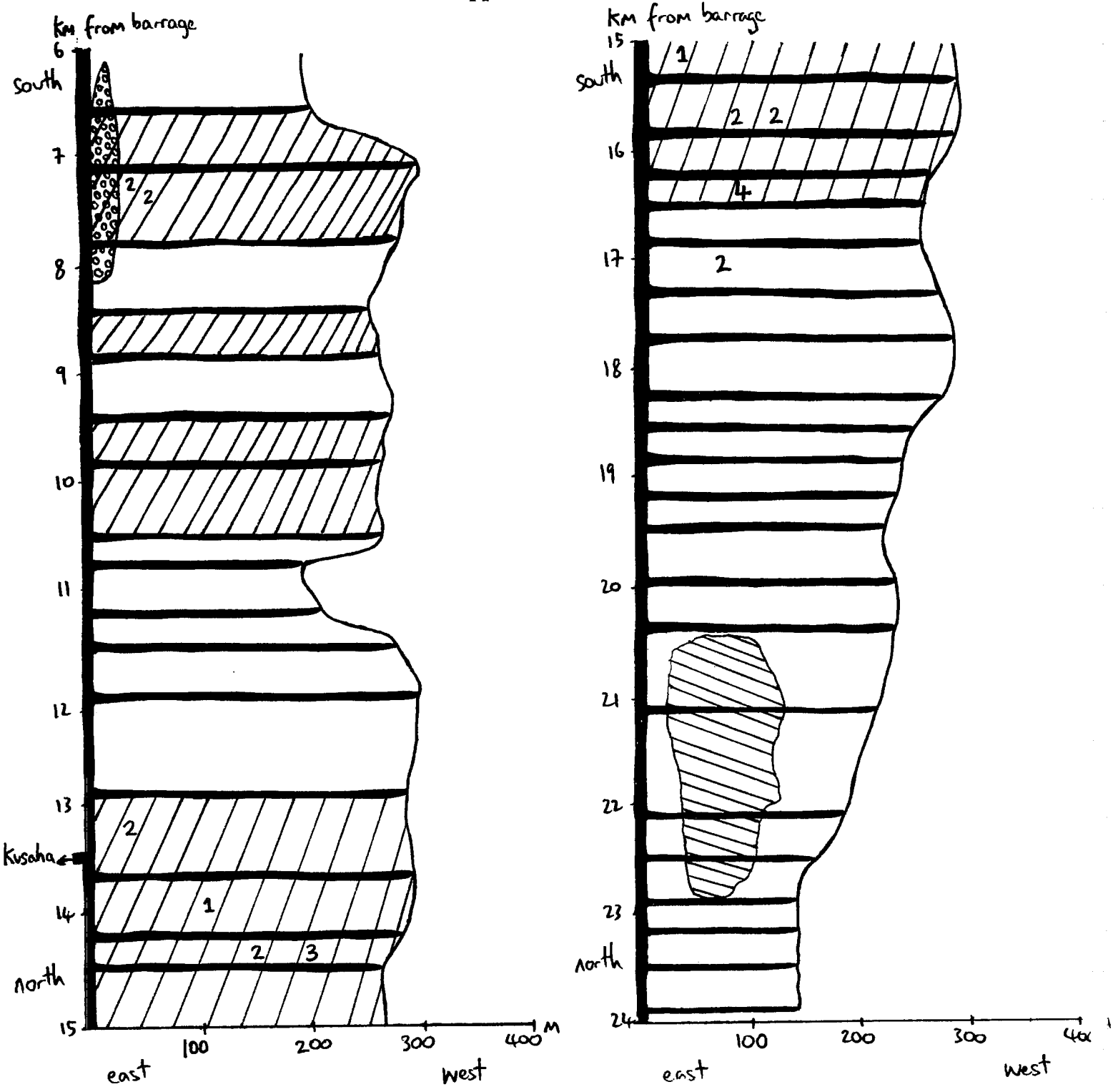
The most serious threat to Swamp Francolins at Kosi Tappu is the risk of inundation in the light of the dramatic changes in the course of the river in recent years. This risk would apply to all ground-nesting birds. The height of the river also depends on irrigation management and the flow of water past the Kosi Barrage. Other threats include the invasion of limited marshland by shrubs, and its possible transformation to bush land, and grass cutting by locals, which occurs every March with permission from the reserve warden. This cutting may be advantageous to the francolin as it curbs the growth of very tall elephant grasses, but there is still a serious risk of disturbance and over-cutting. Natural threats include predation, especially of Jackals, mongooses and raptors.

Bengal Florican

No Bengal Floricans were seen at Kosi, either at the reserve or south of the barrage, where they have been recorded in the past (Inskipp and Inskipp 1983). Suitable florican habitat was found on the main island of the reserve, although the area south of the barrage was heavily utilised for agriculture and grazing.

Figure 1

Swamp Francolin sightings (and suitable habitat) by the eastern embankment of Kosi Tappu Wildlife Reserve



▨ : Dalbergia sissoo woodland

▨ : Acacia catechu woodland

▨ : Preferred/Suitable Swamp Francolin habitat

Casuarina bushes occur between 14.5 and 19.5km north of the barrage.
The dark lines represent the eastern embankment and its bunds.
Note the scale differences between horizontal and vertical axes.

Lower Mai valley

There is around 50 km^2 of tropical evergreen forest south of Ilam, lying between 100 m and 150 m altitude. A track cuts north into the forest past the village of Sukhani, at the southern edge, towards Garuwa. The forest here has an average crown cover of 70%, with a thick understorey away from the main tracks and villages. The track continues to Soktim through cultivated land and tea plantations and into tropical mixed forest. At Soktim there are extensive tea plantations and a tea processing factory. The forested ridges have about 70% crown cover, though the understorey is much degraded, with evidence of burning. North from Soktim, the forest continues interspersed with agriculture to Ilam.

