

Status Distribution and Conservation of Grey-crowned Prinia Royal Chitwan National Park, Central Region, Nepal



Dhirendra Kumar Pradhan
Nepal, 2005



WCS

Wildlife Conservation Society



The Rufford 
Small Grants for
Nature Conservation
www.rufford.org/rsg

EXECUTIVE SUMMARY

Grey -crowned prinia *Prinia cinereocapilla* is a globally threatened small grassland nesting bird. It is qualified as vulnerable by Birdlife International. This species is endemic to Indian Sub-continent. In Nepal this species is confined in few protected areas. RCNP, Nepal is probably the largest strong hold of Grey -crowned prinia in the world.

The study entitled “Status Distribution and Conservation of Grey -crowned prinia” was carried out in RCNP in May 2005 and August 2005 to find out its status, distribution and habitat threats.

Potential habitats were identified and open width line transects were laid to estimate the crude density of this species as described by Bibby *et al* 1992/1998 and Rodgers 1991. GIS soft wares were used to show the distribution of this species within RCNP.

The density of the Grey -crowned prinia for the surveyed areas was found to be ranges from 8.3 to 9.3 per sq.km. The largest numbers of Grey -crowned prinia were observed in Sunachuri and Kachauni. Grey -crowned prinia was seen in association with Grey –breasted Prinia *Prinia hodgsoni*, Yellow eyed babbler *Chrysomma sinense*, White tailed stonechat *Saxicola leucura*, and Chestnut capped babbler *Timalia pileata*. Grey -crowned prinia and Pale footed Bush warbler *cectia pallidepes* were highly correlated with *Themeda arundinacea* grassland extended in moist *Shorea robusta* forest with scattered clumps of *Apluda mutica*, *Narenga porphyrocoma* and *Imperata cylindrical*. The sightings of Grey -crowned prinia was high in forest edges created naturally or artificially in course of habitat management and trails formed by human movement inside the park.

In the key habitats livestock grazing, collection of forest products and burning were major threats to this species. These all activities are prohibited in PAs by National Park and Wildlife Conservation Act 1973, Nepal.

Educating the people especially residing in the periphery of RCNP is the most important method for implementing conservation measures of this species. Villagers should be encouraged to practice agro forestry in their farmland. It could be a possible measure to avoid grazing pressure and fuel wood collection inside the park. Furthermore, while managing the habitats of big mammals small creatures should be given equal importance

Acknowledgement

I am greatly indebted to Dr. Peter Clyne, Asian Programme Director, Wildlife Conservation Society and Dr. Hem Sagar Baral, Bird Conservation Nepal for their constant encouragement, support and timely feed back. Likewise I am grateful to Josh Cole, Small Grant Manager, The Rufford Mourice Laing Foundation for kind co operation and support from the initiation of this project. I am very much thankful to Wildlife Conservation Society, The Rufford Maurice Laing Foundation for providing financial support and Royal Chitwan National Park for issuing permit to conduct this research study. I am indebted to Shiv Raj Bhatt, Chief Warden, RCNP, Bed Kumar Khadaka and Bishnu Thapaliya, Ranger, RCNP for kind suggestion and providing warm hospitality while in RCNP. I am grateful Mr. Shushil Khadka, for his invaluable support and preparing GIS maps included in this report.

The survey would not have been successful without indefatigable hardship of young energetic field guide Mr. Raju Tamang and field assistant Mr. Nirajan Rawat who had assisted me throughout the field trip and contributed greatly in every achievement of the survey, for this they deserve my sincere gratitude. Mr. Parmod Yadav and Mr. Madhav Khadaka, Rangers, RCNP deserve special thanks for their cooperation in the field and for the commendable logistic support. Thanks are due to all the staff of WCS, BCN, RMLF, RCNP and IoF for providing necessary literatures and documents. My Cordial thanks go to Mr. Raj Kumar Koirala, IoF, Pokhara, Mr. Suresh Shrestha, PhD scholar, Michigan State University and Dr. Andrew F. Egan, Professor, Laval University, Quebec, Canada for their continuous encouragement and support from the initiation of this study.

At last but not the least I have no words to express my feelings towards contribution made by Sunita Ulak, IoF, Pokhara and all my family members for their loving support.

ACRONYM

| | |
|-------|--|
| BCN | Bird Conservation Nepal |
| BI | Birdlife International |
| BZ | Buffer Zone |
| BZCF | Buffer Zone Community Forest |
| CJL | Chitwan Jungle Lodge |
| D | Density |
| DFO | District Forest Office |
| DNPWC | Department of National Park and Wild Conservation |
| GCP | Grey -crowned prinia |
| GIS | Geographic Information System |
| GPS | Geographical Positioning System |
| HMGN | His Majesty's Government, Nepal |
| IoF | Institute of Forestry |
| IUCN | International Union for the Conservation of Nature |
| KMTNC | King Mahendra Trust for Nature Conservation |
| | Nature and Natural Resources (The World |
| NGO | Non Governmental Organization |
| NPWCA | National Park and Wildlife Conservation Act |
| PCP | Participatory Conservation Programme |
| RCNP | Royal Chitwan National Park |
| RMLF | The Rufford Mourice Laing Foundation |
| TAL | Terai Arc Landscape |
| VDC | Village Development Committee |
| WCS | Wildlife Conservation Society |
| WWF | World Wide Fund |

INDEX

Executive Summary..... 0

Acknowledgement 2

Acronym..... 3

Index 4

UNIT ONE 6

INTRODUCTION..... 6

UNIT TWO 8

DISTRIBUTION OF GREY –CROWNED PRINIA 8

 2.1 GREY -CROWNED PRINIA IN THE WORLD 8

 2.2 GREY -CROWNED PRINIA IN NEPAL 8

UNIT THREE 9

RATIONAL AND OBJECTIVES OF THE STUDY 9

 3.1 RATIONAL..... 9

 3.2 OBJECTIVES 10

UNIT FOUR..... 11

STUDY AREA AND METHODOLOGY 11

 4.1 STUDY AREA, INDIGENOUS PEOPLE AND BIODIVERSITY 11

 4.2 FLORA AND FAUNA OF RCNP 12

 4.3 CLIMATE, HYDROLOGY, LAND SYSTEM AND LAND USE CHANGES 13

 4.3.1 Climate..... 13

 4.3.3 Land System 14

 4.3.4 Landuse and Land use Changes..... 14

 4.4 METHODOLOGY 15

 4.4.2 Bird Identification..... 16

 4.4.3 Transect Survey 17

 4.4.4 Habitat Preferences and Disturbances 17

 4.4.5 Distribution of Grey -crowned prinia 18

UNIT FIVE 19

RESULTS AND DISCUSSIONS 19

 5.1 STATUS AND DENSITY 19

 5.2 HABITAT PREFERENCES..... 20

 5.3 DISTRIBUTION OF GREY -CROWNED PRINIA 21

 5.4 HABITAT THREATS 24

 5.6 LOCAL PEOPLE INVOLVEMENT AND EDUCATIONAL ACCOMPLISHMENT 26

UNIT SIX 27

CONCLUSIONS AND RECOMMENDATION 27

 6.1 CONCLUSIONS 27

 6.2 RECOMMENDATION AND PRACTICAL IMPLICATION28

REFERENCES 30

ANNEXES..... 32

Annex-1: Itinerary of The Research Survey Team..... 32

Annex: 2 Geo Information of Transects..... 33

Annex: 3 Birds Sighting Points 34

Annex: 4 Other Important GPS Locations 35

Annex: 5 Checklist of Birds of Royal Chitwan National Park..... 35

Unit One

INTRODUCTION

Grey -crowned prinia *Prinia cinereocapilla* was first described to science from a specimen in Hodgson's later collection by F. Moore (Horsfield and Moore 1854).

It belongs to the order Passeriforms and family Cisticolidae. Nine types of Prinia have been recorded in Nepal (Grimmet, Inskipp and Inskipp, 1998). Grey -crowned prinia is a small bird characterized by bright fulvous above with ashy head distinctly different from fulvous back. It has buff eyebrow and black eye line. It occurs in small flocks (Fleming and Fleming 1984). Its diet includes insects and probably nectar (Ali and Ripley 1968, 1998). Fleming *et al.* (1984) describe this species as fairly common at forest edges of open, sunny forest glades. Inskipp and Inskipp (1991) mention bushes in forest clearings and secondary growth. Grimmett *et al.* (1998) describe the habitat as grassland in forest clearings and forest edges and secondary growth.

Grey -crowned prinia is globally threatened grassland bird with a very restricted world range and is inferred to be rapidly declining, as a result of destruction and conversion of grasslands throughout its range. It therefore qualifies as Vulnerable (Ali and Ripley 1987, Birdlife International 2000, IUCN 2003). It is endemic to the Indian Sub-continent and found only in the Himalayan foothills of Nepal, Bhutan and India (Grimmett *et al.* 1998, Birdlife International 2001), where its population is restricted to few protected areas.

Grey-crowned prinia frequents quite dense forest and secondary growth, particularly around forest clearings and edges from the fringe of the plains up to 1,350 m (Ali and Ripley 1968, 1998, Fleming and Fleming 1976, Inskipp and Inskipp 1991). It also occurs in shrubby grasslands, especially those close to *Shorea robusta* forest. Its main habitat is forest edges and grasslands. Its world population is estimated to be less than 10,000.

Grey- crowned prinia is a small grassland nesting bird due to its small body size and drab coloured plumage it is likely that both the government and established larger conservation organizations neglect the welfare of such creature. One of the prerequisites of the management of a wildlife species is to establish the database of the species including the status and distribution.

The establishment of protected areas like RCNP has provided protection to the Grey -crowned prinia population, due to lack of adequate information about the status and distribution; it is very difficult to say any thing strongly about their long run survival. Against this backdrop, the study aims to generate some data, especially about the status and distribution. The finding of the study is expected to help for designing a viable population for the conservation of this vulnerable species.

Unit Two

Distribution of Grey –crowned Prinia

2.1 Grey -crowned prinia in the world

This species is recorded in India, Nepal and Bhutan and no record of its sighting is available from rest of the world. In India it is reported from foothills of northern parts, from Uttar Pradesh to northern west Bengal and Assam (Grimmet et al 1998). The population status data is not available but is inferred to be declining as a result of habitat loss throughout its Indian range. In Bhutan there is apparently an early breeding record (Baker 1932–1935). This species is scarce with only three records of small numbers of birds. (Inskipp and Inskipp *in litt.* 1999). Its estimated population is less than 10,000 and habitat range is 33,000 Km²

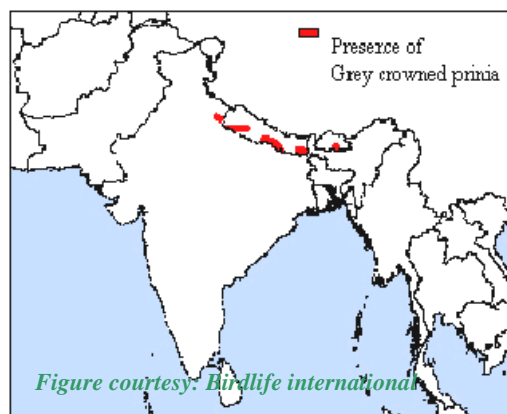


Figure 1 Distribution of Grey -crowned prinia in Indian sub continental

2.2 Grey -crowned prinia in Nepal

Grey -crowned prinia is a near endemic grassland bird of Indian Sub-continent (Ali and Ripley 1986). In 1947 it was common in the central Doon area. This species is fairly common at Royal Chitwan National Park and uncommon elsewhere in the country. In literatures Grey -crowned prinia is distributed from Kanchnpur district in the west of Nepal to the Ilam district in the east of the country. The species presence information is available from Biala Doti district (Rand and Fleming 1957), Royal Bardia National Park (Cox 1985, Lama 1991) Trishuli (del-Nevo and Ewins 1981), Royal Chitwan National Park (Gurung 1983) and its buffer zone area (Kovacs *in litt.* 1998), Hetauda (Biswas 1960m –1963), Parsa wildlife Reserve (Baral 1997), Ilam district (Robson 1979), Koshi

tappu Wildlife Reserve (Inskipp 1989) and hills in eastern Nepal (Gregory – Smith and Batson 1976). Chitwan valley is the largest strong hold of Grey -crowned prinia in the world.

Unit Three

RATIONAL AND OBJECTIVES OF THE STUDY

3.1 Rational

The avifauna of Nepal is exceptionally diverse; about 863 bird species have been recorded (BCN, 2005). Nepal's species richness is partly attributed to the wide range of altitude, climate and vegetation in the country. Nepal represent Palaearctic and Indomalayan bio-geographical region and major floristic province of Asia, encompassing a unique and rich diversity of life, although comprising of only 0.1% of the global land area, Nepal possesses a disproportionately large diversity of flora and fauna at genetic, species and ecosystem level (HMGN/MFSC 2002)

The tall grassland of lowland Nepal are the extremely rich in bird species compared to grassland elsewhere in the world (Tucker 1991) in the same time terai (lowland) regions of Nepal and India have undergone massive ecological disturbance over the last century and the loss and degradation of natural and semi-natural terai grasslands and forest is the key threat to Grey -crowned prinia (Baral in litt. 1998, Peet *et al.* 1999a). This species is perhaps especially vulnerable to grassland degradation, it does not colonise grassland regrowth until well developed (Baral 2000a). In Nepal *Shorea robusta* forests and associated shrub land in the terai and Himalayan foothills have been cleared for timber, agriculture, settlement and have been degraded by the collection of fuel wood and fodder for domestic livestock (N. B. Peet *in litt.* 2001).

