INTERIM REPORT

BIODIVERSITY STUDY OF BONAI FOREST DIVISION, ODISHA






Submitted to

Divisional Forest Office, Bonai Forest Division, Bonai

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BIODIVERSITY (FAUNAL) STUDY OF BONAI FOREST DIVISION, ODISHA

Project submitted to
Divisional Forest Officer,
Bonai Forest Division
Bonai, Sundargarh

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Executive Summary

The Bonai Forest Division situated between coordinates of 21º39′-22º8′ N and 84º30′-85º23′ E towards the North-western boundary of the state of Odisha in eastern India. The forest division is spread over an area of 2934.21 km^2 of Sundergarh district. It is bounded on the North by Jharkhand State and Rourkela Forest Division. On the east it is bounded by Keonjhar Forest Division and Deogarh Forest Division. On the west & south it is bounded by Bamra Forest Division and Deogarh Forest Division. This Division comes under Rourkela Forest Circle in Sundargarh District of Odisha State. There are seven nos. of Forest Ranges in this Division namely Bonai Range, Kuliposh Range, Tamra Range, Jarda Range, Sole Range, Barsuan Range and Koira Range. The forest division is part of the Chotanagpur plateau of Deccan Peninsular Biogeographic Zone (Rodgers and Panwar, 1988). The climate of the area is divided into three distinct seasons: Summer (March – June), monsoons (July – October), and winter (November – February). The mean annual rainfall in the division is about 1400 mm and average number of rainy days in a year is 83 days. Mean annual temperature ranges between 15 °C and 40 °C.

The Bonai Forest Division occupies an important position from geological information point of view, because of availability of large deposits of high grade iron and manganese ores. The rock formations found in Bonai Forest Division

belong mainly to Iron ore, super group of Precambrian age. The important rocks are Mica-Schists, Phyllites and Quartizites. Two groups of sedimentaries known as Dhanjori group and Kolhan series are recognised here. The soil in east Bonai is lateritic, reddish ferruginous type which are derived from the rocks of iron ore. Therefore, the present study was aimed to know the biodiversity in Bonai Forest Division and suggest conservation strategy for wild habitats on the area. The deep valleys, enchanting hills, perennial streams, magnificent waterfalls and deep gorges in the river mix this landscape important for nature lovers. The landscape is known for its good biodiversity for plant and animal.

The faunal diversity of Bonai Forest Division consist of 29 species of mammals, 189 species of birds ,57 species of snakes,136 species of butterflies. The rich biodiversity that has been documented by these studies indicates that despite all negative pressure on forest habitat, a vast zone of contiguous forest is still biodiversity-rich. Management focus extends to entire Division. Biological & ecological measures, such as habitat improvement, increase of prey base, weed eradication, corridor linking etc. Physical measures such as site specific WHS, Check dams, Water holes, Salt licks, Soil & Water Conservation Measures. It proposes to improve the existing road network from Soluguda, Kunjar and Kelo village of Sole and Jarda range, maintenance, construction of bridges & culverts, concreting the steep slopes, alignment of a inside the forest.

C H A P T E R 1

INTRODUCTION

Faunal inventory is one of the important tasks for precise taxon-specific and area-specific conservation efforts. It's relevance increase manifold in the light of lack of information about the biodiversity profile of the ecologically important areas within the country. Additionally, acquisition of baseline data on the distribution and status of eco-biologically important species is essential for their conservation. Successful conservation management requires an understanding of species distribution; including which species are restricted to particular areas and which are adequately protected in these areas. In addition, owing to habitat fragmentation and consequent losses suffered by different population, there is need for ensuring the safety of the threatened biodiversity lying in Bonai Fores Division.

However, non-availability of faunal check-lists, the exact status of several species of animals in the Division is yet to be assessed, Bonai Forest Division can be a veritable repository of biodiversity in Odisha. Most of the small carnivores have received very little conservation and scientific attention with almost no field studies on them. Even information on distribution of many species of mammals is still very scanty with considerable range extension of species being reported even now. Among the small cats, the species definitely known to occur in the area are the Jungle cat. It is very likely that two other species of Small cats such as the Leopard cat, and the Rusty spotted cat are also present in the area. Also the present status of Ungulates and carnivores like Leopard, Jackal and Otters in the forest division is also known.

The major carnivore species of this division as per working plan i.e *Panthera tigris,* Leopard *Panthera paardus* Rusty Spotted Cat *Prionailurus rubiginosus* Jungle cat *Felis chaus*,Indian grey wolf *Canis lupu,* Hyeana *Hyaena hyaena,* Jackal *Canis aureus,* and Indian fox *Vulpes bengalensis* were also recorded of this division.

STUDY AREA

The Bonai Forest Division situated between coordinates of 21º39′-22º8′ N and 84º30′-85º23′ E towards the North-western boundary of the state of Odisha in eastern India. The forest division is spread over an area of 2934.21 km^2 of Sundergarh district (Fig.1). It is bounded on the North by Jharkhand State and Rourkela Forest Division. On the east it is bounded by Keonjhar Forest Division and Deogarh Forest Division. On the west & south it is bounded by

Bamra Forest Division and Deogarh Forest Division. This Division comes under Rourkela Forest Circle in Sundargarh District of Odisha State. There are seven nos. of Forest Ranges in this Division namely Bonai Range, Kuliposh Range, Tamra Range, Jarda Range, Sole Range, Barsuan Range and Koira Range. The forest division is part of the Chotanagpur plateau of Deccan Peninsular Biogeographic Zone (Rodgers and Panwar, 1988).