The bird life here is prolific, especially in the thicker tropical evergreen forests. From 12-18 March a total of 86 species was identified. Of these, 32 have not been recorded in forests of the upper Mai valley. The rarest bird seen was the Great Hornbill *Buceros bicornis*, endangered in Nepal; a flock of five birds was recorded flying over forest at Garuwa. The Greater Necklaced Laughingthrush, vulnerable in Nepal, was seen in undergrowth both at Soktim and Garuwa. Both these birds and three other species, White-rumped Shama *Copsychus malabaricus*, Snowy-browed Flycatcher *Ficedula hyperythra* and Streaked Spiderhunter *Arachnothera magna*, are apparently dependent on dense forest with thick undergrowth in the breeding season.

Threats

The forests between Sukhani and Ilam are severely threatened due to the following main reasons:-

1. Timber operations
The tropical forest south of Garuwa is being depleted rapidly due to logging, particularly by the Nepal Timber Corporation. Trucks were coming north into the forest along the main dirt track and returning later loaded with timber. Logging trucks were also seen on tracks closer to Soktim, though none on the steeply ascending track to the village.

2. Wood collection for use by Soktim Tea Factory
The tea factory at Soktim uses wood as a fuel for the tea-drying process. It takes 4 kg of wood to dry 1 kg of tea. Only hardwood is used as it burns more slowly and at a higher temperature than softwoods. A small project is exploring the possibility of using cattle dung as an alternative fuel, though, if this was to become a significant source, the existing forest understorey would become further degraded by additional cattle grazing.

3. Wood collection for local use
Wood is used as a fuel and for construction. Areas close to villages (e.g. Garuwa) and along the main track and river beds are especially affected.

4. Forest clearance
Much forest has already been cleared for agriculture and especially for tea cultivation. The area affected most is between Garuwa and Soktim, where only small patches of forest remain. Some previously-felled areas were abandoned and are now dominated by low scrub. There was much evidence of burning of both forest and scrub.

5. Clearance of understorey
Some forested areas were being extensively grazed, especially for cattle, though buffalo, sheep, goats and pigs also feed in the forest. Often forest understorey is burned to encourage new growth, which provides better grazing for livestock and attracts forest deer for hunting. Undergrowth vegetation and young trees are also collected, especially for use as fodder material.

6. Erosion
The timber-carrying trucks use unsuitable dirt tracks in the forest, resulting in serious erosion and the formation of wide multiple-tracks, as the original tracks become muddied and impassable. In the dry season trucks also use the dry river beds.

Upper Mai valley

There are about 100 km^2 of lower and upper temperate forests in the upper Mai watershed between 1800 m and 3050 m. Dominant tree species are *Quercus lamellosa, Lithocarpus* spp., *Castanopsis* spp. and *Rhododendron* spp. There is a diverse understorey, often dominated by bamboo, which is especially rich in gullies and north-facing slopes away from villages.

There are several small villages in the area, all belonging to the Jamuna panchayat, whose total population is about 2,500. Local people depend on forest trees such as *Michelia* spp. and *Castanopsis* spp., for building materials and fuel (either as wood or charcoal) used within the house for crop-drying, especially of cardamom seeds. (Cardamom is grown under trees in plantations and in some forest areas). Bamboo is a multi-purpose resource used, amongst other things, for construction, weaving, medicine and cattle fodder. People were regularly seen carrying bamboo down from the forest above Hanga Tham. Other plants, particularly of the understorey, are collected for livestock, food and medicinal purposes (including poison production).

The main crops grown in the upper Mai are potatoes and maize. Cattle are the most numerous stock animals; they are sometimes grazed within the forest, though it is more usual for fodder to be collected for them, especially as suitable grazing areas near the homesteads become less available. Buffalo are also kept.

The forest is also used for hunting, particularly Kalij Pheasants, which are usually shot at night by flashlight, using locally-made guns (totas). Pheasants fetch less than half the price of a large chicken. Other birds and mammals, such as partridge and small deer, and the occasional bear are also hunted. Jackals have been persecuted, largely because of their threat to chickens.

At Hanga Tham there is a tree nursery and some replanting has been carried out on degraded forest areas, especially on south-facing slopes of the Inga Khola valley. The most common species planted has been *Pinus roxburghii*, which is not native to the forest here, and has limited wildlife value. Trees have also been planted over areas dominated by the exotic annual ban mara or forest killer *Eupatorium adenophorum*. This highly invasive weed inhabits growth of other species and is prevalent along many tracks and grazed areas.

Between 19 March and 9 April 121 bird species were recorded in the upper Mai valley. Of these there were 28 species for which Nepal may hold internationally significant breeding populations and four for which Nepal may be especially important. Eleven species were recorded which are apparently dependent on forest with dense understorey in the breeding season. Five species were recorded which are rare in Nepal: Short-billed Minivet *Pericrocotus brevirostris*, Long-billed Thrush, Ferruginous Flycatcher *Muscicapa ferruginea*, Little Pied Flycatcher *Ficedula westermanni*, and Black-throated Parrotbill *Paradoxornis nipalensis*. One species, Scaly Laughingthrush *Garrulax subunicolor* is vulnerable in Nepal, and three, Grey-cheeked Warbler *Seicercus poliogenys*, Rufous-throated Wren-Babbler *Spelaeornis caudatus*, Rufous-backed Sibia *Heterophasia annectans*, are endangered in Nepal. The Rufous-backed Sibia, additionally, does not occur in any protected or proposed protected areas and is therefore especially at risk in the country.

Threats

The forests of the upper Mai valley are threatened primarily by wood collection for use within the panchayat for fuel and construction, forest clearance for agriculture and grazing and the clearance of understorey, especially as fodder for livestock. Some forest animals are also threatened by hunting, particularly larger mammals and pheasants.

The grazing pressure around settlements such as Jolbari at 3050 m, Jamuna and Hanga Tham, is heavy, and prevents forest regeneration. It also encourages growth of the exotic weed *Eupatorium adenophorum* which also prohibits forest regeneration.