While most mammals that inhabit lowland grasslands are well studied (Laurie 1979, Sunquist 1981, Mishra 1982, Dhungel and O'Gara 1985), little is known about the grassland avifauna in the lowland of Nepal. The grassland avifauna is best known by number of species that are considered globally threatened (Collar *et al.* 1994) and threatened in Asia (Birdlife International *in prep.*). There is an urgent need for a greater understanding of its status distribution and ecology especially within Nepal where important population of Grey-crowned prinia are found from Shuklaphanta (Kanchanpur) in the west to Jhapa and Ilam districts in the east (Inskipp and Inskipp 1991).

The tall grasslands of Nepal once were extensive but due to excessive exploitation by local people for their daily use grasslands now are confined to protected areas. Subtropical riverine grasslands in Nepal and north India are habitats of international importance for bio diversity conservation (Peet

1997). They support many animal taxa of which birds constitute a significant part. Many bird species that occur in these grasslands are globally threatened and little known (Collar *et al* 1994, Collar 1996 cited in Baral 2001).

The population of many threatened grassland birds in lowland Nepal form significant proportion of global population. The population of Grey -crowned prinia of the RCNP is of global significance. Therefore, Nepal has an international obligation for conservation of this species and its habitat. It is very necessary to reveal the population status and habitat relation to recommend management prescription for better management of the Grey -crowned prinia so that concerned species may survive and reproduce within their natural ranges. It is one of the twenty-nine globally threatened lowland grassland birds as identified by Birdlife International.

Furthermore, National Park and Wildlife Conservation act 1973 Appendices has not listed this species in any threat category though its population is very low and declining. This type of study will provide necessary baseline information to the Department of National Park and Wildlife Conservation (DNPWC) regarding listing of this species in local threat category and implement subsequent conservation measures.

3.2 Objectives

The main objective of the study was to contribute for the conservation of Grey –crowned prinia.

The specific objectives were:

1. To identify the crude population status and distribution of Grey-crowned prinia.
2. To assess the abundance of Grey -crowned prinia in the proposed site.
3. To assess the habitat disturbances.
4. To outline current threats to Grey –crowned prinia.

Unit Four

STUDY AREA AND METHODOLOGY

4.1 Study area, Indigenous People and Biodiversity

Chitwan valley in the central terai of Nepal spans east west 100 km and about 40 km at its widest (Gurung 1980). Before 1950s it was an almost forested and inhabited by indigenous people like *Tharu*, *Darai* and *Bote*. These indigenous people were subsistence farmers and gathered forest products, wild animals and fished in lake and rivers. After malaria eradicated in the 1950s people from the hills came in large numbers, clearing most of the forested lands of the Chitwan for settlement and farming; keeping this in view Royal Chitwan National Park (RCNP) was established in 1973 covering an area of 932 sq. km. It spans across portions of four administrative districts namely, Chitwan, Nawalparasi, Parsa and Makwanpur. The name of the park is derived from the name of the district, as a major portion of the park i.e. about 74.04 percent lies in Chitwan district.

The people of thirty-six VDCs living in the periphery of the RCNP represent a wide range of cultures. There is diverse range in ethnic composition the true indigenous groups i.e. *Tharu*, *Bote* and *Derai* have become minority in their own land. They form only 32 percent of the total population compared with 42 percent Hindus and 26 percent other ethnic groups most of who migrated to the valley over last few decades (Sharma 1991).

RCNP (hereafter Chitwan, 27°15'-27°35'N/83°45'-84°58'E) is an inner doon valley between the Siwalik hills in the south and the Mahabharat hills to the north, ranging in altitude from 150m to 815 m (IUCN 1993). It borders with Parsa Wildlife Reserve to the east, and Valmiki Nagar and Udaipir Sanctuaries across the Nepal-India border to the south. Similarly, Sohagbarwa Sanctuary lies close to the park to the southeast. This contiguous group of protected areas is perhaps one of the largest areas in the world set aside for conservation to represent pristine type of ecosystem. RCNP is popularly known as the birds' paradise and it is the country's first national park and is included in the World heritage site of UNESCO in 1979. It bears exemplary biodiversity value in the world. The biological richness of the park is outstanding with 8 ecosystem types that include 7 forest types, 6 grassland types, 5 wetlands and 3 major river system habitats.

4.2 Flora and fauna of RCNP

Vegetation of RCNP can be classified into three main types. Sal *Shorea robusta* forest occupies the seventy percent of the park. Sal comes in pure stand or in association with other trees such as *Terminalia alata*, *Adina cordifolia*, *Terminalia belerica*, *Terminalia chebula*, *Holrrhena antidysenterica*, *schleichera trijuga* etc. in the higher elevation carry an interesting mixture of *shorea robusta* and *Pinus roxburghii*. Many shrubs, creeper ferns, grasses grow among and under the Sal forest. The riverine forest (*Acacia catechu* – *Dalbergia sissoo* forest) covers seven percent and is found in recently formed alluvial banks, ox bow lakes and on large gravel island such as those of Bandarjhola and Majurlika in the Narayani river.

Grassland occurs in alluvial flood plains cover twenty percent of the park area support luxuriant growth of grasses interspersed with patches of riverine forest important grass species include Elephant grass which reaches about twenty feet, *Imperata cylindrica*, *Saccharum*, *pharamites*, *arundo*, *Themeda*, *Narenga* etc.

RCNP harbours an exceptionally diverse wildlife population. The grassland and riverine forest support higher ungulates biomass density than Sal forest (Tamang 1982). The extensive riverine forest and flood plains along three major rivers of the park, Narayani, Rapti and Reu, form excellent habitats for ungulates and their predators. The one horned Asian rhinoceros (*Rhinoceros unicornis*) is the spectacular pre-historic animal of the park. Its population was rising despite occasional incidents of poaching. The 2000 count showed 544 but due to security situations and merging of the Royal Nepalese Army (RNA) post. The recent 2005 count showed only 372 individuals inside the park and buffer zone. Other species of ungulate include Sambar (*Cervous unicolor*), Chittal (*Axis axis*), Hog deer (*Axis porcinus*), Barking deer (*Muntiacus muntijack*), and wild boar (*Sus scrofa*). In addition, there is a transient population of wild elephant (*Elehus maximus*), which visit the park from east time to time. RCNP is also home for more than 570 species of flora, 56 species of mammal of which 17 species are carnivores, more than 500 species of birds, 47 species of reptiles, 9 species of amphibians, 126 species of fish and 150 species of butterflies. (Shrestha, RCNP twenty years of conservation). RCNP has high number of mammalian and bird species. The high diversity of birds is attributed to the diverse habitats, which consist of forest, grasslands, and wetlands. Several oxbow lakes formed due to changes in the river course, support a good density of water birds and provide habitat for Marsh mugger (*Crocodylus palustris*). The density of wild ungulates in the park was

estimated to be about 18,590-kg/sq. km in 1974, which is comparable to the African savanna (Seidensticken 1976). Its large mammals and birds are well studied; as a result extensive information is available. However, studies on small birds are hardly done so, information is lacking. RCNP is one of the major home and destination for world-endangered birds. There are mainly three types of birds found in the park. First one is the resident bird, which stay whole year and also breed in the park. The second one is the winter visitor that stays only for the winter season and return back immediately after the end of winter season. Some of them are breeding birds in the park and rest are visitors or transit visitors. The third types of bird are the summer visitors. Grey -crowned prinia falls under the first category and fairly good sighting bird in the specified locations of RCNP.

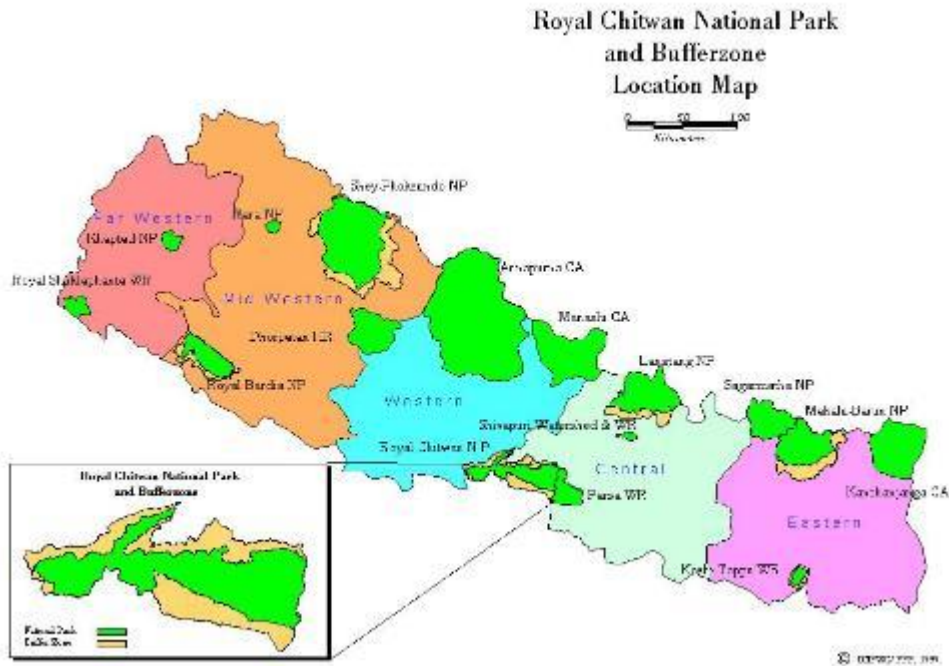


Figure 2 Location of RCNP, the Study Area

4.3 Climate, hydrology, land System and Land use changes

4.3.1 Climate

Chitwan valley has tropical monsoon climate with relatively high humidity. The cool winter season occurs from October to February. Springs start from March and are immediately followed by summer that ends in June. The summer days are hot with average daily maximum temperature of about

30°C. The minimum average daily temperature is about 16° C. The monsoon begins from late June and continues until September. The mean annual rainfall ranges from 2000 mm to 2100 mm. More than eighty percent of the total rainfall occurs within four month from June to September.

4.3.2 Hydrology

The national park has two Siwalik hill ranges, namely Churia and Someshwor. The Siwalik rises from 150 m east to over 800 m. The flood plains are rich alluvial. About eighty five to ninety percent of the total area of national park falls within the Rapti watershed. The major tributary of Rapti is the Reu river. Average maximum discharge of Rapti watershed near the outlet of national park is about 200 to 400 cum/sec. and minimum discharge is about 1.2 cum/sec.

4.3.3 Land System of Chitwan valley

Terrace and Valley: The north- west part of the valley consists of terraces near the foot of the Siwalik. They are dissected by a parallel series of broad, north-south valleys. The streams valleys have one to three terrace levels. Slope gradient ranges from two to five percent. The soils are deep reddish sand loams and silt loams. The vegetation is a sub tropical forest with dominated by *Shorea robusta*. The valleys are mostly cultivated. The higher terraces are not cultivated due to lack of water and are grazed. In places trampling have eliminated ground vegetation stream bank cutting is prevalent.

Central valley: This land type occupies bulk of the valley. It is an out wash plain with several levels. The slope is one to five percent. The materials are deposits from Siwaliks and Middle mountains. The soils are deep, silt loams and sandy loams. Gravels are present in scattered low ridges.

Flood plains: This includes low lands of Rapti and Narayani rivers. Its southern edge is the base of the Siwalik hills along Indian border. The area consists of flood plains and base of Siwaliks. The soils are deep, loamy and fine sands. The forest cover includes *Salmalia* sps. *Mallotus* sps., *Acacia catechu*, *Ziziphus* sps. Encroachment is high on this type of land type. Most of the area of the park belongs to this land type.

4.3.4 Land use and Land use changes

There is no cultivation inside the national park. Recently Padampur, an enclave inside the park has been relocated outside the park. The area is now reclaiming as grassland and serves as good habitat for edge species. The buffer zone, which occupies an area of 750 sq. km, is dominated by cultivation. In the buffer zone about 741 ha of forest land and 1,402 ha of grazing land were converted to

agriculture land between 1978- 92. About 268 ha of forest have been converted to grazing land in the buffer zone

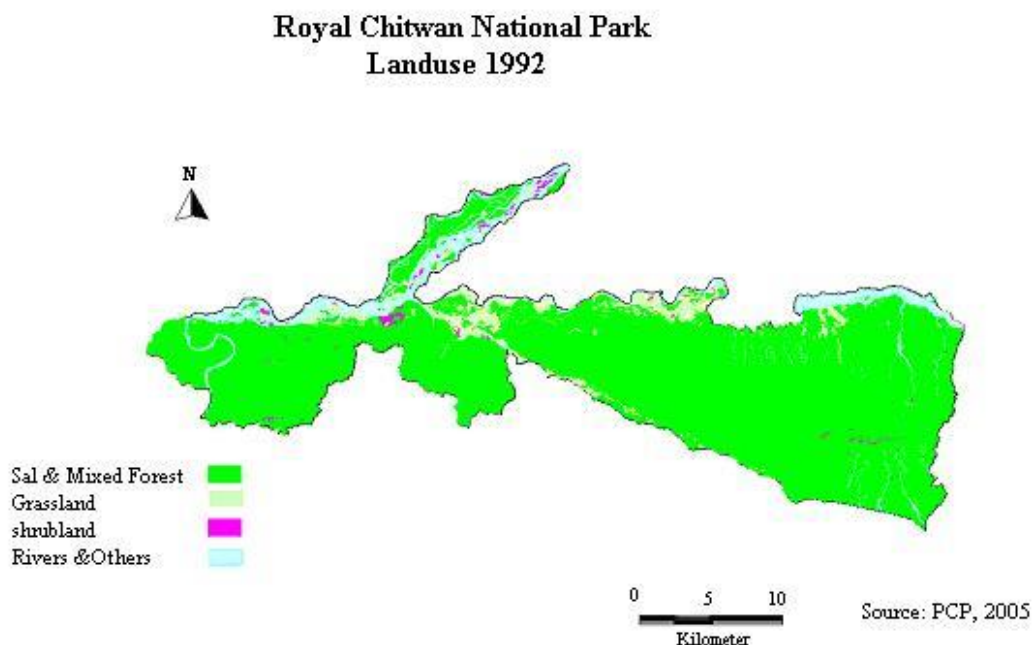


Figure 3 Landuse of Royal Chitwan National Park

4.4 Methodology

The objective of the work was to collect the bird data and environmental data from the selected transects. Open width line transects was adopted as the main technique for surveying this bird species. It is because fixed width transects are inefficient for cryptic species like Grey –crowned prinia, as sightings will have to be rejected outside the fixed distance and density may be biased. All the observations were recorded, and the frequency of distance at which individual/group of birds seen was used to estimate an optimum strip width (Rodgers 1991). Several factors restricted the selection of transects such as dangers from large mammals such as tiger, wild elephant, rhino, sloth bear. To avoid potential risk and to maximize the visibility existing dirt foot /dirt trails were followed.