The mean daily temperatures of winter range from 5˚C to 20˚C and that of summers range from 30˚C to 45˚C. There are three distinct seasons that is Summer- March to June, Rainy- July to October and winter-November to February. The rainfall of the Sanctuary and the nearby areas varies from 1000 mm to 1800mm. Due to good rainfall in the Sanctuary area, moist peninsular high level Sal and moist mixed deciduous forests are noticed, along with extensive Bamboo forests. Most villagers in the Division are tribal, and their activities inside forest are grazing livestock and collection of forest products (e.g. fodder for livestock, non-timber). The Division is dominated by Northern Tropical Dry Deciduous Forest, Dry Peninsular Sal Forests and Northern Dry Mixed Deciduous Forests. (Champion & Seth's 1968). The sanctuaries contain forest of good quality having associates like *Terminalia tomentosa. Anogeissus latifolia. Pterocarpus marsupium, Diospyros melanoxylon, Adina cordifolia, Terminalia chebula, terminalia bellerica, lagerstroemia parviflora, Buchananialanzyn, Lanniacoromandelica and Dalbergia latifolia* etc. The common plants are *Emblica officinalis, Cassia fistula, Morinda tinctoria. Antidesma species, Randia species, Symplococosracemosus and Cleistanthuscollinus.* The under growths in these forests are *Flemingia chappar*, *Indigofera pulchela*, *Wordfordia fruticosa, Desmodium* species, *Strobilanthes* species. The common climbers in these forests are *Bauhinia vahlii* and *Smilax* species while *Combretum decandrum* occurs in valleys and ravines.

METHODOLOGY

I. Secondary data

a. Literature Survey

An exhaustive literature survey will be done to determine and document the available information both in grey and peer-reviewed literature and will be arranged taxa / topic-wise as an annotated bibliography.

b. Study of departmental records

Different material lies unused and unanalyzed with the forest department in the form of sighting registers, census data sheets etc. All these will be compiled and analysed to the extent possible.

c. Structured and semi-structured Interviews

These will be done with old experienced staff of the Division as well as with local community elders / erstwhile shikaris.

II. Primary data

Apart from ad libitum sampling which shall be used for all faunal groups, taxa-specific methods are as follows:

a. Mammals

The basic method will be that of Transect Surveys, both Foot and Vehicle-based (for Ungulates). This will be augmented by Block Counts (for small Ungulates, Giant Squirrel) / Pellet counts in nested Plots (for Ungulates), Pug-mark Impression Pads (for carnivores), Water-hole Counts (for Elephants etc.), Shermann Traps (for rodents) and Mist-netting (for Bats).The details of these will be worked out after the reconnaissance and shall be incorporated into the time Line.

Camera trap survey:

Field Site: We first carried out an extensive reconnaissance survey in four forest ranges within Sole, Jarda, Kuliposh and Barsuan ranges. During the survey, signs of carnivore viz. scats, pug-marks, claw marks, scraps and scent marks, were recorded and geo-referenced using a geographical positioning system(GPS).

Camera positioning: We conducted a camera trapping survey in the 19th April 2023 to 31st September 2023 covering the four ranges of Sole, Jarda, Kuliposh and Barsuan ranges. To assess the status of carnivores and herbivores and their prey species in the study area, we used 69 motion sensor camera traps (Cuddeback Model C1) to carry out a mammal survey. We setup 69 camera trapping stations in Grid wise in Sanctuary (Fig. 1). We used 2X2 km2 grids to guide camera placement in four ranges. Camera traps were predominantly set along forest roads, trails and footpaths. All camera traps were strapped to trees approximately 45 cm above ground. At each location, either a pair of traps on either side of the path facing each other was set up to

photograph simultaneously both flanks of the animal passing between the cameras or a single Camera trap basing on the terrain.

Each location consist one pair camera trap and set to operate 24 hour with programmed to delay sequential photographs by 30 second delay time for capturing for 25 days, yielding a total of 3150 trap nights. Each camera traps were checked at least once a week for battery level, positioning and to replace memory (SD) cards. Each and every photograph was manually checked to identify the species. Total sampling effort was calculated as the sum of the effective days across all stations that each camera was functioning (Boitani and Powell, 2012). We considered photos separated by at least 30 minutes as independent events (Ohashi et al., 2013; Guo et al. 2017). Data on large and medium sized mammals, bird, reptiles, birds, human traffic and livestocks including date time, year and behavior were collated from camera trap photographs. Relative abudance was calculated as RAI = A/NX100

Where A is the total number of detections of a species by all cameras and N is the total number of camera trap days by all the cameras throughout the study area following Jenks et al. (2011). All animals captured (photographed) in the camera traps were identified to the species level and the time and date of the capture (inbuilt in the camera) were noted. Consequently, each photo was rated as a dependent or independent event. All camera trap pictures were screened for the presence of animals and all data was entered in an Office ACCESS 2010 database. Identification of the animals was done using the (Menon 2014).

b. Birds

Regular surveys were done by walking on fixed routes throughout the study area. Observations were made in the morning between 07:00 and 10:00 hr and/or in the afternoon 15:00 and 18:00 hr, depending on the light condition. Night observations were also conducted and listen and identified the nocturnal species like owls and nightjars. Birds were observed using (Nikon Monarch 7 X 42) binocular and identified. The key characters were noted down in the field note book. In case of doubtful identification, photographs were taken and the species is identified later by consulting literature. Field guides like Grimmet et al. (2006), Ali and Ripley (1983) were used for identification.

c. Herpetofauna

Active (Time-effort) search method / Pitfall Traps etc. will be the applied for studying the herpetofaunal diversity of the area. Rocks, leaf litters and boulders will be turned to search the animal species. Basking reptiles along the roads, aquatic species along the hill streams and the cave dwelling species will be searched. In some areas night surveys will be carried out with the help of powerful search lights.

d. Invertebrates

Invertebrate species such Butterflies and odonates will be studied based on random search. Time-Effort Methods, Strip transects, light traps and bait trap methods will be carried out to study butterflies and moth species.