Erosion may become a serious problem in some areas if forest clearance continues. Some roads and agricultural areas have already experienced erosion on the hillsides.

Hans Pokhari Danda

The village of Hans Pokhari is situated on the road between Ilam (north) and Dhulabari (south). It is (or was) also the headquarters of the Ilam - Dhulabari road-building operation. Around the village and on either side of the road is a relict of natural broadleaved forest of great diversity. The dominant tree species are *Eugenia tetragona* and *Ostodes paniculata* to the north and *Castanopsis tribuloides* to the south, both in pure patches or mixed with *Schima wallichii, Rhododendron arboreum* and others. The hills and valleys within the forest are all quite different from each other, reflected by the number and types of birds.

Between 7 and 11 April, 81 bird species were seen at Hans Pokhari Danda, including 11 for which Nepal may hold internationally significant breeding populations. Three: Long-tailed Broadbill *Psarisomus dalhousiae*, Silver-eared Mesia *Leiothrix argentauris* and White-naped Yuhina, are endangered; two: White-throated Bulbul *Alophoixus flaveolus* and Scaly Laughingthrush, are vulnerable; and three: Short-billed Minivet, Ferruginous Flycatcher and Little Pied Flycatcher, are rare in Nepal. Eleven species were recorded which are apparently dependent on dense forest with thick understorey in the breeding season, and two: Hill Prinia and White-naped Yuhina, do not occur in any protected or proposed protected areas in Nepal.

Threats

The local panchayat has had a policy of protecting the forest, although there is evidence of tree-felling, especially close to the Ilam-Dhulabari road which bisects the forest. This road was being upgraded and surfaced in 1989, due for completion in 1990. Many trees along the length of the road were being felled, thus segregating the forest, especially for birds of thick undergrowth which would probably not contemplate crossing this alien environment. Additionally, the presence of a good road in the region will put extreme pressure on existing forest, as the wood and other products will become accessible to many more people, including those from other areas who may have little regard for local panchayat rules.

The Tamur valley

There are a number of forest patches in this valley, most extensively round Khamlalung. As in other areas, most forest is restricted to the higher ridges. There are disturbed but relatively intact patches close to some of the hill villages, notably Sankranti, Basantpur, and Choti Bazaar (Map 1). Additionally the villagers of Sankranti (at about 2000 m) we spoke to seemed very interested in the bird life of the forest and could readily identify several birds in discussion.

All forests were grazed to varying degrees and used for timber, fodder and other uses, but there was no commercial exploitation apparent. The forests around Khamlalung were particularly impressive, offering fine panoramic views of hills, forest and mountains.

During seven days spent in the Tamur valley 92 bird species were recorded including 24 for which Nepal may hold internationally significant breeding populations (including two for which Nepal may be especially important) and eight species which are apparently dependent on dense forest with thick understorey for breeding. Two species, Yellow-rumped Honeyguide *Indicator xanthonotus* and Short-billed Minivet, are rare, and one species, Large Niltava *Niltava grandis* is vulnerable in Nepal.

Threats

The forests of the Tamur valley were under similar threats to those of the upper Mai valley. Essentially there is still a good selection of forests, especially on the higher ridges, which are only being used and degraded by locals.

DISCUSSION AND RECOMMENDATIONS

Kosi Tappu

The recommendations arising from this report can only really be taken into consideration with the assumption that areas surveyed are not or will not be inundated in the near future. As there is a genuine risk of this, it may be necessary to translocate wildlife (eg francolins) to 'safe' areas within the reserve. However, the following points should be considered:-

1. Further (regular) studies at Kosi Tappu Wildlife Reserve and Kosi Barrage to monitor the Swamp Francolin population and look for Bengal Florican and locate areas of suitable habitat for both species, e.g. the western embankment?
2. More extensive surveys within the riverine forest and island grasslands.
3. Careful management of annual grass cutting.
4. Management (thinning or removal) of *Casuarina* bushes and any other potentially invasive plants.
5. Possible extension of the grassland along the eastern embankment to increase the area of habitat suitable to Swamp Francolin.

The eastern embankment was (and hopefully still will be) an ideal place to study Swamp Francolin, as the birds may be viewed from elevated bunds which offer excellent viewing. The island should be surveyed extensively, especially for suitable florican habitat.

Most of the survey and management could be carried out with little extra resources by Nepalis either employed directly by the Department of National Parks and Wildlife Conservation or a voluntary body such as the King Mahendra Trust for Nature Conservation or the World Pheasant Association.

Lower Mai Valley

Both types of forest in this area are found nowhere else in Nepal. As one principle aim of the Department of National Parks is to protect examples of all different ecotypes, the tropical forests south of Ilam should be receiving some form of protection. A structured management policy should be adopted, incorporating reserved areas and limited use areas. No part of the forest should be subject to complete deforestation as is happening at present. Before any more steps may be taken, further, more detailed survey work would be needed, preferably by a Nepali team, which could determine exactly what was happening in the area and the needs of the local population. From this project the following points have been highlighted:-

a. Establishment of one or more reserved areas.
b. Establishment of buffer zones around these areas for limited use.
c. Termination of timber export from the region.
d. Adoption of an alternative fuel by Soktim Tea Estate for the tea-drying process (perhaps electricity from Ilam)
f. Reafforestation of degraded and eroded areas with native species.
g. Prohibition of the burning of high forest or its understorey.
h. Introduction of tree-planting schemes and agroforestry throughout the panchayats to relieve pressure on existing forest.

Upper Mai Valley

The forests around Hanga Tham still represent a relatively intact example of mixed broadleaved forest, and were found to be especially rich in bird life. There is much forest use, but little attempt at reafforestation, except some planting of species alien to this forest type which support a small number of bird species.