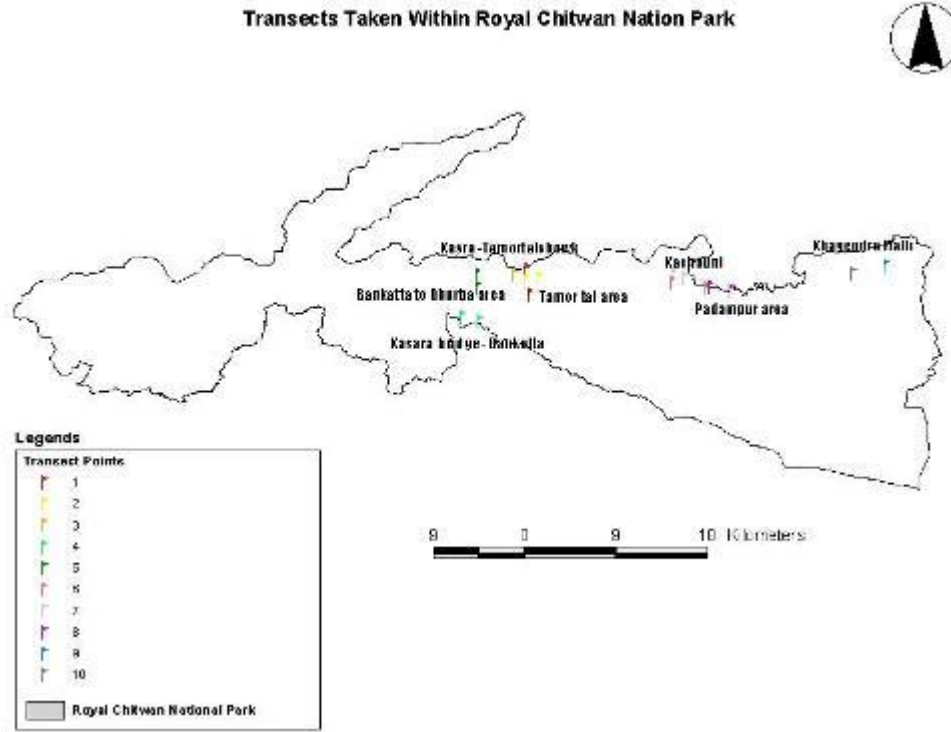


Figure 4 Location of Transects

4.4.1 Reconnaissance survey

A preliminary reconnaissance survey was conducted to determine the potential habitat. This was done by discussing with park authority (wardens, rangers and game scouts), local natural guides and expert from BCN. On the basis of literature review and close consultation with the field birders it was known that this species is closely associated with *Themeda* grassland and *shorea robusta* forest, so by using participatory tools the potential areas (mixtures of *Themeda* grass and *Shorea robusta* forests) were identified on the base map of RCNP and these areas were thoroughly visited on bicycle. The areas chosen for laying the transects were Kasra (the park HQ area), Lami tal, Tiger Tops areas, Old Padampur, Kachaouni, Khagendra Malli, Sunachuri, Amrite, Dhurba, Dumaria, Sukhibar, Bhimle, Bankatta and Sauraha areas.

4.4.2 Bird Identification

Grassland birds are difficult to identify and it need considerable time and effort to recognize the targeted bird species. It is because of elusive nature and similarity to each other. (Fleming *et al*, 1984, Inskipp and Inskipp, 1991, quoted in Baral, 2001). park Ranger, Mr. Bed Kumar Khadaka and local field guide Mr Raju Tamang helped me to get acquainted with the targeted species. WCS also provided tape recording of Grey -crowned prinia that helped me significantly to

recognize the bird species. Bird species were confirmed with guidance from book entitled “Birds of Nepal” by Grimmet, Inskipp and Inskipp, 2000.

4.4.3 Transect survey

The basic information about the line transect was obtained from Bibby *et al* 1992/1998. Actual fieldworks were conducted twice in May 2005 and August 2005. Variable distance line transect were randomly laid in the potential habitat as explored from reconnaissance survey. At every 100 m distance environmental data were recorded. The point where the birds observed the following details: habitat features, Geo information and estimated distance to the right or left of transect between bird and the observer was recorded in data sheet as shown in the annex. Efforts were made to give an accurate distance between the observer and the bird. To maximize the level of precision interval estimation of distance were made. The length of transects were up to 10 km. The variation in the length of transects were mainly due to habitat structure and inaccessible due to dense grass cover or presence of dangerous mammals. Bird surveys were not done in rainy, stormy and strongly windy days to avoid biases due to the change in intensities of bird activities. Most of transects were visited on foot or bicycle. In potential dangerous areas where big mammals were likely to encounter elephants were used such as in Chitwan Jungle lodge (Khagenda Malli sector). Though using domesticated elephant is safest way to work in the grassland, but hiring an elephant is unaffordable for studies doing on limited budget.

Density was simply calculated by using the formulae $D = \{n / (L \times r \times 2)\}$.

Where:

D = density per sq. km

L = total length of transects

n = no of birds

r = single mean angular sight distance

And numeric figure 2 is for each side of the transect (Rodgers, 1991)

4.4.4 Habitat preferences and disturbances

The locations where Grey -crowned prinia were observed a rectangular plot of 25 sq. m. where laid out and all vegetations including trees, shrubs and grasses were recorded. Their height, estimated cover percentage and phenophase were recorded.

The habitat disturbances to the concerned species were recorded by direct field observation and recording various ecological attributes related to population and habitat. It includes grassland fire,

cattle grazing and other human influences like thatch grass collection (*Khar khadai*), logging activities.

4.4.5 Distribution of Grey -crowned prinia

The location of transects and the points where birds sighted were recorded in GPS. This geo information was feed in GIS software to prepare the distributional map/ spot mapping of the species within RCNP.

Unit Five

Results and Discussions

5.1 Status and density

Transect survey was conducted as main methodology to estimate the status and density of this cryptic species. Estimation of density for the entire RCNP is rather difficult task. So the local and expert's knowledge is also used to select the site for estimating density of this species. According to the field birders and bird experts the potential habitat of the Grey -crowned prinia were Kasara, Bhimle, Tamor tal, Dhurba, Tigertops, Souraha, Sukhibar, Gaida camp, Sunachuri, Khagendra Malli and Bankatta areas. Other areas selected such as in the foothills of Churia, Jaimangala, Khorla muhan where Grey -crowned prinia were not observed were not selected for laying transects.

The density of the Grey -crowned prinia for the surveyed areas is found to be ranges from 8.3 to 9.3 per sq.km. The largest numbers of Grey -crowned prinia were observed in Sunachuri and Kachauni area in number of four. Grey -crowned prinia is seen in association with Grey – breasted prinia *Prinia hodgsoni*, Yellow eyed babbler *Chrysomma sinense*, White tailed stonechat *Saxicola leucura*, and Chestnut capped babbler *Timalia pileata*. Though Grey -crowned prinia can be seen all year round but its sightings are high in August and September. These bird species are found to be active in sunny days after mild shower of rain. It is because Grey -crowned prinia is an insectivorous and it came out to feed the insects that came out. Grey -crowned prinia is perching bird, in field it were seen that these birds were so quickly perched from one place to another that if you blink the eyes you will no see the birds then. Its flying height is estimated as about 10 meter. In the first survey which was conducted in June the Grey -crowned prinia were mostly recorded in single and in the second survey this species where recorded in groups of two or three. On this basis it can be possibly said that the nesting time of the Grey -crowned prinia is June and July. This is because in the same transect birds were recorded in the group of two or three in the subsequent visit made in the fall of August. The sexual differences were not made due to little distinguish between male and female of the Grey -crowned prinia.

5.2 Habitat preferences

Very few bird species showed a strong preference for certain vegetation or grassland type such bird species are specialist and others, which do not show such strong preference over certain grass species or vegetation and occupy a wide range of grass types and habitat structures are generalist. Grey -crowned prinia, a grassland bird is strongly associated with *Themeda arundinacea* grass species. *Themeda* grassland assemblages are found in the well-developed soil and close to Sal forest. *Themeda* grassland is also characterized by the presence of some woody species components.

This type of type of grassland, which is dominant grassland type in Chitwan, is not found in open areas far from forest edges (Peet *et al* 1999 cited in Baral 2001).

Environmental data showed that Grey – crowned prinia and Pale footed Bush warbler *ceitia pallidepes* are highly correlated *Themeda arundinacea* grassland extended



Habitat of Grey-crowned prinia

in moist *Shorea robusta* forest with scattered clumps of *Apluda mutica*, *Narenga porphyrocoma*, *Imperata cylindrical* and other secondary vegetations comprises of Kyamuna *Eugeniaoporculata*, Mainkanda, Simal, *Bombax ceiba*, and Sindure *Malotus philipinensis*. More than 70% of the birds have been sighted in *Themeda* dominated habitat and rests were sighted in *Narenga porphyrocoma*, *Imperata cylindrical* and other grass species, with scattered clumps of *Themeda*.

Themeda Grassland

Themeda grasslands are grows at the edge of Sal forest or mixed forest. *Themeda arundinacea* bends downward horizontally to the ground with advancing age. *Themeda arundinacea*, *Apluda mutica* and *Saccharum spontaneum* are more predominant in the sites near forest edge habitat. *Themeda arundinacea* always occurred close to moist forest and is a good habitat of Grey -crowned prinia.

In the grazed areas Grey -crowned prinia were absent and in the moderately grazed areas with *Saccharum* grassland Plain prinia *Prinia inornate*, and Ashy prinia *P. sociatis* were noticed in

greater number than other species. Average height, estimated ground coverage percentage and relative frequency of the vegetations are tabulated as:

| Species | Av.height (Ft.) | Coverage (%) | Relative Frequency (%) |
|-------------------------------|-----------------|--------------|------------------------|
| <i>Shorea robusta</i> | 45 | 0.86 | 10 |
| <i>Themeda arundinacea</i> | 5.5 | 43.22 | 55.3 |
| <i>Apluda mutica</i> | 4.5 | 15.32 | 20.5 |
| <i>Narenga porphyrocoma</i> | 4.5 | 20.33 | 23.6 |
| <i>Imperata cylindrica</i> | 2.6 | 15.36 | 15.2 |
| <i>Bombax ceiba</i> | 20 | 0.50 | 5.3 |
| <i>Mallotus philipinensis</i> | 10.3 | 10.63 | 8.16 |
| Mainkanda | 9.6 | 0.37 | 4.23 |
| Tatri | 15.6 | 2.36 | 6.32 |

Table showed that Grey -crowned prinia mostly prefers mix grassland of *Themeda* species, *Narenga porphyrocoma*, *Apluda mutica*, and shorter species *Imperata cylindricalica* with scattered *Shorea robusta* forest, *Bombax ceiba*, Tatri and shrubby clumps of Mainklanda and *Mallotus philipinensis*. Grey -crowned prinia are not present in large open grassland where *Themeda* grassland appeared less frequent or absent. Grey -crowned prinia also prefers forest edges and intermediate grassland. Baral, 2001 also stated that bird diversity both specialist and generalist are high in forest edges than open grassland.

5.3 Distribution of Grey -crowned prinia

Grey -crowned prinia is a specialist bird. It is found to be distributed in the assemblage of *Shorea robusta* forest dominated by *Themeda arundinacea* grass species. Three Grey -crowned prinia were observed in Kasara, Tamor tal, perching on the bush of *Mallotus philipinensis* and *Themeda* grasses. It is the parks headquarter. The area is mainly dominated by Sal forest and *Themeda* grasses others associate species includes *Bombax ceiba*, *Trewia nudiflora*, *Terminalia species*, *Mallotus philipinensis* and grasses includes *S. spontaneum*, *S. bengalensis*, *Artemisa vulgaris*.