Occurrence of mammals

1. Transects

A survey was conducted by walking through different transects; recording and collecting evidence of mammals. In order to study mammalian diversity, the entire habitat was divided into different blocks on the basis of natural barriers and manmade demarcation such as deep gullies, rivers and foot trails. Each block was surveyed by walking through transects line of variable length, depending on availability of tracks. Besides fix transects survey, a random search was also adopted to record the occurrence of mammalian species in the sanctuary.

2. Indirect Methods

Following indirect methods were adopted:

i) **Identification of footprint (pugmarks or tracks):**

Footprints of different species of mammals are different with distinct characters in their shape, size and presence or absence of claws. The pugmarks were observed using different characters: Total length (TL), total width (TW), and pad width (PW) of animal were measured. In some cases, field circumstances (e.g. clear occurrence of large and small track) allowed for a confident interpretation and were also included in the reference data set. The tracks or footprints of ungulates (Barking deer, mouse deer, chital, wild pig and sambar) were also identified on the basis of different shape, size, and signs associated with foot prints such as scratches and pellets.

ii) Identification of feces (scats or pellets or dropping):

Identifying the species that deposited the feces is a convincing indirect method because: a) feces are also long lived, especially in areas with little rain and minimal insect activity, b) feces may be deposited solitary or in clumps, typically, left on a shape pile or within a meter of scrape but along or next to trail, and c) scats of some felidae (e.g., leopard) and canidae (e.g., jackal) are often visible and easy to find large sample per unit effort. The sample lengths and diameter were measured to the nearest centimeter with calipers and it was weighed using digital weight. The collected feces were distinguished by different size, shape, odor, color and signs associated with feces, such as scrapes and footprints.

iii) Identification of scrapes and scratches:

Scraping is the most common marking activity and among long-lived signs, especially if it is made in undisturbed area. Scrapes are made when an animals scuffs the ground its hind feet, leaving a characteristics shape. Identification of the scrapes of the scrapes of different animal followed WWF (2001). Length and width of the scrapes were measured by a measuring tape. Wild boar's scratches or signs (plough) were like ploughing.

iv) **Other methods:**

We used methods such as mammalian feeding signs (e.g. carcass left by predator) some of which have distinct characters, identified home or shelters (e.g., burrow of pangolin and porcupine and bedding of hare), recognized calls or vocal of some mammals including barking deer and monkeys, and recorded quills of porcupine.

Data Analysis:

Abundance of mammals was estimated on the basis of indirect signs. The signs data were expessed as total count, encounter rate (number/km/day) and relative frequency percentage following Johnsingh and Negi (2003) and Singh (2001, 2003). The relative frequency percentage sign of each species was estimated.

C H A P T E R 2

Mammalian diversity of Bonai Forest Division, Odisha

ABSTRACT

We assessed the mammalian diversity and abundance of Bonai Forest Division, North-Western Odisha by using camera traps from 25th April 2023 to 4th November 2023 covering an area of 404sq km. A total 207 camera traps were stationed with a total sampling effort of 7450 trap days, 4126 photographs of mammals belong to 20 families including 28 species, of mammals, seven species of birds photographs were captured in the study area. The wild pig *Sus scrofa* was the most frequently captured species. The wild pig *Sus scrofa* represented high relative abundance (RAI =8.05) among the other species. The wild pig *Sus scrofa* (RAI 8.08; n=418, in 145 locations), four-horned antelope *Tetracerous quadricornis* (RAI 6.92; n=130, in 46 locations) and leopard *Panthera pardus* (RAI 6.26;n=324 in 105 locations). Frequency of various anthropogenic activities from movement of livestock, feral dogs and human traffic accounted for maximum photo capture (combined RAI = 16.27) and found to be negatively correlated with mammalian relative abundance. These results highlighted the fact that all mammalian species occurring in the division were detected and their presence was confirmed, which resulted in the distribution pattern of the species in this division..

Key words: Mammalian diversity, camera trap photo, livestock pressure, relative abundance index, Bonai, Odisha, India

Introduction

Mammals can also act as apex predators, regulating the populations and behavior of their prey, which can impact the structure and composition of the forest community (Ripple et al. 2014). Despite their vital role in forest ecosystems, they face a multitude of threats that can significantly impact their populations. Habitat destruction and fragmentation due to human activities such as deforestation, mining, and urbanization are some of the most significant threats to mammal communities in the world (Ripple et al. 2014, 2015; Nayak et al. 2020).Camera trapping has been proved to be an effective method in monitoring elusive and nocturnal species along with population estimation of naturally marked individuals using spatially explicit capture-recapture models (Karanth and Nichols 1998; Harihar et al. 2014). Camera traps have become an important