Most forest exploitation is for local use, the most effective form of forest protection would be the gradual provision of alternative fuel and fodder sources. Villagers from Hanga Tham now have to travel quite high into the forest to reach sizeable patches of bamboo and other understorey plants. It would benefit both forest wildlife and villagers if the forest could be improved by the regeneration of understorey and the replanting of native tree seedlings. An agroforestry system could be incorporated into this forest improvement. A replanting scheme is already underway, but the emphasis of the small tree nursery could switch to native species. It would also be necessary to control grazing within the forest.

It may actually be advantageous to establish some form of forest reserve with a small policing force to ensure that further areas were not seriously degraded.

The forests above Hanga Tham are already visited by more adventurous ornithologists, and the whole Mai valley is a very attractive trekking area. There is actually high potential for limited tourism in the upper Mai, which has already brought significant benefits to some of the villagers of Hanga Tham and Jamuna. The ridge along the border with India is already a popular trekking route, offering spectacular vistas of Kanchenjunga and other Himalayan mountains. So far, almost all visitors approach from the Indian side, where there are maps of suitable trekking routes. Forest depletion would undoubtedly reduce the potential economic benefits to the region, which are already increasing.

Mai Valley

The forests of the Mai valley, both upper and lower, are all part of the Mai valley watershed and should be viewed holistically as important attributes to this region of Nepal, both for their conservation value and their usage by local people. The region would be well-suited to a programme of sustainable development and protection by its designation as a Conservation Area, along similar lines to the Annapurna region. The implementation of such a project would require both funding and careful planning, but forest protection must be given priority as further degradation and/or destruction would undermine the long-term objectives and benefits of a Conservation Area. This report is not the place to put forward a detailed project proposal, but it is important to reiterate that this region does contain some of the most threatened forest types and associated fauna, particularly birds, in Nepal. Nepal's tourist industry is growing and it is likely that more and more people will visit this area for trekking and birdwatching.

Hans Pokhari Danda

The distinctive characteristics of the forest and the variety and number of flora and fauna within it, particularly birds, coupled with its recent accessibility make this an ideal site for

conservation education and recreation. There is also a small Hindu shrine on one of the forested ridge tops, which is regularly visited by locals. Since the panchayat already has an existing policy of forest protection, it would seem likely that it would be keen to continue with this protection, and perhaps welcome educational and recreational initiatives, especially if they brought extra income to the area. At the same time it would have to commit itself to giving the forest as full protection as possible.

If the area were set aside as a National Park there might be conflicts between park authorities and locals. After all, the local panchayat has managed to protect this island of forest whilst neighbouring forests have all but disappeared. However, traditional forest-use control systems are already practised in other protected areas of Nepal, especially in the Himalayas e.g. in Sagamartha N.P. where 'shing-i nawas' or protectors of the forest have been empowered to allocate wood to families in the park). Although a reserve or park at Hans Pokhari Danda would be very different, there is no reason why similar methods of forest protection could not be effectively employed.

A tree nursery is already present near Hans Pokhari, where seedlings are grown for local reafforestation schemes on nearby eroded hillsides. Most species planted though are exotic, including varieties of pine and eucalyptus. It would be beneficial to forest regeneration if native species were replanted, especially in bare patches within and around the forest. *Castanopsis tribuloides* for instance is a highly valued tree for fuel, nuts and leaves for fodder.

The emergence of the road must put a much greater pressure on this forest in the 1990s, and the panchayat will need all the support it can get if it is to continue to preserve its distinctive and valuable forest.

The Tamur Valley

The remaining forests in the Tamur valley are not under as much immediate pressure as those of the Mai valley, although they are all utilised to varying degrees. The most extensive forest areas are on the ridges around Khamlalung. This is a lightly populated area and most locals depend on the forests for their livelihood, particularly for grazing and provision of fodder. The whole valley would suit a general community development and conservation programme, with Khamlalung as the core conservation area. This could be executed in conjunction with the Mai valley, especially as this whole area is likely to be the recipient of a rural development programme. This would also be valuable for those forests close to the valley's settlements, such as Basantpur, where there is a real danger of over-exploitation of these limited resources.

REFERENCES

Ali, S., Ripley, S.D. and Dick, J.H. (1983) *A pictorial guide to the birds of the Indian Subcontinent.* Bombay Natural History Society, New Delhi.

Dinerstein, E. and Mehta, J.N. (1989) The Clouded Leopard in Nepal. *Oryx* 23(4):199-207.

Dobremez, J.F. an Shakya, P.R. (1977) *Carte ecologique du Nepal, Biratanagar - Kanchenjunga 1/250,000, et Documents No.7.* Editions du Centre National de la Recherche Scientifique, Paris.

Fleming, R.L. Sr., Fleming, R.L. Jr. and Bangdel, L.S. (1984) *Birds of Nepal.* Nature Himalayas, Kathmandu.

Halliday, J.B. and McKnight, G. (1990) *Investigation of the status and conservation of forest birds in the Mai and Tamur valleys in eastern Nepal.* Unpublished report.

Inskipp, C. and Inskipp, T. (1985) *A guide to the birds of Nepal.* Croom Helm, London.

Inskipp, C. (1988) *A birdwatcher's guide to Nepal.* Birdwatcher's Guides, Prion Ltd, Sandy.

Inskipp, C. (1989) *Nepal's forest birds: their status and conservation.* ICBP Monograph 4. ICBP, Cambridge.

IUCN Conservation Monitoring Centre (1990) *IUCN Red List of Threatened Animals.* IUCN, Cambridge.

Lall, K. (1985) *Nepalese book of proverbs.* Dr Shashi M. Shrestha, Kathmandu.

Land Resources Mapping Project (1986) *Land utilisation mapping.* Kenting Earth Sciences Ltd., Kathmandu.

MacKinnon, J., MacKinnon, K., Child, G. and Thorsell, J. (1986) *Managing protected areas in the tropics.* IUCN/UNEP, Gland.