Three Grey -crowned prinia were observed in two subsequent visits in Dhurba area, this area bordered by Rapti River in the north. Major species found in this area are *Shorea robusta*, *Bombax ceiba*, *Terminalia species*, Tatari. Grasses comprises of *S. spontaneum*, *Imperata cylindrica*, *Themeda Species* and shrubs include *Mallotus philipinensis* and *Coolebrokia oppositifolia*

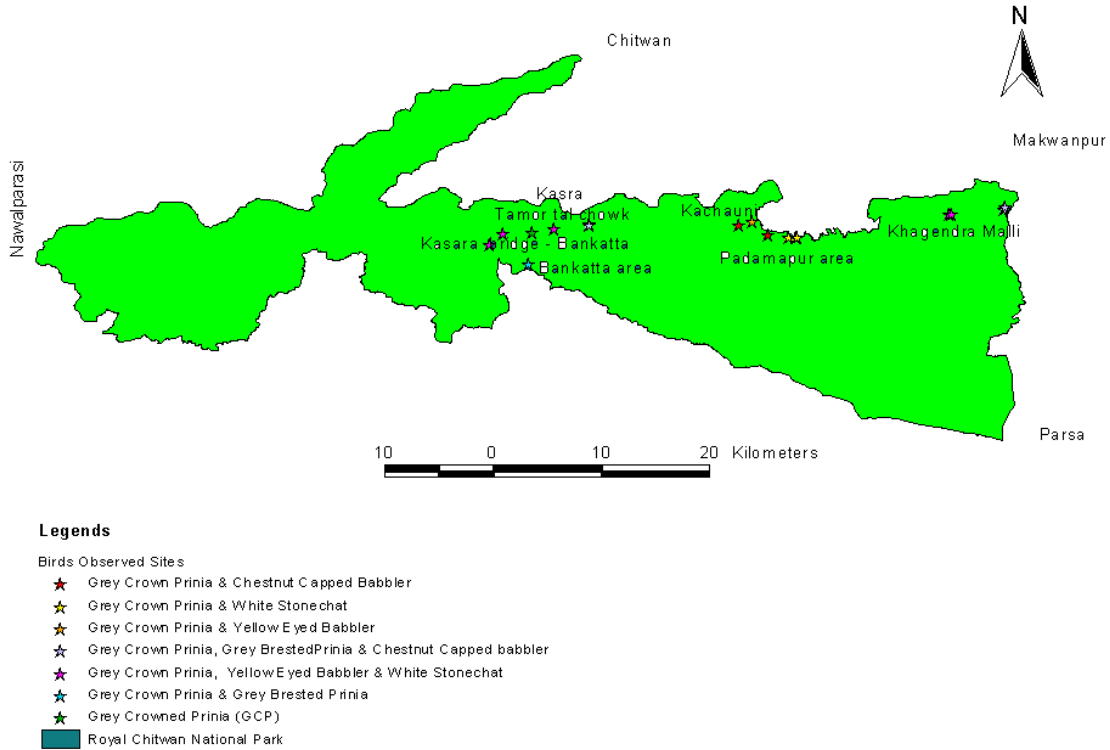
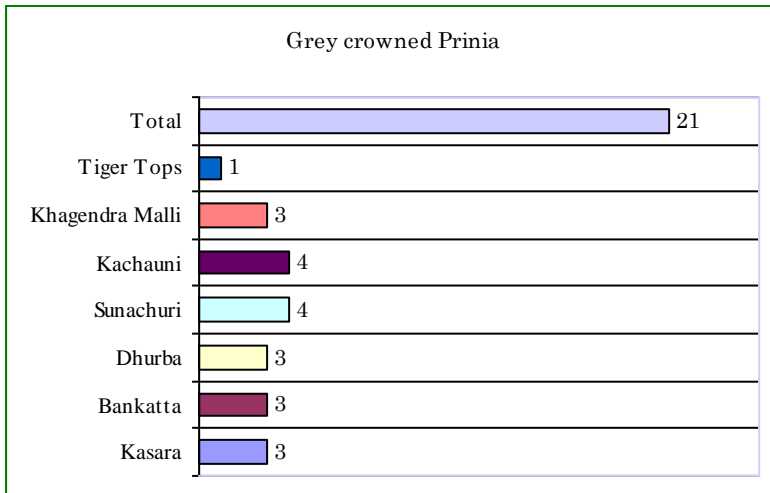


Figure 5 Distribution of Grey -crowned prinia in RCNP

Altogether five Grey -crowned prinia were recorded in Kachauni, Gaida tented camp and Tiger Tops. These areas are also good habitat of this species. The area composed of *Saccharum* species, *Typha elephantia* and *Themeda* species. Calls were recorded in the forest edges near old Padampur village area but could not be sighted. Padampur was the only village enclave inside the park and putting tremendous pressure to the park resources. To reduce this pressure His Majesty Government of Nepal has resettled this village outside the park. Now the abandoned cultivation land is developing as good grassland with scattered woody trees and shrubs. The forest adjacent to this abandoned land has admixture of Sal forest with few clumps of *Themeda* grasses, which is also a good habitat of Grey -crowned prinia. Terai Arc Landscapes (TAL), a consortium of

WWF, Nepal has constructed waterholes/ pools and the area is developing as a good habitat for many endangered species. Two globally threatened Lesser Adjutant *Leptoptilos javanicus* strokes were sighted in this area.

Four Grey -crowned prinia, on the clump of *Narenga porphyrocoma* and *Themeda* were observed in two subsequent visits in Sunachuri area. It is about four km from the Mahendra Highway and is bordered by Rapti River in the north. The forest is mainly dominated by *Shorea robusta* with



admixture of *Themeda* and *Narenga* grass species. Sunachuri area holds good population of Grey -crowned prinia. According to the naturalist of the Machan wildlife resort altogether thirty-two Grey -crowned prinia were observed in 1997(Checklist of Birds, 1997; Machan Wildlife Resort and Ram Hari Chaudhary

pers. comm.). Rapti river forms the boundary and many villagers used to graze cattle and collect forest products from this area. In the grazed areas Rufous winged Bush lark *Mirafra assamica* and in the short emergent grassland of *Saccharum*, Green Bee Eater *Merops orientalis*, Eurasian Collard Dove *Streptopelia decaocto* were noticed.

Bankatta lies in the south of the park and is bordered by Reu River. Three Grey -crowned prinia were observed in two subsequent visits. This area also suffers from excessive human inferences (cutting and burning).

Khagendra Malli, it is five km. inside the Bhandara bazaar. Three Grey -crowned prinia were observed in the grassland near the Chitwan Jungle Lodge (CJL). The most peculiar characteristics of the areas is the assemblage of big matured Sal forest and *Themeda arundinacea* grass species and other secondary species includes *Imperata cyllindrica*, *S. spontaneum* and *Narenga* species. This forest area is good habitat of sloth bear and movement route of wild elephant *Elephas maximus*. These animals are frequently encountered. The endangered Great hornbill *Buceros bicornis* were also observed in this area. Graph showed that Sunachuri and Kachauni area hold

the higher number of Grey - crowned Prinia followed by Kasara, Bankatta, Dhurba, Khagendra Malli and Tiger tops.

5.4 Habitat Threats

In Nepal, particularly in lowland there has been widespread habitat loss since the virtual eradication of malaria in 1950. The large population from mid hills migrated to lowland Nepal resulting in vast clearance of grassland and deforestation. There are no significant areas outside the protected areas capable to

support threatened birds and animals, as most are heavily grazed by domestic live stocks, exploitation for thatch grasses and overwhelming level of human disturbances (Peet 1997). It is likely that small and isolated population of Grey -crowned prinia, which were seen until late 80s might have been extirpated due to factors such as



Habitat destruction

inbreeding, disturbances and habitat deterioration. Therefore, it is likely that this species may have faced local extinction from several localities (Baral, 2002).

In the key sites as listed above livestock grazing, collection of fuel wood, grasses and other forest products, and burning are observed to be the key threats for this species. Though these all activities are prohibited by National Park and Wildlife Conservation Act 1973 and Regulation 1975. Cattle grazing were mainly seen at the boundary of park and in some areas like Sunachuri grazing impacts were seen more than five kilometers inside the park boundary. Grazing is mainly concentrated at *Saccharum spontaneum* and in Sunachuri, the prime habitat of the Grey -crowned prinia, grazing were also serious problem in *Themeda* grassland. More than 20 cattle were observed in Khagendra Malli and Sunachuri. Rapti and Reu river forms the northern and southern boundary of the park respectively and most grassland that grow at the riverside are *Saccharum* grassland and inside the matured Sal forest *Themeda* are dominant. Sharma *et al*, 1998 indicated that illegal grazing average 4.1 head per ha. and livestock biomass was found to be increasing by 2.36 % per annum in the park form adjoining villages. Grasslands of northern edge of the park are facing enormous pressure from cattle grazing and illegal collection of forest products especially *Asparagus racemes*, *Colocasia* species and other edible tubers for vegetables.

Collections of firewood and small logs are also serious problems especially at the park edges. Fodder, firewood, *Khar*, *Khadai* (it is the local name for canes used as building material for house) and timber are the major forest products extracted by local people from the park. Park authority opens the boundary for ten days for collection of grasses and reeds in every winter and this appears as festival for the local villagers especially for the indigenous groups, *Tharus*, *Bote*, *Derai*, *Majhi* and *Kumal* because tall grasses are almost absent outside the park. Grasses are very useful for the indigenous groups because grasses and reeds are useful material for construction of houses. *Tharus* traditionally do not use stones or bricks and use their homes are mainly made of wood, mud and *Khadai*. More than 60,000 people entered the park for collection of grasses in each season (Sharma *et al* 1997). Some of these people came from distance as far as 50 km for harvesting of grasses. They are not allowed to take other forest products except grasses and reeds but illegally take away small timbers and other forest products like *Asparagus*, and other edible tubers. These indigenous groups are traditionally engaged in and dependent in fishing. The park authority provided special fishing concession to *Bote* ethnic groups. This year park authority did not open the park boundary due to security reasons and conflicting situation of the country.

Fire has been the most debated topic in the management of grassland and its impacts to Grey -crowned prinia have not been fully understood (Inskipp and Inskipp, 1983). Grasslands are set to fire by grass cutters, elephant drivers and occasionally by reserve staff (to lessen the after effects). Existing dirt trails and streams act as control lines for fire.



Habitat destruction by fire.

Fire traces were noted in Kasara and Sauraha sector, set by elephant drivers. When grassland are set on fire the vegetations burnt are depend on the intensity of fire, type of grasses and the moisture condition of the area resulting in the development of mosaic of habitat. Patches of unburnt grasses offer refuge for grassland birds to escape the fire. The ecological role of such patches of grasses is important for the sustenance of grassland birds in spite of the heavy pressure of fire. Doves, Pigeon and White-throated kingfishers were frequently noted in the burnt areas. The occurrences of fire in the grassland have adverse effects on the breeding ecology of Grey –

crowned prinia because of its habit of making nest in the clumps *Themeda* grasses. This species does not colonize the burnt area until fully developed (Baral, 2002). The time taken for most grasses to regain their original height is longer in cut areas than in burnt ones. Cutting, burning and cattle grazing directly affect the grass height and which ultimately affects the bird population. Grey -crowned prinia and many other prinia species live in tall *Themeda* grasses. Their body structure is adapted to live in tall grassland and is specialized in this regard. It is vital to maintain the pristine condition of the grasses for the survival of the Grey -crowned prinia.

5.6 Local People Involvement and educational accomplishment

Tharu, Bote, Derai, Majhi and *Kumal* are the indigenous people residing in the periphery of the park. These groups are directly or indirectly dependent on park resources and if these groups are satisfied than park management would be easier and there would be no park and people conflicts. On the contrary these people were completely unaware about the Grey -crowned prinia. The formal and informal interactions with these ethnic groups have helped to raise conservation awareness among them. Photographs were shown and vocal sound was played to make them acquainted of the concerned bird species. Hardly any park personnel heard about and see Grey -crowned prinia. They ignored such small creature and generally confused with other bird species of same plumages like sunbird or warbles. One local guide belonging to ethnic group was hired and was involved in every step of the field research. Photo slide presentation and informal interaction were conducted among security personnel of Royal Nepalese Army, Park Ranger, Conservation officers, Game scouts and members of the local Bird watching clubs. People were curious to learn about this small creature. A pictorial leaflet of the Grey -crowned prinia; focusing on its distribution, density and characteristics were distributed to make them the aware. Though these endeavors are minuscule but help to raise awareness of people towards the conservation of Grey -crowned prinia.

Unit Six

Conclusions and Recommendation

6.1 Conclusions

In Royal Chitwan National Park the density of the Grey -crowned prinia is 8.3 - 9.3 per square kilometer. The density of this species has not been estimated elsewhere but it is reported to occur in Royal Bardia National Park, Shukla Phanta Wildlife Reserve and Laukah Daha area of Parsa Wildlife Reserve.

The sightings of Grey -crowned prinia is high in forest edges created naturally or artificially in course of habitat management and trails formed by human movement inside the park.

Grey -crowned prinia is a specialist bird and prefer grasslands dominated by *Themeda arundinacea* and *Apluda mutica*. *Themeda* grassland assemblages are found close to the moist *Shorea robusta* forest. *Themeda* grassland is also characterized by the presence of some other woody species like *Bombax ceiba*, *Terminalis species*, *Mallotus philipinensis* and *Coolebrokia oppositifolia*.

Sunachuri, Kasara, Kachauni, Tiger tops, Bankatta, Old Padampur, Khagendra Malli and Dhurba are the main habitat of the Grey -crowned prinia. These areas are equally facing serious problem from cutting and burning of grasses, illegal collection of forest products and grazing by livestock. Cattle grazing are biggest problem to grassland in the northern boundary and part of the Souraha sector. Controlling cattle grazing has been cumbersome task for park authority and is also inevitable because park boundary is not fenced and neither possible until the local community become self-aware. Weak enforcement of grazing controls in the park motivated local people to graze inside the park and lost their incentives of stall feed. These issues are more serious than what it appears; it is because local people have been enjoying access to the park resources long before the park was established. There is continuing shrinkage of forest resources outside the park because of exploitation by local people and growing number of unproductive cattle.

Most of the park staffs are ignorant about the identification and any information concerning Grey -crowned prinia and other threatened birds species. Conservation values are extremely lacking among the park staff and local inhabitants. Most of the Post staffs and local inhabitant were

amazed when they heard about the species. It may be due to the small body size and little known among conservationist.