tool for inventorying for estimating species diversity at a site (Cutler and Swann, 1999; Silveira, Jacomo and Diniz-Filho, 2003; O'Connell, Nichols and Karanth, 2011). Camera trapping is an increasingly popular method to study wildlife. While there are several types of camera traps, all models have the same basic principle: a photo (and / or video) camera protected by some sort of weather proof housing, coupled to a mechanism that allows the camera to be triggered automatically when an animal moves in front of it. Since camera traps were first used to estimate the density of tiger *Panthera tigris* populations in India (Karanth 1995) this methodology has been widely used to study a variety of species: leopards *Panthera pardus* (Henschel and Ray 2003; Kostyria et al. 2003). Due to increasing anthropogenic pressure, half the world's 5491 known mammalian species are declining and a fifth are clearly at the verge of extinction (Anon 2016). Although the use of relative abundance index (RAI) generated from camera trap encounter rates is controversial as it gets biased with animal body mass and study design (Sollmann et al. 2013), there are examples of a linear relationship between RAI and abundance, estimation, especially of cryptic species (Gonthier et al., 2013; Karantha et al., 1998; Datta et al., 2008; Rovero and Marshall, 2008;Rovero and Marshall 2009; Jenks et al. 2011 and Lahker et al 2018).

Monitoring mammals is challenging due to their elusive behavior and low abundances in vast and remote forest areas (Dorji et al. 2019). Therefore, camera traps have become an increasingly vital tool for wildlife research (Blake et al. 2017). Camera traps not only detect rare, secretive, or elusive mammal species but are also frequently used to estimate population density(Singh & Macdonald 2017; Abade et al. 2018; Greenspan et al. 2023), study activity patterns (Ramesh et al. 2012; Ullas Karanth et al. 2017; Palei et al. 2020; Puls et al. 2021; Palei et al. 2022), assess habitat use (Tharmalingam Ramesh et al. 2012; Morelle & Lejeune 2015), and evaluate the impact of anthropogenic activities (Augugliaro et al. 2020; Feng et al. 2021).

India is a megadiverse country, home to a diverse mammal community with approximately 427 extant mammal species, representing about 8% of the world's mammal diversity (Srinivasulu 2018). India is home to a network of protected areas (PAs) (e.g. National Park, Wildlife Sanctuary, Tiger Reserve) aimed at conserving its rich biodiversity and unique ecosystems. These protected areas play a crucial role in preserving the diverse flora and fauna of the country. Nevertheless, protected areas may not always be optimal for conservation; hence,

maintaining landscape connectivity through corridors or linkages is crucial for biodiversity preservation. These corridors allow species to move, colonize new areas and maintain gene flow (Dutta et al. 2016). These corridors have faced significant anthropogenic pressure due to the expansion of mining and agricultural activities. Several studies have emphasized the importance of evaluating the conservation potential of these corridors, which is crucial for developing effective conservation and management strategies(Dutta et al. 2018; Chakraborty et al. 2021).

In Odisha several mammalian studies were reported; (Tiwari et al. 2002) first compiled 37 species of mammals from Chandaka- Dampara Wildlife Sanctuary. Ramakrishna et al. (2006) reported 55 species of mammals from Similipal Biosphere Reserve encompassing the Similipal Wildlife Sanctuary and Similipal Tiger Reserve. Mohapatra et al. (2009, 2012, 2013) reported 36 species of mammals from different hill forests of southern Odisha, 43 species from Kotagarh Wildlife Sanctuary, and 47 species from several sacred groves in Sundargarh District. Murmu et al. (2013) also reported 23 species of mammals of Kuldiha Wildlife Sanctuary, and 42 species of mammals from Hadagarh Wildlife Sanctuary. Recently, (Debata & Swain 2020) surveyed the mammalian fauna of an urban-influenced zone of Chandaka-Dampara Wildlife Sanctuary using camera traps and reported 14 species of mammals. Debata et al. (2018) also reported 20 species of mammals of Kuldiha Wildlife Sanctuary. Palei et al. (2020) reported 22 species of mammals of Sunabeda Wildlife Sanctuary. Palei et al. (2021) reported 19 species of mammals from Hadagarh Wildlife Sanctuary. Palei et al (2023a) reported 27 species of mammals in Debrigarh Wildlife Sanctuary and also Palei et al (2023b) reported in 27 species mammals in Sundargarh Forest Division. In the present study we carried out a camera trap survey in the moist mixed deciduous forests of Bonai Forest Division, to estimate mammalian species, their Relative abundance and anthropogenic disturbances which will be useful in conservation and management strategies of the sanctuary.

Materials and methods

Study area

The Bonai Forest Division situated between coordinates of 21º39′-22º8′ N and 84º30′-85º23′ E towards the North-western boundary of the state of Odisha in eastern India. The forest division is spread over an area of 2934.21 km^2 of Sundergarh district (Fig.1). It is bounded on the North by Jharkhand State and Rourkela Forest Division. On the east it is bounded by

Keonjhar Forest Division and Deogarh Forest Division. On the west & south it is bounded by Bamra Forest Division and Deogarh Forest Division. This Division comes under Rourkela Forest Circle in Sundargarh District of Odisha State. There are seven nos. of Forest Ranges in this Division namely Bonai Range, Kuliposh Range, Tamra Range, Jarda Range, Sole Range, Barsuan Range and Koira Range. The forest division is part of the Chotanagpur plateau of Deccan Peninsular Biogeographic Zone (Rodgers and Panwar, 1988).