Majupuria, T.C. and Joshi, D.P. (1988) *Religious and useful plants of Nepal and India.* M. Gupta, Lashkar.

Prater, S.H. (1980) *The book of Indian animals.* Bombay Natural History Society, Bombay.

Shrestha, T.K. (1981) *Wildlife of Nepal.* Tribhuvan University Press, Kathmandu.

Sibley, C.G. and Monroe, B.L. (1990) *Distribution and taxonomy of birds of the world.*

Stewart, M. (1987) *A guide to the mapping of forest and land use types in the Koshi Hills, Eastern Nepal.* Land Resource Development Centre, Surrey.

Storrs, A. and Storrs, J. (1984) *Discovering trees in Nepal and the Himalayas.* Sahayogi Press, Kathmandu.

Valli, E. and Summers, D. (1988) Honey hunters of Nepal. *National Geographic* 174(5):660-671.

APPENDIX

Checklist of birds

Sequence and nomenclature follows Sibley and Monroe (1990)

	Kosi Tappu	Upper Mai	Lower Mai	Hanga Tham	Tamur Valley
GALLIFORMES					
Phasianidae					
Francolinus francolinus Black Francolin	★		★		
Francolinus gularis Swamp Francolin	★				
Arborophila torqueola Hill Partridge					★
Gallus gallus Red Junglefowl	★		★		
Lophura leucomelanos Kalij Pheasant		★			★
Pavo cristatus Indian Peafowl			★		
ANSERIFORMES					
Anser indicus Bar-headed Goose	★				
Tadorna ferruginea Ruddy Shelduck	★				
Anas crecca Common Teal	★				
Anas acuta Northern Pintail	★				
Netta rufina Red-crested Pochard	[★]				
Aythya ferina Common Pochard	★				
PICIFORMES					
Indicatoridae					
Indicator xanthonotus Yellow-rumped Honeyguide					★
Picidae					
Jynx torquilla Eurasian Wryneck	★				★
Dendrocopos canicapillus Grey-capped Woodpecker			★	★	
Dendrocopos macei Fulvous-breasted Woodpecker				★	
Dendrocopos cathpharius Crimson-breasted Woodpecker		★			
Dendrocopos darjellensis Darjeeling Woodpecker		★			★
Picus flavinucha Greater Yellownape			★		
Picus canus Grey-faced Woodpecker			★		
Dinopium shorii Himalayan Flameback			★		

	Kosi Tappu	Upper Mai	Lower Mai	Hanga Tham	Tamur Valley
Dinopium benghalense Black-rumped Flameback	★				
Chrysocolaptes lucidus Greater Flameback			★		
Megalaimidae					
Megalaima virens Great Barbet		★		★	★
Megalaima lineata Lineated Barbet			★		
Megalaima asiatica Blue-throated Barbet			★		★
BUCEROTIFORMES					
Bucerotidae					
Buceros bicornis Great Hornbill			★		
UPUPIFORMES					
Upupidae					
Upupa epops Eurasian Hoopoe	★		★		
CORACIIFORMES					
Coraciidae					
Coracias benghalensis Indian Roller			★		
Dacelonidae					
Pelargopsis capensis Stork-billed Kingfisher	★				
Halcyon smyrnensis White-throated Kingfisher	★	★	★		★
Cerylidae					
Ceryle rudis Pied Kingfisher	★				
Meropidae					
Merops orientalis Little Green Bee-eater	★				
Merops leschenaulti Chestnut-headed Bee-eater			★		
CUCULIFORMES					
Cuculidae					
Cuculus sparverioides Large Hawk-Cuckoo		★		★	★
Cuculus varius Common Hawk-Cuckoo	★				★
Cuculus micropterus Indian Cuckoo					★
Cuculus canorus Common Cuckoo	★	★		★	★
Cuculus saturatus Oriental Cuckoo					★
Phaenicophaeus tristis Green-billed Malkoha			★		
Centropodidae					
Centropus sinensis Greater Coucal	★				

	Kosi Tappu	Upper Mai	Lower Mai	Hanga Tham	Tamur Valley
Centropus bengalensis Lesser Coucal	★				
PSITTACIFORMES					
Psittacidae					
Psittacula krameri Rose-ringed Parakeet	★		★		
Psittacula himalayana Slaty-headed Parakeet					★
Psittacula alexandri Red-breasted Parakeet			★		
APODIFORMES					
Apodidae					
Tachymarptis melba Alpine Swift					★
Apus pacificus Fork-tailed Swift		★			★
Apus nipalensis House Swift	★				
Hemiprocnidae					
Hemiprocne coronata Crested Treeswift			★		
STRIGIFORMES					
Strigidae					
Ketupa zeylonensis Brown Fish-Owl	★				
Glaucidium cuculoides Asian Barred Owlet		★		★	
Glaucidium radiatum Jungle Owlet			★		
Athene brama Spotted Owlet	★				
Caprimulgidae					
Caprimulgus indicus Grey Nightjar		★			
Caprimulgus macrurus Large-tailed Nightjar			★		
COLUMBIFORMES					
Columbidae					
Columba hodgsonii Speckled Wood-Pigeon					★
Columba pulchricollis Ashy Wood-Pigeon					★
Streptopelia orientalis Oriental Turtle-Dove		★		★	★
Streptopelia chinensis Spotted Dove	★		★		★
Streptopelia tranquebarica Red Collared-Dove	★				
Streptopelia decaocto Eurasian Collared-Dove	★		★		
Treron bicincta Orange-breasted Green-Pigeon	★				