Different animals and have different habitat requirements. In habitat management mammals or the big creatures are taken into account neglecting the welfare of the small creatures especially birds. There is no record of habitat management in RCNP taking into consideration the habitat of small grassland birds.

The ethnic groups like *Tharus*, *Bote*, *Darai*, *Majhi* and *Kumal* mainly inhabit the buffer zone of RCNP. They are heavily depends upon park resources due to lack of alternate resources. These indigenous tribes have been using the resources before the establishment of RCNP. The prevailing practice of allowing local people to collect grasses and grass products is a major public relation programme. While the exploitation of grass is generally believed to have no lasting effects on wildlife and their habitat (Sharma 1997), over harvesting may have serious effects on herbivores and grassland dependent birds habitat.

6.2 Recommendation and practical implication

Based on the results and discussion following recommendations are made for improvement in habitat and long-term survival of Grey -crowned prinia in RCNP.

1. Grey -crowned prinia is a least known globally threatened bird species. Educating the people especially residing in the periphery of RCNP is the most important method for implementing conservation measures of this species. Furthermore, intensive awareness campaign among park officials and local naturalist should be lunched because of poor knowledge of this species among them.
2. Forest products especially grasses are important for people living adjacent to the park. *Themeda* grass is locally used by ethnic groups *Tharus*, *Bote*, *Derai* and *Kumal* for paneling of houses, weaving baskets and used for making fish traps. Local traditions can be continued with optimal exploitation and careful management of resources.
3. Abandoned old Padampur village sites have been turning into *Saccharum spontaneum* and *Imperata cylindrica* grassland. The site is moist and scattered mixed trees species are already there which can be develop as a potential habitat for Grey -crowned prinia. To increase the

habitat area of the Grey -crowned prinia *Themeda* grass should be encouraged by sowing seeds or planting turfs.

4. The undue exploitation of mixed grassland of *Themeda* should be minimized. Grass collection should be restricted in areas that support globally threatened species and grasslands considered of international importance.

5. A detailed study should be undertaken related to behavior and breeding ecology of Grey -crowned prinia.

6. In Nepal habitat management are focused on mega fauna. Birds and small animals seems to be overlooked. Grey -crowned prinia is not getting proper attention that it deserves. Therefore, habitat management should also focus on management and conservation of this small creature. Generally, it is believed that habitat management for big animals will simultaneously manage habitat of small animals but it is not true. Therefore, *Themeda* grassland should be managed scientifically for better conservation of Grey -crowned prinia.

7. Cattle pressure inside park grassland is attributed to the lack of fodder in the village land. Encourage villagers to plant fodder trees in marginal land and introduction of agro forestry in such land could be a possible measure to avoid grazing pressure and fuel wood collection inside the park.

8. In RCNP management plans have been prepared for large mammals but none for small animals especially for grassland birds. Therefore, a detailed management plan should be prepared for the grassland birds taking into consideration the globally threatened birds like Grey -crowned prinia.

9. Only nine species of birds have been considered as nationally protected under Appendix-1 of National Park and Wildlife Conservation Act 1973. Grey -crowned prinia should be included in list of protected bird species considering its population status.

References

- Ali, S. and Ripley, S.D. (1987) *Compact handbook of birds of India and Pakistan*. Second edition. Oxford University Press, Delhi, India.
- Baral, H. S., Inskipp, C., Inskipp, T. P., Regmi, U. R. 1996. *Threatened Birds of Nepal*. BCN and DNPWC; Kathmandu. Nepal
- Baral, H.S. (2001) *Community structure and habitat associations of lowland grassland birds in Nepal*. University of Amsterdam, Netherlands.
- Baral, H.S. (2002) Status, Distribution, and ecology of Grey-crowned prinia with new data from Nepal. *Danphe Vol.11*. BCN, Kathmandu, Nepal
- Baral, H.S. and Inskipp, C., 2004. *State of Nepal's Bird*, Published by Department of National Park and Wildlife Conservation (DNPWC-Nepal), Bird Conservation Nepal and IUCN-Nepal
- Baral, H.S. and Pradhan, N.B. (1992) *Birds recorded at Parsa Wildlife Reserve*. A report to the DNPWC, Nepal Bird Watching Club. Unpublished.
- Baral, H.S. and Upadhyaya, G.P. (1998). *Birds of Chitwan*. Department of National Parks and Wildlife Conservation and Birds Conservation Nepal, Kathmandu
- Bibby, C.J.; Burgess, N.D. and Hill, D.A. (1992, 1998) *Bird Census Technique*. Academic Press Limited, London.
- Birdlife International (2001) *Threatened birds of the Asia: the Birdlife International Red Data Book*. Cambridge, UK, Birdlife International.
- Birdlife International (2001). *Threatened Birds Of Asia: The Birdlife International Red Data Book*. Cambridge, Birdlife International UK
- Collar, N.J.; Crosby, M.J. and Stattersfield, A.J. (1994) *Birds to watch 2: the world's list of threatened birds*. Birdlife International, Cambridge.
- Dhungel, S.K., and O' Gara, B. W. (1985) *Ecology of the Hog Deer in RCNP, Nepal*. *Wildlife Monographs*.
- Fleming, R.L. Sr., Fleming, R. L. Jr. and Bangdel, L.S. (1984) *Birds of Nepal*. Third edition. Nature Himalayas, Kathmandu.
- Grimeett, R.G., Inskipp, C. and Inskipp T. (1998) *Birds of Indian Subcontinent*. Christopher Helm, London.

Grimmett, R., Inskipp, C., and Inskipp, T.P. A Guide to the Birds of Pakistan, Nepal, Bangladesh, Bhutan, Sri Lanka and the Maldives

Gurung, K. K. (1983) *Heart of the Jungle*. Andre Deutsc. London.

HMGN/MFSC (2002), *Nepal Biodiversity Strategy*

Horsefield, T. and Moore, F. (1854) *A catalogue of birds in the Museum of the Hon. East-India Company*. W. H. Allen, London, UK

Inskipp, C., Inskipp, T.P. and Grimmett, R. (1999) *Birds of Bhutan*. Christopher Helm, London, UK.

KMTNC, 1998 Buffer zone Policy analysis of RCNP, a Technical Report.

Laurie, W.A.(1979) The Ecology of greater One horned rhinoceros. PhD dissertation, University of Cambridge, Cambridge.

Mishra, H. R. (1984) a delicate balance: tigers, rhinoceros, tourist and park management vs. the need of the local people in RCNP, Nepal.

Murphy, C. (1992). Nepal Bird List- Cygnus Tours 7-23 November 1992. Unpublished

Nepal Gazette, National Park and Wildlife Conservation act 1973 and regulation 1975.

Peet, N.B., Watkinson, A.R. Bell, D.J. and Kattel, B.J. (1999) Plant diversity in the threatened subtropical grasslands of Nepal.

Peet,N.B.; Watkinson,A.R: Bell D.J. and Brown,K 1997 .The mangagement of the tall grassland for the conservation of biodiversity and sustainable utilization:Scientific and management report for university of East Anglia,Norwich,UK and DNPWC, Nepal.

Rahmani, A.R. (1992). Threatened fauna of Indian grassland. In K. P. Singh and J. S. Singh. *Tropical Ecosystem: Ecology and Management*. Wiley eastern Limited, New Delhi.

Rand, A.L. and Flemming,R.L. (1957) Birds of Nepal. *Fieldiana Zoology*.

Tucker, G. (1991) The status of lowland dry grassland birds in Europe, In P.D. Goriup, I. A. Batten and J. A. Norton (eds.) *The Conservation of lowland dry grassland birds in Europe*.

[www. birdlifeinternational.org](http://www.birdlifeinternational.org).

[www. birdlifenepal.com](http://www.birdlifenepal.com)

Annexes**Annex-1: Itinerary of the Research Survey Team**

| Date | Destination | Night halt |
|------------------------|-------------------------------|----------------------|
| May 16, 2005 | Bharatpur – Kasara | Kasara |
| May 17& Aug. 13-14 | Kasara | Kasara |
| May 18-19 & Aug.15-17 | Kasara, Tamor Tal & Dhurba a | Kasara |
| May 20-22 & Aug. 18-20 | Shukhibar, Bhimle, Tiger tops | Shukhibar Post |
| May 23-24 & Aug. 21-23 | Sauraha | Sauraha |
| May 25-26 & Aug. 24-26 | Khagendra Malli | Khagendra Malli Post |
| ay 26-28 & Aug. 27-29 | Sunachuri | Sunachuri Post |
| May 28 & Aug. 30 | Sunachuri – Bharatpur | |

Annex: 2 Geo information of Transects

| Transect code | Transect length | Elev. | Location | Latitude | Longitude |
|----------------------|------------------------|--------------|------------------------------|-----------------|------------------|
| T1 | 5 | 177 | Kasra - Tamor tal chowk | 27°33'5.1" | 84°20'5.5" |
| Te1 | | 154 | | 27°31'47.3" | 84°20'14.5" |
| T2 | 3 | 170 | Tamor tal area | 27°32'40.4" | 84°20'42.2" |
| Te2 | | 159 | | 27°32'34.3" | 84°20'0.5" |
| T3 | 9 | 148 | Kasara bridge - Bankatta | 27°32'52.5" | 84°19'25.2" |
| Te3 | | | | 27°30'34.3" | 84°16'37.8" |
| T4 | 3 | 126 | Bankatta area | 27°30'34.3" | 84°16'37.8" |
| Te4 | | 182 | | 27°30'21.9" | 84°17'31.9" |
| T5 | 3 | 187 | Bankatta to Dhurba area | 27°32'8.5" | 84°17'29.5" |
| Te5 | | 160 | | 27°32'50.5" | 84°17'31.0" |
| T6 | 5 | 207 | Padmapur – Gaida tented camp | 27°32'8.5" | 84°29'41.3" |
| Te6 | | 188 | | 27°32'22.1" | 84°27'48.4" |
| T7 | 3 | 167 | Kachauni | 27°32'52.2" | 84°27'50.4" |
| Te7 | | 146 | | 27°32'41.2" | 84°28'27.2" |
| T8 | 4 | 181 | Padampur area | 27°32'10.7" | 84°29'51.0" |
| Te8 | | | | 27°31'56.1" | 84°30'58.6" |
| T9 | 3.5 | 204 | Khagendra Malli &CJL area | 27°33'18.7" | 84°39'10.3" |
| Te9 | | 215 | | 27°32'55.8" | 84°37'25.7" |
| T10 | 10 | 224 | KM – Sunachuri | 27°32'55.8" | 84°37'25.7" |
| | | | | | |
| Te10 | | 269 | | 27°32'02.2" | 84°44'11.9" |

Annex: 3 Birds sighting points

| Transect code and Location | Time of the day(Hrs.) | Locations | | | Birds |
|------------------------------------|-----------------------|-------------|-------------|-----------|--|
| | | Latitude | Longitude | Elev. (m) | |
| T1, Kasra - Tamor tal chowk | 1630 | 27°32'31.6" | 84°20'18.0" | 189 | Grey crowned Prinia, Grey Breasted prinia, Chestnut capped babbler |
| | 1600 | 27°32'36.7" | 84°20'17.9" | 164 | |
| | 1530 | 27°32'33.6" | 84°20'17.3" | 250 | |
| T3, Kasara bridge - Bankatta | 1230 | 27°32'06.0" | 84°15'57.8" | 148 | Grey crowned Prinia, Yellow eyed babbler, White stonchat |
| | 1330 | 27°32'22.4" | 84°18'35.8" | 159 | |
| | | 27°31'31.2" | 84°15'19.3" | 146 | |
| T4, Bankatta area | 1445 | 27°30'29.6" | 84°17'18.0" | 180 | Grey crowned Prinia, Grey Breasted prinia, |
| | | | | | |
| T5, Bankatta - Dhurba area | 1700 | 27°32'12.5" | 84°17'30.2" | | Grey crowned Prinia, |
| T6, Padampur-Gainda Tented camp | 1100 | 27°32'3.6" | 84°29'14.9" | 193 | Grey crowned Prinia, Chestnut capped babbler |
| | 1600 | 27°32'32.9" | 84°27'43.7" | 171 | |
| T7, Kachauni | 1300 | 27°32'47.0" | 84°28'24.0" | 171 | Grey crowned Prinia, Yellow eyed babbler, |
| T8, Padampur area | 1100 | 27°31'53.8" | 84°30'17.7" | 195 | Grey crowned Prinia, White stonchat |
| | 1330 | 27°31'55.4" | 84°30'35.5" | 172 | |
| | 1200 | 27°31'57.3" | 84°30'37.4" | 190 | |
| T9 Khagendra Malli and CJL area | 1500 | 27°33'03.6" | 84°38'16.5" | 217 | Grey crowned Prinia, Yellow eyed babbler, White stonchat |
| | 1600 | 27°33'5.8" | 84°38'20.6" | 220 | |
| T10, Khagendra Malli and Sunachuri | 1700 | 27°32'43.6" | 84°42'32.5" | 233 | Grey crowned Prinia, Grey Breasted prinia, Chestnut capped babbler |
| | 1500 | 27°33'25.1" | 84°40'59.8" | 224 | |
| | 1530 | 27°33'30.5" | 84°40'62.8" | 230 | |
| | | | | | |