Table.1. Camera trap installation of Bonai Forest Division from 19 April 2023 to 4th Nov 2023

Year	Sampling Period	No. of Camera stations	Trap nights (effort)	Total photo captured
2023-24	09th April 2023 to 22nd May 2023	22	550	5074
2023-24	25 May 2023 to 27 June 2023	69	1725	9068
2023-24	28th June 2023 to 30th July 2023	69	1725	17303
2023-24	29th July 2023 to 01ST Sept 2023	69	1725	9855
2023-24	02nd Sept 2023 to 30th Sept 2023	69	1725	8778
2023-24	1ST Sept. 2023 to 02nd Oct 2023	69	1725	8000
2023-24	3rd Oct 2023 to 4th Nov 2023	69	1725	8752
	Total	**207**	**7450**	**66254**

The mean daily temperatures of winter range from 5˚C to 20˚C and that of summers range from 30˚C to 45˚C. There are three distinct seasons that is Summer- March to June, Rainy- July to October and winter-November to February. The rainfall of the division and the nearby areas varies from 1000 mm to 1800mm. Due to good rainfall in the division area, moist peninsular high level Sal and moist mixed deciduous forests are noticed, along with extensive Bamboo forests. Most villagers outside in the reserve forest and some people are tribal, and their activities inside forest are grazing livestock and collection of forest products (e.g. fodder for

livestock, non-timber). The division is dominated by Northern Tropical Dry Deciduous Forest, Dry Peninsular Sal Forests and Northern Dry Mixed Deciduous Forests. (Champion & Seth's 1968). The sanctuaries contain forest of good quality having associates like *Terminalia tomentosa. Anogeissus latifolia. Pterocarpus marsupium, Diospyros melanoxylon, Adina cordifolia, Terminalia chebula, terminalia bellerica, lagerstroemia parviflora, Buchananialanzyn, Lannia coromandelica and Dalbergia latifolia* etc. The common plants are *Emblica officinalis, Cassia fistula, Morinda tinctoria. Antidesma species, Randia species, Symplococos racemosus and Cleistanthus collinus.* The under growths in these forests are *Flemingia chappar*, *Indigofera pulchela*, *Wordfordia fruticosa, Desmodium* species, *Strobilanthes* species. The common climbers in these forests are *Bauhinia vahlii* and *Smilax* species while *Combretum decandrum* occurs in valleys and ravines.

Camera trap study

We first carried out an extensive reconnaissance survey in four forest ranges within Bonai Forest Division. During the survey, signs of carnivore viz. scats, pug-marks, claw marks, scraps and scent marks, were recorded and geo-referenced using a geographical positioning system(GPS). we conducted camera trap surveys in the division in three phases from 25th April 2013 to 25 May2023: first phase (69 camera trap stations), second phase 25th August to 25th September 2023(69 camera trap stations) and third phase 25th November to 25th December 2023(69 camera trap stations). Total 207 camera trap stations established in the study area (Fig. 1).Total we setup 207 motion sensor camera traps (Cuddeback Model C1) in Grid wise in division(figure 1). We used 2X2 km2 grids to guide camera placement hole ranges. Camera traps were predominantly set along forest roads, game trails and footpaths. All camera traps were strapped to trees approximately 45 cm above ground. At each location, a pair of traps on either side of the path facing each other was set up to photograph simultaneously both flanks of the animal passing between the cameras. Each location consist one pair camera trap and set to operate 24 hour with programmed to delay sequential photographs by 30 second delay time for capturing for 25 days, yielding a total of 5150 trap nights. Each camera traps were checked at least once a week for battery level, positioning and to replace memory (SD) cards. Each and every photograph was manually checked to identify the species. Total sampling effort was calculated as the sum of the effective days across all stations that each camera was functioning (Boitani and Powell, 2012).

Data analysis

We considered photos separated by at least 30 minutes as independent events (Ohashi et al., 2013; Guo et al. 2017). Data on large and medium sized mammals, bird, reptiles, birds, human traffic and livestocks including date time, year and behavior were collated from camera trap photographs. Data on large and medium sized mammals, human traffic and livestocks including date time, year and behavior were collated from camera trap photographs. Relative abundance index (RAI) was calculated as RAI = A/NX100, Where A is the total number of independent detections of a species by all cameras and N is the total number of camera trap days by all the cameras throughout the study area following (Jenks et al. 2011).

Results

A total 207 locations camera trapping effort of 7450 trap nights with 4126 photographs were captured belonging to 20 families in six order and 28 species, of which 14 species of carnivore, 12 species herbivores, 2 species omnivores 7 birds reported during the study area. Carnivore was the most diverse order with 16 species, followed by Artiodactyla with five, Primates with two, and all other orders with a single species each (Table 2). Table 1 shows all identified species (common and scientific names), the total number of pictures obtained, the RAI for each species as well as the total number of locations where each species was photographed. Out of twenty eight species of mammals were recorded during the survey through camera traps survey of which one species Near Threatened i.e Eurasian otter *Lutra lutra* four species have been categorized as endangered i.e Elephant *Elephas maximus* Rusty Spotted Cat *Prionailurus rubiginosus,* Four-Horned Antelope *Tetracerous quadricornis* and Sloth bear *Melursus ursinus*; three species Vulnerable i.e Indian gaur *Bos gaurus,* sambar *Rusa unicolour* and smoth Coated otter *Lutragale percipillatte,* 14 species as least concern i.e Barking deer *Muntiacus muntjac,* Rhesus Macaque *Macaca mulatta,* Hanuman Longur *Presbytis entellus,* Indian Hare *Lepus nigricollis,* Wild Pig *Sus scrofa,* Indian Grey Wolf *Canis lupus,* Jackal *Canis aureus,* Small Indian Civet *Viverricula indica,* Common Palm Civet *Paradoxurus hemaphroditus,* Rattel *Mellivora capensis,* Porcupine *Hystrix indica,* Grey Mongoose, *Herpestes edwardsii,* Ruddy Mongoose, *Herpestes smithii,* Indian hare *Lepus nigricollis* and Jungle cat *Felis chaus* by the IUCN Read list of threatened species(IUCN 2017; Table-1). According to RAI, the most abundant mammal in the study area was wild boar (RAI=8.08), followed by four-horned