	Kosi Tappu	Upper Mai	Lower Mai	Hanga Tham	Tamur Valley
Treron sphenura Wedge-tailed Green-Pigeon					★
GRUIFORMES					
Rallidae					
Amaurornis phoenicurus White-breasted Waterhen	★				
Porzana fusca Ruddy-breasted Crake	★				
Porphyrio porphyrio Purple Swamphen	★				
Fulica atra Common Coot	★				
CICONIIFORMES					
Scolopacidae					
Gallinago stenura Pintail Snipe	★				
Numenius arquata Eurasian Curlew	★				
Tringa stagnatilis Marsh Sandpiper	[★]				
Tringa nebularia Common Greenshank	★				
Tringa ochropus Green Sandpiper	★				
Tringa hypoleucos Common Sandpiper	★				★
Jacanidae					
Metopidius indicus Bronze-winged Jacana	★				
Burhinidae					
Burhinus oedicnemus Eurasian Thick-knee	★				
Burhinus recurvirostris Great Thick-knee	★				
Charadriidae					
Charadrius dubius Little Ringed Plover	★				
Vanellus duvaucelii River Lapwing	★		★		
Vanellus indicus Red-wattled Lapwing	★				
Glareolidae					
Glareola lactea Small Pratincole	★				
Laridae					
Larus ichthyaetus Great Black-headed Gull	★				
Larus brunnicephalus Brown-headed Gull	★				
Larus ridibundus Common Black-headed Gull	★				
Sterna acuticauda Black-bellied Tern	★				

	Kosi Tappu	Upper Mai	Lower Mai	Hanga Tham	Tamur Valley
Chlidonias hybridus Whiskered Tern	★				
Accipitridae					
Pandion haliaetus Osprey	★				
Elanus caeruleus Black-winged Kite	★				
Milvus migrans Black Kite	★	★			
Haliaeetus leucoryphus Pallas's Sea-Eagle	★				
Gyps bengalensis White-rumped Vulture	★				★
Gyps himalayensis Himalayan Griffon		★			
Gyps fulvus Eurasian Griffon	★				★
Aegypius monachus Cinereous Vulture	★				
Spilornis cheela Crested Serpent Eagle		★	★	★	
Circus aeruginosus Western Marsh Harrier	★				
Circus cyaneus Northern Harrier	★				
Circus macrourus Pallid Harrier	★				
Circus melanoleucos Pied Harrier	★				
Circus pygargus Montagu's Harrier	★				
Accipiter trivirgatus Crested Goshawk			★		★
Accipiter badius Shikra	★				
Accipiter nisus Eurasian Sparrowhawk		★			
Butastur teesa White-eyed Buzzard	★				
Buteo buteo Common Buzzard		★		★	
Ictinaetus malayensis Black Eagle				★	
Aquila vindhiana Eurasian Tawny-Eagle	★				
Aquila nipalensis Steppe Eagle				★	
Aquila heliaca Imperial Eagle	★				
Hieraaetus fasciatus Bonelli's Eagle		★			
Spizaetus nipalensis Mountain Hawk-Eagle		★		★	

	Kosi Tappu	Upper Mai	Lower Mai	Hanga Tham	Tamur Valley
Falconidae					
Microhierax caerulescens Collared Falconet			★		
Falco tinnunculus Common Kestrel	★	★	★	★	★
Podicipedidae					
Tachybaptus ruficollis Little Grebe	★				
Anhingidae					
Anhinga melanogaster Oriental Darter	★				
Phalacrocoracidae					
Phalacrocorax niger Little Cormorant	★				
Phalacrocorax carbo Great Cormorant	★				
Ardeidae					
Egretta garzetta Little Egret	★				
Ardea cinerea Grey Heron	★				
Ardea purpurea Purple Heron	★				
Casmerodius albus Great Egret	★				
Mesophoyx intermedia Intermediate Egret	★				
Bubulcus ibis Cattle Egret	★		★		
Ardeola grayii Indian Pond-Heron	★				
Nycticorax nycticorax Black-crowned Night-Heron	★				
Ixobrychus cinnamomeus Cinnamon Bittern	★				
Threskiornithidae					
Threskiornis melanocephalus Black-headed Ibis	★				
Pseudibis papillosa Red-naped Ibis	★				
Platalea leucorodia Eurasian Spoonbill	★				
Pelecanidae					
Pelecanus philippensis Spot-billed Pelican	★				
Ciconiidae					
Anastomus oscitans Asian Openbill	★				
Ciconia nigra Black Stork					★
Ciconia episcopus Woolly-necked Stork	★				★

	Kosi Tappu	Upper Mai	Lower Mai	Hanga Tham	Tamur Valley
Ephippiorhynchus asiaticus Black-necked Stork	★				
Leptoptilos javanicus Lesser Adjutant	★		★		
Leptoptilos dubius Greater Adjutant	★				
PASSERIFORMES					
Eurylaimidae					
Psarisomus dalhousiae Long-tailed Broadbill				★	
Eopsaltriidae					
Culicicapa ceylonensis Grey-headed Canary-Flycatcher		★		★	★
Irenidae					
Chloropsis aurifrons Golden-fronted Leafbird			★		
Laniidae					
Lanius cristatus Brown Shrike	★				
Lanius vittatus Bay-backed Shrike	★				
Lanius schach Long-tailed Shrike	★	★	★		★
Lanius tephronotus Grey-backed Shrike			★	★	
Corvidae					
Garrulus glandarius Eurasian Jay					★
Urocissa flavirostris Gold-billed Magpie		★			
Urocissa erythrorhyncha Red-billed Magpie		★			★
Cissa chinensis Green Magpie		★			
Dendrocitta vagabunda Rufous Treepie	★		★		
Dendrocitta formosae Grey Treepie		★		★	★
Nucifraga caryocatactes Spotted Nutcracker					★
Corvus splendens House Crow	★	★			
Corvus macrorhynchos Large-billed Crow	★	★	★	★	
Artamus fuscus Ashy Wood-swallow	★		★		
Oriolus oriolus Eurasian Golden-Oriole	★				
Oriolus xanthornus Black-hooded Oriole	★		★		
Oriolus traillii Maroon Oriole				★	
Coracina macei Large Cuckoo-shrike		★	★		