Annex: 4 Other important GPS locations

| Name of the area | Location | | |
|------------------------|-------------|-------------|----------|
| | Latitude | Longitude | Elev.(m) |
| Lamital | 27°32'59.0" | 84°09'07.1" | 123 |
| Kasara | 27°32'59.4" | 84°19'48.0" | 159 |
| Dhurba Post | 27°32'53.6" | 84°17'30.9" | 142 |
| Bhimle | 27°33'09.1" | 84°12'20.8" | 131 |
| Amaltari Post | 27°33'05.1" | 84°05'41.7" | 109 |
| Baghmara Post | 27°33'15.2" | 84°09'47.1" | 131 |
| Tiger tops | 27°32'29.5" | 84°11'24.8" | 125 |
| Tiger tops tented camp | 27°31'36.5" | 84°13'26.4" | 143 |
| Temple tiger | 27°32'09.1" | 84°04'42.2" | 129 |
| Vimle junction | 27°33'09.5" | 84°12'19.5" | 130 |
| Sukhibar | 27°32'11.3" | 84°14'57.9" | 143 |
| Munnatal | 27°33'04.4" | 84°10'07.1" | 135 |
| Khoria muhan | 27°32'53.6" | 84°08'29.1" | 173 |
| Jarneli area | 27°32'09.6" | 84°23'28.7" | 215 |
| Island hotel area | 27°36'0.07" | 84°09'30.7" | 141 |
| Hatar | 27°34'22.4" | 84°30'04.4" | 168 |
| Tamsapur post | 27°34'12.9" | 83°56'46.1" | 170 |
| Harda khola | 27°33'25.1" | 84°41'05.9" | 227 |
| Hasta khola | 27°30'49.3" | 84°46'46.0" | 253 |
| CJL | 27°33'16.7" | 84°38'18.6" | 208 |

Annex: 5 Checklist of Birds of Royal Chitwan National park

k

| English Name | Scientific Name |
|--|-------------------------------|
| Grebes, Podicipedidae | |
| Little grebe | <i>Tachybaptus ruficollis</i> |
| Great crested grebe | <i>Podiceps cristatus</i> |
| Cormorant, Phalacrocoracidae | |
| Great cormorant | <i>Phalacrocorax carbo</i> |
| Little cormorant | <i>Phalacrocorax niger</i> |
| Darter, Anhingidae | |
| Oriental Darter | <i>Anhinga melanogaster</i> |
| Bitterns, Egrets, Herons Ardeidae | |
| Eurasian bittern | <i>Botaurus stellaris</i> |
| Yellow bittern | <i>Ixobrychus sinensis</i> |
| Cinnamon bittern | <i>Ixobrychus cinnamomeus</i> |
| Black bittern | <i>Dupetor flavicollis</i> |
| Black -crowned night heron | <i>Nycticorax nycticorax</i> |
| Green -backed heron | <i>Butorides sriatus</i> |
| Indian pond heron | <i>ardeola grayii</i> |
| Cattle egret | <i>Bubulcus ibis</i> |
| Little egret | <i>Egretta garzetta</i> |

| | |
|--|-----------------------------------|
| Intermediate egret | <i>Egretta intermedia</i> |
| Great egret | <i>Egretta alba</i> |
| Grey heron | <i>Ardea cinerea</i> |
| Purple heron | <i>Ardea pupurea</i> |
| Storks, Ciconiidae | |
| Painted stork | <i>Mycteria leucocephala</i> |
| Asian open bill stork | <i>Anastomus oscitans</i> |
| Black stork | <i>Ciconia nigra</i> |
| Woody necked stork | <i>Ciconia episcopus</i> |
| White stork | <i>Ciconia ciconia</i> |
| Black necked stork | <i>Ephippiorhynchus asiaticus</i> |
| Great adjutant stork | <i>Leptoptilos dubius</i> |
| Lesser adjutant stork | <i>Leptoptilos Javanicus</i> |
| Ibises, Threskiornithidae | |
| Red -naped ibis | <i>Pseudibis papillosa</i> |
| Glossy ibis | <i>Plegadis falcinellus</i> |
| Swans, Geese and Ducks, Anatidae | |
| Lesser whistling duck | <i>Dendrocygna javanicus</i> |
| Tundra swan | <i>Cygnus columbianus</i> |
| Bean goose | <i>Anser fabalis</i> |
| Grey lag goose | <i>Anser anser</i> |
| Bar headed goose | <i>Anser indicus</i> |
| Ruddy shelduck | <i>Tadorna ferruginea</i> |
| Eurasian shelduck | <i>Tadorna tadorna</i> |
| Comb duck | <i>Sarkidiornis melanotos</i> |
| Cotton pigmy goose | <i>Nettapus coromandelianus</i> |
| Eurasian wigeon | <i>Anas Penelope</i> |
| Falcated duck | <i>Anas falcate</i> |
| Gadwall | <i>Anas strepera</i> |
| Mallard | <i>Anas platyrhynchos</i> |
| Spot billed duck | <i>Anas poecilorhyncha</i> |
| Common teal | <i>Anas crecca</i> |
| Garganey | <i>Anas querquedula</i> |
| Northern pintail | <i>Anas acuta</i> |
| Northern shoveler | <i>Anas clypeata</i> |
| Red -crested pochard | <i>Netta rufina</i> |
| Common pochard | <i>Aythya ferina</i> |
| Ferruginous duck | <i>Aythya nyroca</i> |
| Tufted duck | <i>Aythya fuligula</i> |
| Common golden eye | <i>bucephala clangula</i> |
| Smew | <i>Mergus albellus</i> |
| Goosander | <i>Mergus merganser</i> |
| Hawks, Eagles and Vultures,Accipitridae | |
| Black Baza | <i>Aviceda leuphotes</i> |
| Crested honey buzzard | <i>Pernis ptilorhyncus</i> |
| Black -shouldered kite | <i>Elanus caeruleus</i> |

| | |
|-------------------------------------|---------------------------------|
| Pariah kite | <i>Milvus migrans</i> |
| Brahminy kite | <i>Haliastur indus</i> |
| Pallas's fishing eagle | <i>Haliaeetus leucoryphus</i> |
| White tailed eagle | <i>Haliaeetus albicilla</i> |
| Himalayan grey headed fishing eagle | <i>Ichthyophaga nana</i> |
| Grey headed fishing eagle | <i>Ichthyophaga ichthyaetus</i> |
| Egyptian vulture | <i>Neophron percnopterus</i> |
| Oriental white backed vulture | <i>Gyps bengalensis</i> |
| Long billed vulture | <i>Gyps indicus</i> |
| Himalayan griffon vulture | <i>Gyps himalayensis</i> |
| Eurasian griffon vulture | <i>Gyps fulvus</i> |
| Red headed vulture | <i>Sarcogyps calvus</i> |
| Eurasian black vulture | <i>Aegypius monachus</i> |
| Short toed eagle | <i>Circaetus gallicus</i> |
| Crested serpent eagle | <i>Spilornis cheela</i> |
| Eurasian marsh harrier | <i>Circus aeruginosus</i> |
| Hen harrier | <i>Circus cyaneus</i> |
| Pale harrier | <i>Circus macrourus</i> |
| Montagau's harrier | <i>Circus pygargus</i> |
| Pied harrier | <i>Circus melanoleucos</i> |
| Northern goshawk | <i>Accipiter gentilis</i> |
| Crested goshawk | <i>Accipiter trivirgatus</i> |
| Northern sparrow hawk | <i>Accipiter nisus</i> |
| Besra | <i>Accipiter virgatus</i> |
| Shikra | <i>Accipiter badius</i> |
| White –eyed buzzard | <i>Butastur teesa</i> |
| Common buzzard | <i>Buteo buteo</i> |
| Long legged buzzard | <i>Buteo rufinus</i> |
| Upland buzzard | <i>Buteo hemilasius</i> |
| Black eagle | <i>Ictinaetus malayensis</i> |
| Lesser spotted eagle | <i>Aquila pomarina</i> |
| Greater spotted eagle | <i>Aquila clanga</i> |
| Steppe eagle | <i>Aquila nipalensis</i> |
| Tawny eagle | <i>Aquila vindhiana</i> |
| Imperial eagle | <i>Aquila heliaca</i> |
| Booted eagle | <i>Hieraaetus pennatus</i> |
| Rufous bellied eagle | <i>Hieraaetus kienerii</i> |
| Changeable hawk eagle | <i>Spizaetus cirrhatus</i> |
| Mountain hawk eagle | <i>Spizaetus nipalensis</i> |
| Osprey, Pandionidae | |
| Osprey | <i>Pandian haliaetus</i> |
| FGalcons Falconidae | |
| Red -thighed falconet | <i>Microhierax caerulescens</i> |
| Lesser kestrel | <i>Falco naumanni</i> |
| Common kestrel | <i>Falco tinnunculus</i> |
| Red necked falcon | <i>Falco chicquera</i> |
| Amur falcon | <i>Falco amurensis</i> |

| | |
|---|---------------------------------|
| Eurasian hobby | <i>Falco subbuteo</i> |
| Oriental hobby | <i>Falco severus</i> |
| Lagger falcon | <i>Falco jugger</i> |
| Peregrine falcon | <i>Falco peregrinus</i> |
| Francolinus and Pheasants, Phasiandae | |
| Black francolin | <i>Francolinus francolinus</i> |
| Swamp francolin | <i>Francolinus gularis</i> |
| Common teal | <i>Coturnix coturnix</i> |
| Blue breasted quail | <i>Coturnix chinensis</i> |
| Kalij pheasant | <i>Lophura lecuomelana</i> |
| Blue peafowl | <i>Pavo cristatus</i> |
| Buttonquails, Turnicidae | |
| Striped buttonquail | <i>Turnix sylvatica</i> |
| Yellow legged buttonquail | <i>Turnix tanki</i> |
| Barred buttonquail | <i>Turnix suscitator</i> |
| Rails, Crakes and Gallinules, Rallidae | |
| Slaty breasted tail | <i>Rallus striatus</i> |
| Bailons crake | <i>Porzana pusilla</i> |
| Ruddy breasted crake | <i>Porzana fusca</i> |
| Brown crake | <i>Amaurornis akool</i> |
| White breasted water hen | <i>Amaurornis phoenicurus</i> |
| Common moorhen | <i>Gallinula chloropus</i> |
| Purple gallinule | <i>Porphyrio porphyrio</i> |
| Common coot | <i>Fulica atra</i> |
| Cranes, Gruidae | |
| Common crane | <i>Grus grus</i> |
| Sarus crane | <i>Grus antigone</i> |
| Demoiselle crane | <i>Anthropoides virgo</i> |
| Floricans Otidae | |
| Bengal florican | <i>Houbaropsis bengalensis</i> |
| Lesser florican | <i>Sypheotides indica</i> |
| Jacanas, Jacanidae | |
| Pheasant tailed jacana | <i>Hydrophasianus chirurgus</i> |
| Bronze -winged jacana | <i>Metopidius indicus</i> |
| Painted Snipe Rostratulidae | |
| Painted snipe | <i>Rostratula benghalensis</i> |
| Ibisbill, Stilt and Avocet, Recurvirostridae | |
| Ibisbill | <i>Ibidorhyncha struthersii</i> |
| Black winged stilt | <i>Himantopus himantopus</i> |
| Pied avocet | <i>Recurvirostra avosetta</i> |
| Thick -Knees, Burhinidae | |
| Eurasian thick knee | <i>Burhinus oedicephalus</i> |
| Great stone plover | <i>Esacus recurvirostris</i> |
| Pratincoles, Glareolidae | |
| Oriental pratincole | <i>Glareola maldivarum</i> |
| Little pratincole | <i>Glareola lactea</i> |

| | |
|---|--------------------------------|
| Plovers and Lapwings, Charadriidae | |
| Little ringed plover | <i>Charadrius dubius</i> |
| Kentish plover | <i>Charadrius alexandrinus</i> |
| Lesser sand plover | <i>Charadrius mongolus</i> |
| Grey plover | <i>Pluvialis squatarola</i> |
| Pacific golden plover | <i>Pluvialis fulva</i> |
| River lapwings | <i>Hoplopterus duvaucelii</i> |
| Yellow wattled lapwings | <i>Hoplopterus malabaricus</i> |
| Grey headed lapwings | <i>Hoplopterus cinereus</i> |
| Red wattled lapwings | <i>Hoplopterus indicus</i> |
| Norhtern lapwings | <i>Vanellus vanellus</i> |
| Sandpipers, Scolopacidae | |
| Little stint | <i>Calidris minuta</i> |
| Temminckls stint | <i>Calidris temminckii</i> |
| Curlew sandpiper | <i>Calidris ferruginea</i> |
| Dunlin | <i>Calidris alpine</i> |
| Ruff | <i>Philomachus pugnax</i> |
| Jack snipe | <i>Lymnocyptes minimus</i> |
| Common snipe | <i>Gallinago gallinago</i> |
| Pintail snipe | <i>Gallinago stenura</i> |
| Eurasian woodcock | <i>Scolopax rusticola</i> |
| Whimbel | <i>Numenius phaeopus</i> |
| Eurasian curlew | <i>Numenius arquata</i> |
| Spotted red shank | <i>Tringa erythropus</i> |
| Common redshank | <i>Tringa tetanus</i> |
| Marsh sandpiper | <i>Tringa stagnatilis</i> |
| Common greenshank | <i>Tringa nebularia</i> |
| Green sandpiper | <i>Tringa ochropus</i> |
| Wood sandpiper | <i>Tringa glareola</i> |
| Common sandpiper | <i>Actitis hypoleucos</i> |
| Gulls and Terns Laaridae | |
| Great black headed gull | <i>Larus ichthyaetus</i> |
| Common black headed gull | <i>Larus ridibundus</i> |
| Brown headed gull | <i>Larus brunnicephalus</i> |
| Gull billed tern | <i>Geleochelidon nilotica</i> |
| Caspian tern | <i>Sterna caspia</i> |
| River tern | <i>Sterna aurantia</i> |
| Common tern | <i>Sterna hirundo</i> |
| Black bellied tern | <i>Sterna acuticauda</i> |
| Little tern | <i>Sterna albifrons</i> |
| Whiskered tern | <i>Chilonias hybridus</i> |
| White winged black tern | <i>Chilonias leucopterus</i> |
| Skimmers, Rynchopidae | |
| Indian skimmer | <i>Rhynchops albcicollis</i> |
| Pigeons and Doves, Culumbidae | |
| Blue rack pigeon | <i>Columba livia</i> |
| Eurasian collard dove | <i>Streptopelia decaocto</i> |