antelope (6.92),leopard *Panthera pardus* (6.26), Jungle cat *Felis chaus* (5.14), Elephant *Elephas maximus* (4.73), Barking deer(4.10)(Table 1, Figure. 4,5 & 6). Throughout the study area, three threatened species were regularly captured: the wild boar *Sus scrofa* (n=418, in 145 locations), four-horned antelope *Tetracerous quadricornis* (n=130, in 46 locations) and leopard *Panthera pardus* (n=324, in 105 locations)(Table 1, Figure. 5&6).

Out of all the photograph of majority of (n=4126) were wildlife and mostly herbivores mammals 38%,(n=2145 followed by carnivore mammals16% (n=680), omnivore mammals 4% (n=185), bird 6% (n=256) and rest of photograph was anthropogenic from movement of live stock, feral dog and human traffic 34% (n=1421) were recorded during the study period (Fig.2). Besides that, camera traps also captured seven birds species including the Jungle fowl (RAI 2.49) and followed by Indian pea fowl (RAI=1.66) the Painted spur fowl (RAI=0.17) Oriental Pied-Hornbill was the minimum photographed species (RAI=0.02) (Fig.2). Among all anthropogenic activity the highest activity of inside the forest is livestocks, human traffic and feral dog (RAI=16.27) followed by Forest Department Staff (RAI=3.64) and Department Vehicle (RAI=3.52) and the Private vehicle for Villagers vehicle for villagers minimum photographed species (RAI=1.58) (Fig.3).

Discussion

Our study confirmed that herbivores species were the most common at each study site followed by omnivorous. Only three species of medium sized carnivores were found in our study Jungle cat *Felis chaus*, rusty spotted cat *Prionailurus rubiginosus* and leopard cat *Prionailurus bengalensis*. The medium size herbivore Wild pig *Sus scrofa* were detected in all locations in contiguous forest during the study and represented relative abundance (RAI 8.08).The large carnivores, *panther pardus,* were detected in all locations (50%)in contiguous forest during the study and represented relative abundance (RAI =6.32). Indian grey wolf *Canis lupus*, leopard cat *Prionailurus bengalensis*, Eurasian otter *Lutra lutra* and smooth coated otter *Lutragale persipicillata* (RAI =0.02) were represented by a relatively low abundance in the study area(Figure 4). The species that were always found in all study locations are twelve species, which includes, Leopard *Panthera paardus,* Sloth bear *Melursus ursinus,* Four-Horned Antelope *Tetracerous quadricornis,* Rhesus Macaque *Macaca mulatta,* Hanuman Longur *Presbytis entellus,*Wild Pig *Sus scrofa,*Small Indian Civet *Viverricula indica,* Common Palm Civet *Paradoxurus hemaphroditus,* Rattel *Mellivora capensis,* Porcupine *Hystrix indica,* Grey and

Mongoose, *Herpestes edwardsii.* During the survey, species like the spotted deer and hyaena were not detected during the entire study period but as per interview with the local villagers the species is available in Kuliposh Range.

The feral dogs were common prey animals occurring abundantly in the reserve forest area. However, the dogs were detected in few locations (36, 17% or 36 out of 207 locations) in the study areas and is unlikely to have significant effect on forest mammals(Table 1). Three hundred eighty six photographs of human beings were captured in 61 camera locations. Eight camera trap was stolen which confirmed the evidences of human activity in the study area and six camera trap was stolen by elephant during the sampling period. Many human trails, paths and traps were found across the study area indicating that the local people regularly go for NTFP(Non Timber Forest Product) collection inside the forest area. Certainly further research is needed to learn about animal diversity and distribution pattern throughout the Division. This study highlights the rich potential of the Bonai Forest Division in relation to the mammalian diversity and the area.