	Kosi Tappu	Upper Mai	Lower Mai	Hanga Tham	Tamur Valley
Coracina melaschistos Black-winged Cuckoo-shrike		★		★	
Pericrocotus ethologus Long-tailed Minivet		★		★	
Pericrocotus brevirostris Short-billed Minivet		★	★	★	★
Pericrocotus flammeus Scarlet Minivet			★		
Hemipus picatus Bar-winged Flycatcher-shrike			★		
Rhipidura hypoxantha Yellow-bellied Fantail		★	★		★
Rhipidura albicollis White-throated Fantail	★	★		★	★
Dicrurus macrocercus Black Drongo	★	★		★	★
Dicrurus leucophaeus Ashy Drongo		★		★	★
Dicrurus caerulescens White-bellied Drongo	★		★		
Dicrurus aeneus Bronzed Drongo		★	★	★	
Dicrurus remifer Lesser Racket-tailed Drongo			★		
Dicrurus hottentottus Hair-crested Drongo		★	★	★	
Dicrurus paradiseus Greater Racket-tailed Drongo			★		
Hypothymis azurea Black-naped Monarch			★		
Aegithina tiphia Common Iora			★		
Tephrodornis gularis Large Woodshrike			★		
Muscicapidae					
Monticola cinclorhynchus Blue-capped Rock-Thrush				★	★
Monticola rufiventris Chestnut-bellied Rock-Thrush		★			★
Myiophonus caeruleus Blue Whistling-Thrush		★	★		
Zoothera dauma Scaly Thrush				★	
Zoothera monticola Long-billed Thrush		★			
Turdus albocinctus White-collared Blackbird		★			★
Turdus boulboul Grey-winged Blackbird		★	★	★	★
Turdus ruficollis Dark-throated Thrush		★			
Muscicapa sibirica Dark-sided Flycatcher				★	

	Kosi Tappu	Upper Mai	Lower Mai	Hanga Tham	Tamur Valley
Muscicapa ferruginea Ferruginous Flycatcher		★		★	
Ficedula strophiata Rufous-gorgeted Flycatcher		★		★	
Ficedula parva Red-breasted Flycatcher	★		★		
Ficedula hyperythra Snowy-browed Flycatcher			★		★
Ficedula westermanni Little Pied Flycatcher		★		★	
Ficedula superciliaris Ultramarine Flycatcher		★			
Eumyias thalassina Verditer Flycatcher		★	★	★	★
Niltava grandis Large Niltava					★
Niltava macgrigoriae Small Niltava		★		★	
Niltava sundara Rufous-bellied Niltava			★		★
Cyornis poliogenys Pale-chinned Blue-Flycatcher			★		
Cyornis rubeculoides Blue-throated Flycatcher			★	★	
Luscinia calliope Siberian Rubythroat	★				
Luscinia svecica Bluethroat	★				
Tarsiger cyanurus Orange-flanked Bush-Robin		★			★
Tarsiger chrysaeus Golden Bush-Robin		★			
Tarsiger hyperythrus Rufous-breasted Bush-Robin		★			
Copsychus saularis Oriental Magpie-Robin	★	★	★		
Copsychus malabaricus White-rumped Shama			★		
Phoenicurus ochruros Black Redstart	★			★	
Phoenicurus schisticeps White-throated Redstart					★
Phoenicurus frontalis Blue-fronted Redstart		★		★	★
Rhyacornis fuliginosus Plumbeous Water-Redstart		★		★	
Enicurus scouleri Little Forktail		★			
Enicurus immaculatus Black-backed Forktail			★		★
Enicurus maculatus Spotted Forktail		★			
Saxicola maura Siberian Stonechat	★	★			★

	Kosi Tappu	Upper Mai	Lower Mai	Hanga Tham	Tamur Valley
Saxicola caprata Pied Bushchat	★				
Saxicola ferrea Grey Bushchat		★		★	★
Sturnidae					
Saroglossa spiloptera Spot-winged Starling			★		
Sturnus malabaricus Chestnut-tailed Starling	★				
Sturnus pagodarum Brahminy Starling	★				
Sturnus contra Asian Pied Starling	★				
Acridotheres tristis Common Myna	★	★	★		★
Acridotheres fuscus Jungle Myna	★		★		
Sittidae					
Sitta castanea Chestnut-bellied Nuthatch		★	★		
Sitta himalayensis White-tailed Nuthatch		★		★	★
Sitta frontalis Velvet-fronted Nuthatch			★		
Certhiidae					
Certhia familiaris Eurasian Tree-creeper		★			
Certhia nipalensis Rusty-flanked Tree-creeper		★			
Certhia discolor Brown-throated Tree-creeper					★
Troglodytes troglodytes Winter Wren		★			
Paridae					
Parus major Great Tit			★		★
Parus monticolus Green-backed Tit		★		★	★
Parus xanthogenys Black-lored Tit					★
Sylviparus modestus Yellow-browed Tit		★			★
Aegithalidae					
Aegithalos concinnus Black-throated Tit		★		★	★
Aegithalos iouschistos Black-browed Tit		★			
Hirundinidae					
Riparia paludicola Plain Martin	★				
Hirundo rupestris Eurasian Crag-Martin		★			
Hirundo rustica Barn Swallow	★	★	★	★	