| | |
|-------------------------------|-------------------------------------|
| Red turtle dove | <i>Streptopelia tranquebarica</i> |
| Oriental turtle dove | <i>Streptopelia oreintalis</i> |
| Laughing dove | <i>Streptopelia senegalensis</i> |
| Spotted dove | <i>Streptopelia chinensis</i> |
| Emerald dove | <i>Chalcophaps indica</i> |
| Pin tailed green pigeon | <i>Treron apicauda</i> |
| Wedge tailed green pigeon | <i>Treron sphenura</i> |
| Thick billed green pigeon | <i>Treron curvirostra</i> |
| Orange breasted green pigeon | <i>Treron bicincta</i> |
| Pompadour green pigeon | <i>Treron pompadora</i> |
| Yellow footed green pigeon | <i>Treron phoenicoptera</i> |
| Mountain imperial pigeon | <i>Ducula badia</i> |
| Parakeets, Psittacidae | |
| Vernal hanging parrot | <i>Loriculus vernalis</i> |
| Alexandrine parakeet | <i>Psittacula eupatria</i> |
| Ring necked parakeet | <i>Psittacula krameri</i> |
| Slaty headed parakeet | <i>Psittacula himalayana</i> |
| Blossom headed parakeet | <i>Psittacula cyanocephala</i> |
| Moustached parakeet | <i>Psittacula alexandri</i> |
| Cuckoos, Cuculidae | |
| Pied crested cuckoo | <i>Clamator jacobinus</i> |
| Red winged crested cuckoo | <i>Clamator coromandus</i> |
| Common hawk cuckoo | <i>Hierococcyx varius</i> |
| Large hawk cuckoo | <i>Hierococcyx sparveriodes</i> |
| Asian emerald cuckoo | <i>Chrysoccyx maculates</i> |
| Grey bellied painted cuckoo | <i>Cacomantis passerinus</i> |
| Rufous belied painted cuckoo | <i>Cacomantis merulinus</i> |
| Banded bay cuckoo | <i>Cacomantis sonneratii</i> |
| Indian cuckoo | <i>Cuculus micropterus</i> |
| Common cuckoo | <i>Cuculus canorus</i> |
| Oriental cuckoo | <i>Cuculus orientalis</i> |
| Drongo cuckoo | <i>Surniculus lugubris</i> |
| Common koel | <i>Eudynamys scolopacea</i> |
| Large green belied malkoha | <i>Phaenicophaeus tristis</i> |
| Sirkeer malkoha | <i>Phaenicophaeus leschenaultia</i> |
| Greater coucal | <i>Centropus sinensis</i> |
| Lesser caucal | <i>Centropus bengalensis</i> |
| Owl, Tytonidae | |
| Grass owl | <i>Tyto capensis</i> |
| Owls, Strigidae | |
| Collared scopes owl | <i>Otus bakkamoena</i> |
| Oriental scopes owl | <i>Otus sunia</i> |
| Spot bellied eagle owl | <i>Bubo nipalensis</i> |
| Dusky eagle owl | <i>Bubo coromandus</i> |
| Brown fish owl | <i>Ketupa zeylonensis</i> |
| Tawny fish owl | <i>Ketupa flavipes</i> |
| Jungle owlet | <i>Glaucidium radiatum</i> |

| | |
|---------------------------------------|-----------------------------------|
| Asian barred owl | <i>Glaucidium cuculoides</i> |
| Brawn hawk owl | <i>Nonox scutulata</i> |
| Spotted owl | <i>Athene brama</i> |
| Brown wood owl | <i>Strix leptogrammica</i> |
| Short eared owl | <i>Asio flammeus</i> |
| Nightjars, Caprimulgidae | |
| Savanna nightjar | <i>Caprimulgus affinis</i> |
| Indian nightjars | <i>Caprimulgus asiaticus</i> |
| Large tailed nightjars | <i>Caprimulgus macrurus</i> |
| Jungle nightjars | <i>Caprimulgus indicus</i> |
| Needletails, Swifts, Alpodidae | |
| Himalayan swiftlet | <i>Collocalis brevirostris</i> |
| White rumped needletail | <i>Zoonavena sylvatica</i> |
| White throated needletail | <i>Hirundapus caudacutus</i> |
| White vented needletail | <i>Hirundapus cochinchinensis</i> |
| Pacific swift | <i>Apus pacificus</i> |
| Alpine swift | <i>Apus melba</i> |
| Little swift | <i>Apus affinus</i> |
| Asian palm swift | <i>Cypsiurus balasiensis</i> |
| Treeswift Hemiprocnidae | |
| Crested treeswift | <i>Hemiprogne coronata</i> |
| Trogons Tragonidae | |
| Red headed trogon | <i>Harpactes erythrocephalus</i> |
| Kingfishers, Alcedinidae | |
| White breasted kingfisher | <i>Halcyon smyrnensis</i> |
| Black capped kingfisher | <i>Halcyon pileata</i> |
| Ruddy kingfisher | <i>Halcyon coromanda</i> |
| Stork billed kingfisher | <i>Pelargopsis capensis</i> |
| Common kingfisher | <i>Alcedo atthis</i> |
| Deep blue kingfisher | <i>Alcedo meninting</i> |
| Pied kingfisher | <i>Ceryle rudis</i> |
| Crested kingfisher | <i>Ceryle lugubris</i> |
| Bee eaters, Meropidae | |
| Blue beared bee eater | <i>Nyctornis athertoni</i> |
| Green bee eater | <i>Merops orientalis</i> |
| Blue tailed bee eater | <i>Merops philippinus</i> |
| Chestnut headed bee eater | <i>Merops leschenaulti</i> |
| Rollers, Coraciidae | |
| Indian roller | <i>Coracias bengalensis</i> |
| Dollar bird | <i>Eurystamus orientalis</i> |
| Hoopoes, Upupidae | |
| Hoopoe | <i>Upupa epops</i> |
| Hornbills, Bucerotidae | |
| Indian grey horn bill | <i>Tockus birostris</i> |
| Oriental pied hornbill | <i>Anthracoceros coronatus</i> |
| Great pied horn bill | <i>Buceros bicornis</i> |
| Barbets, Capitonidae | |

| | |
|---|-----------------------------------|
| Lineated barbet | <i>Megalaima lineata</i> |
| Blue throated barbet | <i>Megalaima asiatica</i> |
| Coppersmith barbet | <i>Megalaima haemacephala</i> |
| Wryneck, Jyngidae | |
| Eurasian wryneck | <i>Jynx torquilla</i> |
| Woodpeckers, Picidae | |
| Speckled piculet | <i>Picumnus innominatus</i> |
| White browed piculet | <i>Sasia ochracea</i> |
| Rofous woodpecker | <i>Celeus brachyurus</i> |
| Lesser yellow napped woodpecker | <i>Picus chlorolophus</i> |
| Greater yellow napped woodpecker | <i>Picus flavinucha</i> |
| Streak throated green woodpecker | <i>Picus myrmecophoneus</i> |
| Grey headed woodpecker | <i>Picus canus</i> |
| Himalayan golden backed woodpecker | <i>Dinopium shoroo</i> |
| Lesser golden backed woodpecker | <i>Dinopium benghalense</i> |
| Greater golden backed woodpecker | <i>Chrysocolaptes lucidus</i> |
| Great slaty woodpecker | <i>Mulleripicus pulverulentus</i> |
| Yellow crowned pied woodpecker | <i>Dendrocopos mahrattensis</i> |
| Fulvous breasted pied woodpecker | <i>Dendrocopos macei</i> |
| Grey capped pygmy woodpecker | <i>Dendrocopos canicapillus</i> |
| Brown capped pygmy woodpecker | <i>Dendrocopos moluccensis</i> |
| Broad Bills, Eurylaimidae | |
| Long tailed broadbill | <i>Psarisomus dolhousiae</i> |
| Pittas, Pittidae | |
| Hooded pitta | <i>Pitta sordida</i> |
| Indian pitta | <i>Pitta brachyuran</i> |
| Larks, Alaudidae | |
| Bengal bush lark | <i>Mirafra assamica</i> |
| Ashy crowned finch lark | <i>Eremoptrix grisea</i> |
| Greater short toed lark | <i>Calendrella brachydactyla</i> |
| Sand lark | <i>Calendrella raytal</i> |
| Oriental skylark | <i>Alauda gulgula</i> |
| Martins and Swallows, Hirundinidae | |
| Brown throated sand martin | <i>Riparia paludicola</i> |
| Collard sand martin | <i>Riparia riparia</i> |
| Barn swallow | <i>Hirunda rustica</i> |
| Red rumped swallow | <i>Hirunda daurica</i> |
| Nepal house martin | <i>Delichon nepalensis</i> |
| Asian house martin | <i>Delichon dasypus</i> |
| Common house martin | <i>Delichon urbica</i> |
| Pipits and Wagtails, Motacillidae | |
| Richard's pipit | <i>Anthus richardi</i> |
| Paddy field pipit | <i>Anthus rufulus</i> |
| Tawny pipit | <i>Anthus campestris</i> |
| Olive backed pipit | <i>Anthus hodgsoni</i> |
| Eurasian pipit | <i>Anthus trivialis</i> |
| Red throated pipit | <i>Anthus cervinus</i> |

| | |
|---|-------------------------------------|
| Rosy pipit | <i>Anthus roseatus</i> |
| Buff belied pipit | <i>Anthus rubescens</i> |
| Forest wagtail | <i>Dendronanthus indicus</i> |
| Yellow wagtail | <i>Motacilla flava</i> |
| Citrine wagtail | <i>Motacilla citreola</i> |
| Grey wagtail | <i>Motacilla cinerea</i> |
| Pied/ white wagtail | <i>Motacilla alba</i> |
| White browed wagtail | <i>Motacilla maderaspatensis</i> |
| Minivets and Cokoos-shirkes, Campephagidae | |
| Common wood shrike | <i>Tephrodornis pondicerianus</i> |
| Large wood shrike | <i>Tephrodornis gularis</i> |
| Bar winged flycatcher shrike | <i>Hemipus picatus</i> |
| Black headed cuckoo shrike | <i>Coracina melanoptera</i> |
| Black winged cuckoo shrike | <i>Coracina melaschistos</i> |
| Large cuckoo shrike | <i>Coracina novaehollandiae</i> |
| Scarlet minivet | <i>Pericrocotus flammeus</i> |
| Long tailed minivet | <i>Pericrocotus ehtologus</i> |
| Grey chined minivet | <i>Pericrocotus solaris</i> |
| Small minivet | <i>Pericrocotus cinnamomeus</i> |
| Rosy minivet | <i>Pericrocotus roseus</i> |
| Bulbuls, Pycnonotidae | |
| Black crested yellow bulbul | <i>Pycnonotus melanicterus</i> |
| Red whiskered bulbul | <i>Pycnonotus jocosus</i> |
| White cheeked bulbul | <i>Pycnonotus leucogenys</i> |
| Red vented bulbul | <i>Pycnonotus cafer</i> |
| White throated bulbul | <i>Criniger flaveolus</i> |
| Black bulbul | <i>Hypsipetes madagascariensis</i> |
| Brown eared bulbul | <i>Hypsipetes flavalus</i> |
| Iora and Leafbirds, Irenidae | |
| Common iora | <i>Aegithina tiphia</i> |
| Golden throated leaf bird | <i>Chloropsis aurifrons</i> |
| Orange belied leaf bird | <i>Chloropsis hardwickii</i> |
| Thrushes, Turdidae | |
| White browed short wing | <i>Brachypteryx Montana</i> |
| Siberian ruby throat | <i>Luscinia calliope</i> |
| Blue throat | <i>Luscinia svecica</i> |
| White tailed ruby throat | <i>Luscinia pectoralis</i> |
| Indian blue robin | <i>brunnea</i> |
| Asian magpie robin | <i>Copsychus saularis</i> |
| White rumped shama | <i>Copsychus malabaricus</i> |
| Blue capped redstart | <i>Phoenicurus caeruleacephalus</i> |
| Black red start | <i>Phoenicurus ochruros</i> |
| Plumbeous red start | <i>Rhyacornis fuliginosus</i> |
| White tailed robin | <i>Cinclidium leucurum</i> |
| Common stonechat | <i>Saxicola torquata</i> |
| White tailed stonechat | <i>Saxicola leucura</i> |