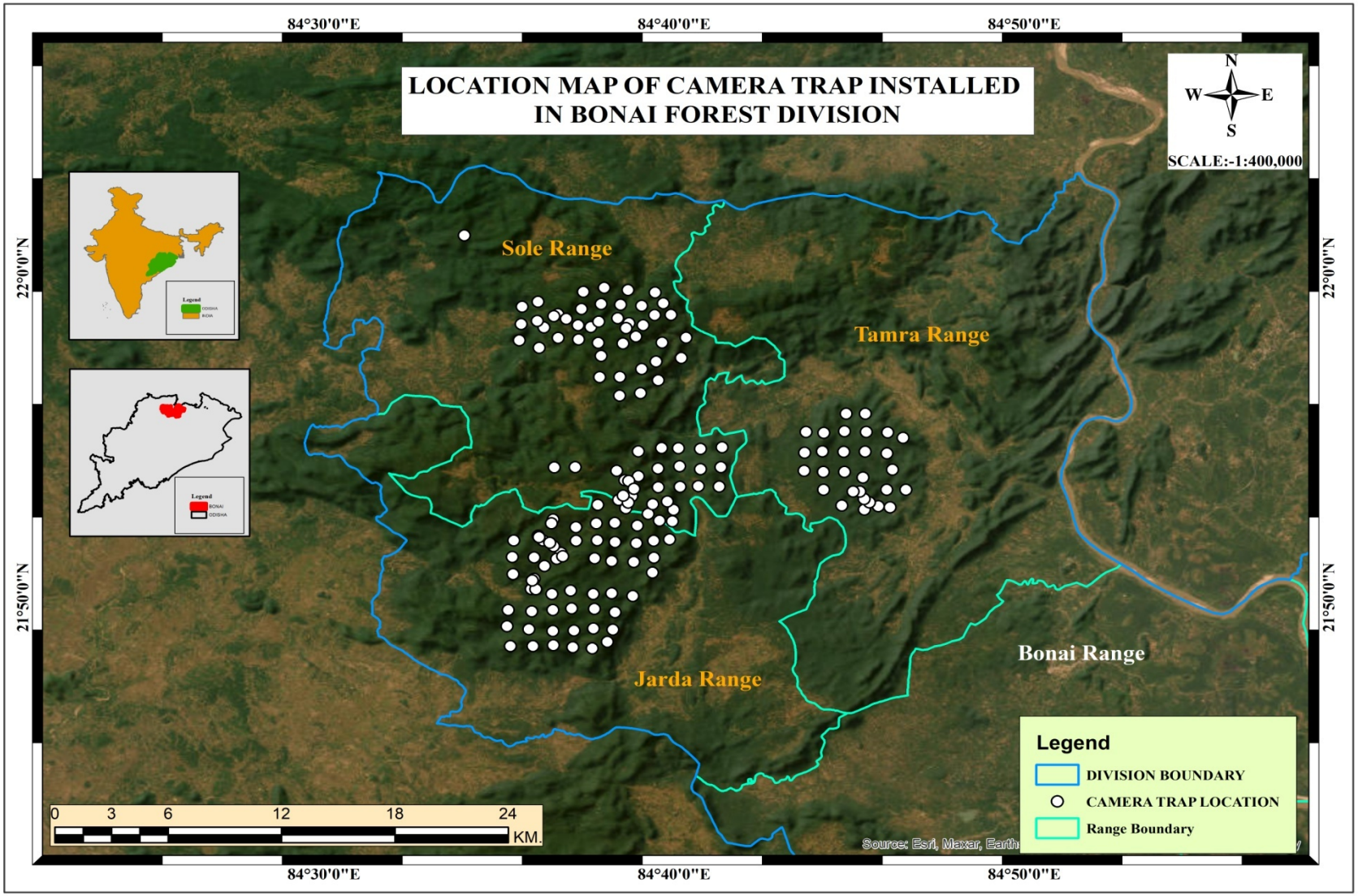


Figure 1. Study area with camera trap installation of Bonai Forest Division, Bonai, Odisha