	Kosi Tappu	Upper Mai	Lower Mai	Hanga Tham	Tamur Valley
Hirundo daurica Red-rumped Swallow	★			★	
Delichon nipalensis Nepal House-Martin		★			
Pycnonotidae					
Pycnonotus melanicterus Black-crested Bulbul			★		
Pycnonotus jocosus Red-whiskered Bulbul	★		★		
Pycnonotus leucogenys Himalayan Bulbul			★	★	★
Pycnonotus cafer Red-vented Bulbul	★				★
Alophoixus flaveolus White-throated Bulbul				★	
Hemixos flavala Ashy Bulbul		★			
Hypsipetes mcclellandii Mountain Bulbul				★	
Hypsipetes leucocephalus Black Bulbul		★		★	★
Cisticolidae					
Prinia atrogularis Hill Prinia				★	
Prinia flaviventris Yellow-bellied Prinia	★				
Zosteropidae					
Zosterops palpebrosus Oriental White-eye	★	★	★	★	★
Sylviidae					
Tesia castaneocoronata Chestnut-headed Tesia		★		★	★
Cettia fortipes Brownish-flanked Bush-Warbler		★			
Acrocephalus dumetorum Blyth's Reed-Warbler	★				
Phylloscopus fuscatus Dusky Warbler				★	
Phylloscopus affinis Tickell's Leaf-Warbler	★			★	
Phylloscopus pulcher Buff-barred Warbler		★			
Phylloscopus maculipennis Ashy-throated Warbler		★		★	★
Phylloscopus proregulus Lemon-rumped Warbler		★	★		★
Phylloscopus inornatus Inornate Warbler	★		★	★	★
Phylloscopus trochiloides Greenish Warbler				★	★
Phylloscopus reguloides Blyth's Leaf-Warbler		★		★	★
Seicercus burkii Golden-spectacled Warbler		★	★	★	★

	Kosi Tappu	Upper Mai	Lower Mai	Hanga Tham	Tamur Valley
Seicercus xanthoschistus Grey-hooded Warbler		★	★	★	★
Seicercus poliogenys Grey-cheeked Warbler		★			
Seicercus castaniceps Chestnut-crowned Warbler		★	★	★	★
Abroscopus superciliaris Yellow-bellied Warbler		★			
Megalurus palustris Striated Grassbird	★				
Garrulax albogularis White-throated Laughingthrush		★			★
Garrulax leucolophus White-crested Laughingthrush		★		★	
Garrulax pectoralis Greater Necklaced Laughingthrush			★		
Garrulax striatus Striated Laughingthrush		★			
Garrulax lineatus Streaked Laughingthrush		★			
Garrulax subunicolor Scaly Laughingthrush		★		★	
Garrulax affinis Black-faced Laughingthrush		★			
Garrulax erythrocephalus Chestnut-crowned Laughingthrush		★		★	
Pomatorhinus erythrogenys Rusty-cheeked Scimitar-Babbler				★	
Pomatorhinus ruficollis Streak-breasted Scimitar-Babbler		★			
Spelaeornis caudatus Rufous-throated Wren-Babbler		★			
Stachyris ruficeps Rufous-capped Babbler		★			★
Macronous gularis Striped Tit-Babbler			★		
Turdoides earlei Striated Babbler	★				
Turdoides striatus Jungle Babbler	★				
Leiothrix argentauris Silver-eared Mesia				★	
Leiothrix lutea Red-billed Leiothrix				★	
Pteruthius flaviscapis White-browed Shrike-Babbler				★	
Pteruthius melanotis Black-eared Shrike-Babbler		★			★
Actinodura nipalensis Hoary-throated Barwing					★
Minla cyanouroptera Blue-winged Minla				★	★
Minla strigula Chestnut-tailed Minla		★		★	★

	Kosi Tappu	Upper Mai	Lower Mai	Hanga Tham	Tamur Valley
Minla ignotincta Red-tailed Minla		★		★	★
Alcippe castaneceps Rufous-winged Fulvetta		★		★	★
Alcippe vinipectus White-browed Fulvetta		★			
Alcippe nipalensis Nepal Fulvetta				★	
Heterophasia annectans Rufous-backed Sibia		★			
Heterophasia capistrata Rufous Sibia		★		★	★
Yuhina bakeri White-naped Yuhina				★	
Yuhina flavicollis Whiskered Yuhina		★		★	★
Yuhina gularis Stripe-throated Yuhina		★			★
Yuhina occipitalis Rufous-vented Yuhina		★			★
Paradoxornis nipalensis Black-throated Parrotbill		★			
Sylvia curruca Lesser Whitethroat		★			
Sylvia hortensis Orphean Warbler	★				
Alaudidae					
Mirafra assamica Rufous-winged Lark	★				
Eremopterix grisea Ashy-crowned Sparrow-Lark	★				
Alauda gulgula Oriental Skylark	★				
Nectariniidae					
Dicaeum ignipectus Fire-breasted Flowerpecker			★	★	★
Nectarinia asiatica Purple Sunbird	★				
Aethopyga gouldiae Mrs Gould's Sunbird		★			
Aethopyga nipalensis Green-tailed Sunbird		★			★
Aethopyga saturata Black-throated Sunbird				★	
Aethopyga siparaja Crimson Sunbird		★	★		
Aethopyga ignicauda Fire-tailed Sunbird		★			
Arachnothera magna Streaked Spiderhunter			★	★	
Passeridae					
Passer domesticus House Sparrow	★		★		

	Kosi Tappu	Upper Mai	Lower Mai	Hanga Tham	Tamur Valley
Passer montanus Eurasian Tree Sparrow	★	★	★		
Motacilla alba White Wagtail	★		★		
Motacilla maderaspatensis White-browed Wagtail	★				
Motacilla citreola Yellow-hooded Wagtail	★				
Motacilla flava Yellow Wagtail	★				
Motacilla cinerea Grey Wagtail		★	★		
Anthus rufulus Paddyfield Pipit	★				
Anthus trivialis Tree Pipit				★	
Anthus hodgsoni Olive-backed Pipit		★			
Prunella strophiata Rufous-breasted Accentor		★			
Prunella immaculata Maroon-backed Accentor		★			
Amandava amandava Red Avadavat	★				
Fringillidae					
Leucosticte nemoricola Plain Mountain-Finch		★			
Pyrrhula erythrocephala Red-headed Bullfinch					★
Mycerobas carnipes White-winged Grosbeak		★			
Melophus lathami Crested Bunting					★
Emberiza pusilla Little Bunting		★		★	★
Emberiza aureola Yellow-breasted Bunting	★				