| | |
|-------------------------------|-------------------------------------|
| Hodgson's bush chat | <i>Saxicola insignis</i> |
| Pied bush chat | <i>Saxicola caprata</i> |
| Grey bush chat | <i>Saxicola ferrea</i> |
| Northern wheatear | <i>Oenanthe oenanthe</i> |
| Desert wheatear | <i>Oenanthe desrti</i> |
| White capped red start | <i>Chaimarrornis lecocephalus</i> |
| Indian robin | <i>Saxicoloides fulicata</i> |
| Chestnut belied rock thrush | <i>Monticola rufiventris</i> |
| Blue capped rock thrush | <i>Monticola cinclorhyncha</i> |
| Blue rock thrush | <i>Monticola solitarius</i> |
| Blue whistling thrush | <i>Myiophonus caeruleus</i> |
| Scaly thrush | <i>Zoothera dauma</i> |
| Large brown thrush | <i>Zoothera monticola</i> |
| Lesser brown thrush | <i>Zoothera marginata</i> |
| Orange headed thrush | <i>Zoothera citrine</i> |
| Tickell's thrush | <i>Turdus unicolor</i> |
| White collard black bird | <i>Turdus albocinctus</i> |
| Grey winged black bird | <i>Turdusboulboul</i> |
| Common black bird | <i>Turdus merula</i> |
| Dark throated thrush | <i>Turdus ruficolis</i> |
| Black capped forktail | <i>Enicurus immaculatus</i> |
| Spotted forktail | <i>Enicurus maculates</i> |
| Warblers, Sylviidae | |
| Chestnut headed tesia | <i>Tesia castaneocoronata</i> |
| Grey belied tesia | <i>Tesia cyaniventer</i> |
| Pale footed bush warbler | <i>Cettia pallidipes</i> |
| Chestnut crowned bush warbler | <i>Cettia major</i> |
| Aberrant bush warbler | <i>Cettia flavolivacea</i> |
| Grey sided bush warbler | <i>Cettia brunnifrons</i> |
| Spotted bush warbler | <i>Bradypterus thoracicus</i> |
| Bright capped cisticola | <i>Cisticola exilis</i> |
| Fontail cisticola | <i>Cisticola juncidis</i> |
| Graceful prinia | <i>Prinia gracilis</i> |
| Plain prinia | <i>Prinia inornata</i> |
| Ashy prinia | <i>Prinia socialis</i> |
| Grey breasted prinia | <i>Prinia hodgsoni</i> |
| Yellow belied prinia | <i>Prinia flaviventris</i> |
| Striated prinia | <i>Prinia criniger</i> |
| Grey crowned prinia | <i>Prinia cinereocapilla</i> |
| Large grass warbler | <i>Graminicola bengalensis</i> |
| Common tailor bird | <i>Orthotomus sutorius</i> |
| Lanceolated warbler | <i>Locustella lanceolata</i> |
| Grasshopper warbler | <i>Locustella naevia</i> |
| Bristled grass warbler | <i>Chaetornis striatus</i> |
| Striated marsh warbler | <i>Megalurus palustris</i> |
| Paddy field warbler | <i>Acrocephalus agricola</i> |
| Blyth's reed warbler | <i>Acrocephalus dumetorum</i> |

| | |
|----------------------------------|----------------------------------|
| Clamorous reed warbler | <i>Acrocephalus stentoreus</i> |
| Thick billed warbler | <i>Acrocephalus aedon</i> |
| Booted warbler | <i>Hippolais caligata</i> |
| Orphean warbler | <i>Sylvia hortensis</i> |
| Lesser white throat | <i>Sylvia curruca</i> |
| Golden spectacled warbler | <i>Seicercus burkii</i> |
| Chestnut crowned warbler | <i>Seicercus castaniceps</i> |
| Grey hooded warbler | <i>Seicercus xanthoschitos</i> |
| Yellow belied warbler | <i>Abroscopus superciliaris</i> |
| Blyth's crowned warbler | <i>Phylloscopus reguloides</i> |
| Western crowned warbler | <i>Phylloscopus occipitalis</i> |
| Green warbler | <i>Phylloscopus nitidus</i> |
| Greenish warbler | <i>Phylloscopus trochiloides</i> |
| Large billed leaf warbler | <i>Phylloscopus magnirostris</i> |
| Pallas's leaf warbler | <i>Phylloscopus proregulus</i> |
| Hume's yellow browed warbler | <i>Phylloscopus humei</i> |
| Dusky warbler | <i>Phylloscopus fuscatus</i> |
| Smoky warbler | <i>Phylloscopus fulgiventor</i> |
| Sulphur belied warbler | <i>Phylloscopus griseolus</i> |
| Tickell's warbler | <i>Phylloscopus affinis</i> |
| Chiffchaff | <i>Phylloscopus collybita</i> |
| Flycatchers, Muscicapidae | |
| Pale chinned flycatcher | <i>Cyornis poliogenys</i> |
| Blue throated blue flycatcher | <i>Cyornis rubeculoides</i> |
| Tickell's blue flycatcher | <i>Cyornis tickelliae</i> |
| Pale blue flycatcher | <i>Muscicapa unicolor</i> |
| Verditer flycatcher | <i>Muscicapa thalashina</i> |
| Asian sooty flycatcher | <i>Muscicapa siberica</i> |
| Rufous tailed flycatcher | <i>Muscicapa ruficauda</i> |
| Asian brown flycatcher | <i>Muscicapa latirostris</i> |
| Slaty blue flycatcher | <i>Ficedula tricolor</i> |
| ultramarine flycatcher | <i>Ficedula superciliearis</i> |
| Little pied flycatcher | <i>Ficedula westermanni</i> |
| Slaty backed flycatcher | <i>Ficedula hodgsonii</i> |
| Snowy browed flycatcher | <i>Ficedula hyperythra</i> |
| Orange-georgetted flycatcher | <i>Ficedula strophciata</i> |
| Kashmir flycatcher | <i>Ficedula subrubra</i> |
| Red -breasted flycatcher | <i>Ficedula prava</i> |
| Grey headed flycatcher | <i>Culicicapa ceylonensis</i> |
| Yellow -bellied fantail | <i>Rhipidura hypopoxantha</i> |
| White -throated fantail | <i>Rhipidura albicollis</i> |
| White browed fantail | <i>Rhipidura aureola</i> |
| Asian paradise flycatcher | <i>Terpsiphone paradise</i> |
| Black-napped monarch | <i>Hypothymis azurea</i> |
| Babblers, Timaliidae | |
| Puff -throated babbler | <i>Pellorneum ruficeps</i> |
| Abbott's babbler | <i>Trichastoma abbotti</i> |

| | |
|-------------------------------------|---------------------------------|
| Rusty -cheeked scimitar-babbler | <i>Pomatorhinus erythrogeus</i> |
| White browed scimitar babbler | <i>Pomatorhinus schisticeps</i> |
| Lesser scaly breasted -wren babbler | <i>Pnoepyga pusilla</i> |
| Black -chinned babbler | <i>Stachyris pyrrhops</i> |
| Grey- throated babbler | <i>Stachyris nigriceps</i> |
| Rufous -bellied babbler | <i>Dumetia hyperythra</i> |
| Stripped tit -babbler | <i>Macronous gularis</i> |
| Red -capped babbler | <i>Timalia pileata</i> |
| Yellow -eyed babbler | <i>Chrysomma sinense</i> |
| Jerdon's babbler | <i>Moupinia altirostris</i> |
| Striated babbler | <i>Turdoides earlei</i> |
| Slender billed babbler | <i>Turdoides longorostris</i> |
| Jungle babbler | <i>Turdoides straitus</i> |
| Lesser neck laced laughing thrush | <i>Garrulax monileger</i> |
| Large necklaced laughing thrush | <i>Garrulax pectoralis</i> |
| Rufous necked laughing thrush | <i>Garrulax ruficolis</i> |
| White crested laughing thrush | <i>Garrulax leucolophus</i> |
| White throated laughing thrush | <i>Garrulax albogularis</i> |
| Nepal fulvetta | <i>Alcippe nipalensis</i> |
| White bellied yuhina | <i>Yuhina xantholeuca</i> |
| Black chinned yuhina | <i>Yuhina nigrimenta</i> |
| Titmice, Paridae | |
| Sultan tit | <i>Melanochora sultanea</i> |
| Great tit | <i>Parus major</i> |
| Yellow cheeked tit | <i>Parus xanthogenys</i> |
| Nuthatches, Sittidae | |
| Velvet fronted nuthatch | <i>Sitta frontalis</i> |
| Chestnut bellied nuthatch | <i>Sitta castanea</i> |
| Wallcreeper, Tichodromidae | |
| Wall creeper | <i>Trochodroma muraria</i> |
| Sunbirds, Nectariniidae | |
| Ruby cheeked sunbird | <i>Anthreptes singalensis</i> |
| Purple sunbird | <i>Nectarinia asiatica</i> |
| Black throated sunbird | <i>Aethopyga saturate</i> |
| Crimson sunbird | <i>Aethopyga siparaja</i> |
| Little spider hunter | <i>Arachnothera longirostra</i> |
| Streaked spiderhunter | <i>Arachnothera magna</i> |
| Flowerpeckers, Dicaeidae | |
| Thick billed flower catcher | <i>Dicaeum agile</i> |
| Pale billed flower catcher | <i>Dicaeum erythrorhynchos</i> |
| Yellow vented flower catcher | <i>Dicaeum chrysorrheum</i> |
| Plain flower catcher | <i>Dicaeum concolor</i> |
| Buff bellied flower catcher | <i>Dicaeum ignipectus</i> |
| White Eye, Zosteropidae | |
| Oriental white eye | <i>Zosterops palpebrosa</i> |
| Orioles, Oriolidae | |
| Maroon oriole | <i>Oriolus traillii</i> |

| | |
|--|-----------------------------------|
| Black hooded oriole | <i>Oriolus xanthornus</i> |
| Slender billed oriole | <i>Oriolus tenuirostris</i> |
| Eurasian golden oriole | <i>Oriolus oriolus</i> |
| Shrikes, Laniidae | |
| Great grey shrike | <i>Lanius excubitor</i> |
| Brown shrike | <i>Lanius cristatus</i> |
| Isabelline shrike | <i>Lanius isabellinus</i> |
| Bay backed shrike | <i>Lanius vittatus</i> |
| Black headed shrike | <i>Lanius schach erythronotus</i> |
| Grey backed shrike | <i>Lanius tephronotus</i> |
| Drongos, Dicruidae | |
| Black drongo | <i>Dicrurus macrocercus</i> |
| Ashy drongo | <i>Dicrurus leucocephaeus</i> |
| White bellied drongo | <i>Dicrurus caerulescens</i> |
| Crow billed drongo | <i>Dicrurus annectans</i> |
| Bronzed drongo | <i>Dicrurus aeneus</i> |
| Lesser racket tailed drongo | <i>Dicrurus remifer</i> |
| Spangled drongo | <i>Dicrurus hottenttus</i> |
| Greater racket tailed drongo | <i>Dicrurus paradiseus</i> |
| Wood Swallow, Artidae | |
| Ashy wood swallow | <i>Artamus fuscus</i> |
| Magpies, Treepies abs Crows, Corvidae | |
| Red billed blue magpie | <i>Urocissa erthrorhyncha</i> |
| Green magpie | <i>Cissa chinensis</i> |
| Rufous magpie | <i>Dendrocitta vagabunda</i> |
| Grey tree pie | <i>Dendrocitta formosae</i> |
| House crow | <i>Corvus splendens</i> |
| Jungle crow | <i>Corvus macrorhynchos</i> |
| Mynahs and Stalings, Sturnidae | |
| Spot winged starlings | <i>Saroglossa spiloptera</i> |
| Chestnut tailed starlings | <i>Sturnus malabaricus</i> |
| Eurasian starlings | <i>Sturnus vulgaris</i> |
| Rosy starlings | <i>Sturnus roseus</i> |
| Brahminy starlings | <i>Sturnus pagodarum</i> |
| Asian pied starlings | <i>Sturnus contra</i> |
| Common mynah | <i>Acridotheres trstris</i> |
| Bank mynah | <i>Acridotheres ginginianus</i> |
| Jungle mynah | <i>Acridotheres fuscus</i> |
| Hill mynah | <i>Gracula religiosa</i> |
| Sparrows and weavers, Ploceidae | |
| House sparrow | <i>Passer domesticus</i> |
| Eurasian tree sparrow | <i>Passer montanus</i> |
| Yellow throated sparrow | <i>Petronia xanthocollis</i> |
| Black breasted weaver | <i>Ploceus benghalensis</i> |
| Baya weaver | <i>Ploceus philippinus</i> |
| Munias, and Allies, Estrildidae | |
| Red avadavat | <i>Amandava amandava</i> |

| | |
|--|--------------------------------------|
| Indian silver bill | <i>Euodice malabarica</i> |
| Straited munia | <i>Lonchura striata</i> |
| Scally breasted munia | <i>Lonchura punctulata</i> |
| Black headed munia | <i>Lonchura Malacca rubroniger</i> |
| Chestnut munia | <i>Lonchura mallacca atricapilla</i> |
| Rose finch and allies, Fringillidae | |
| Common rosefinch | <i>Carpodacus erythrinus</i> |
| Buntings, Emberizidae | |
| Black faced buntings | <i>Emberiza spodocephala</i> |
| Chestnut breasted buntings | <i>Emberiza fucata</i> |
| Rustic buntings | <i>Emberiza rustica</i> |
| Little buntings | <i>Emberiza pussila</i> |
| Yellow breasted buntings | <i>Emberiza aureola</i> |
| Red headed buntings | <i>Emberiza briniceps</i> |
| Crested buntings | <i>Melophus lathami</i> |

| No | Length (Km) | No of bird | Range of angular distance (m) | Overall |
|----|-------------|------------|-------------------------------|---|
| 1 | 5 | 1.5 | 10-12 | 10.5 individuals seen on a total of 48.5 Km at an average of 11.2 – 13.0 m distance $D = \{n / (L \times r \times 2)\}$ Hence density will be 8.3 – 9.6 /sq km. |
| 2 | 3 | - | - | |
| 3 | 9 | 1.5 | 14-16 | |
| 4 | 3 | 1 | 10-12 | |
| 5 | 3 | 0.5 | 12-14 | |
| 6 | 5 | 1 | 14-16 | |
| 7 | 3 | 0.5 | 14-16 | |
| 8 | 4 | 1 | 12-14 | |
| 9 | 3.5 | 1.5 | 12-14 | |
| 10 | 10 | 2 | 14-16 | |
| | 48.5 (Km) | 10.5 | 11.2-13.0 (overall mean) | |