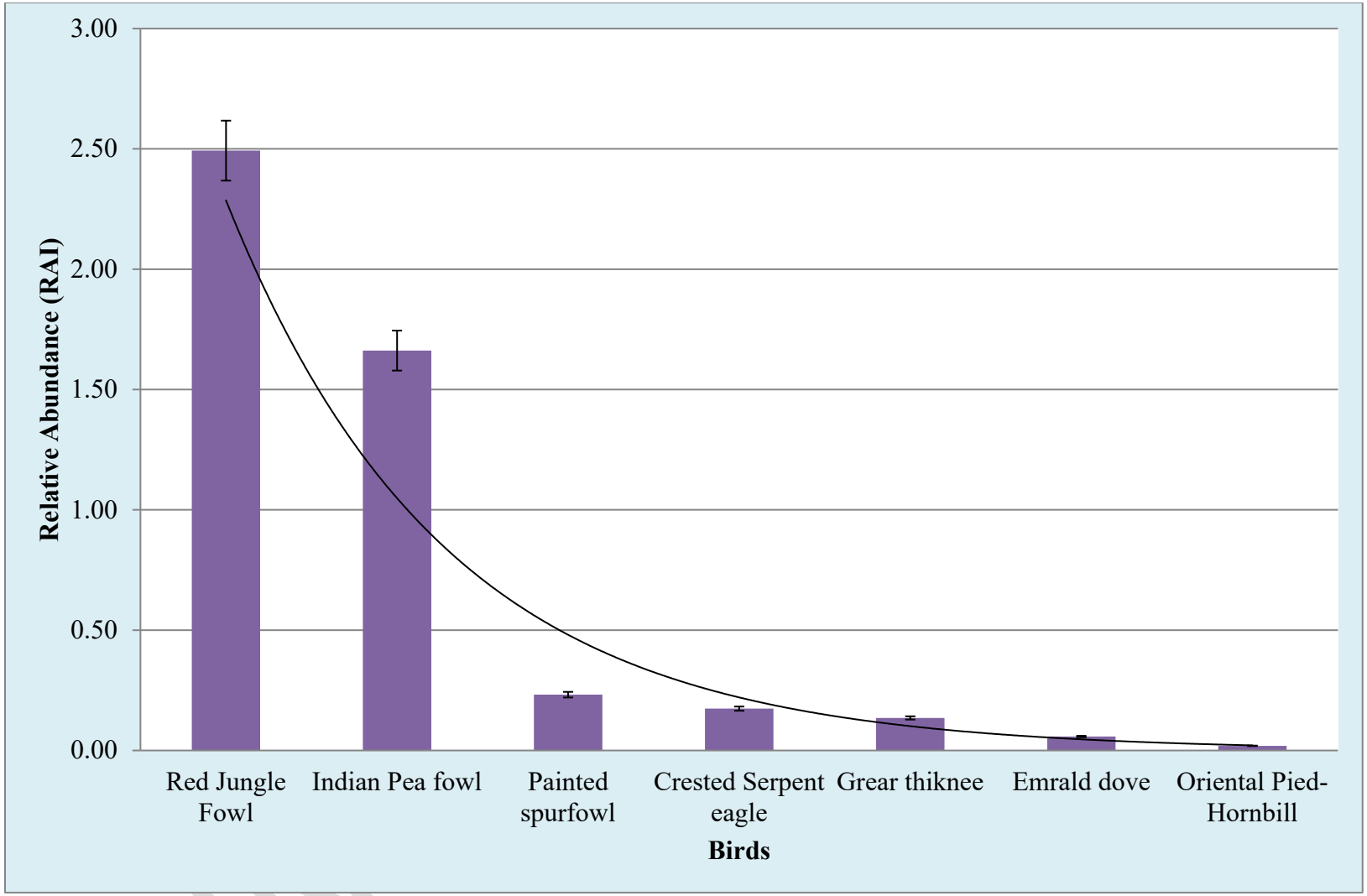


Figure.2.Relative abundance index (RAI) of birds in Bonai Forest Division

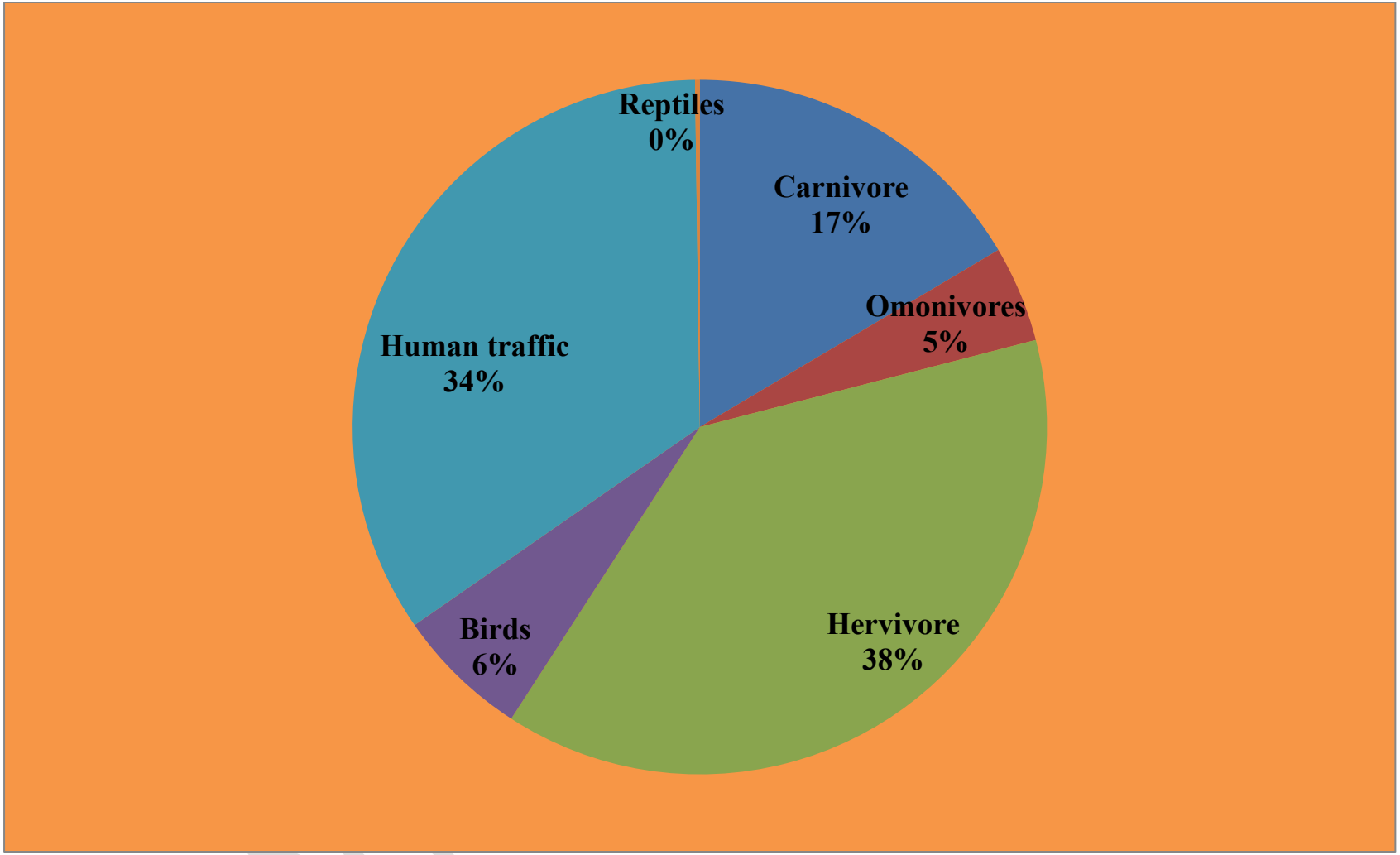


Figure 3. Different wildlife species and others activities based on camera trap photographs captured in Bonai Forest Division during the field-work

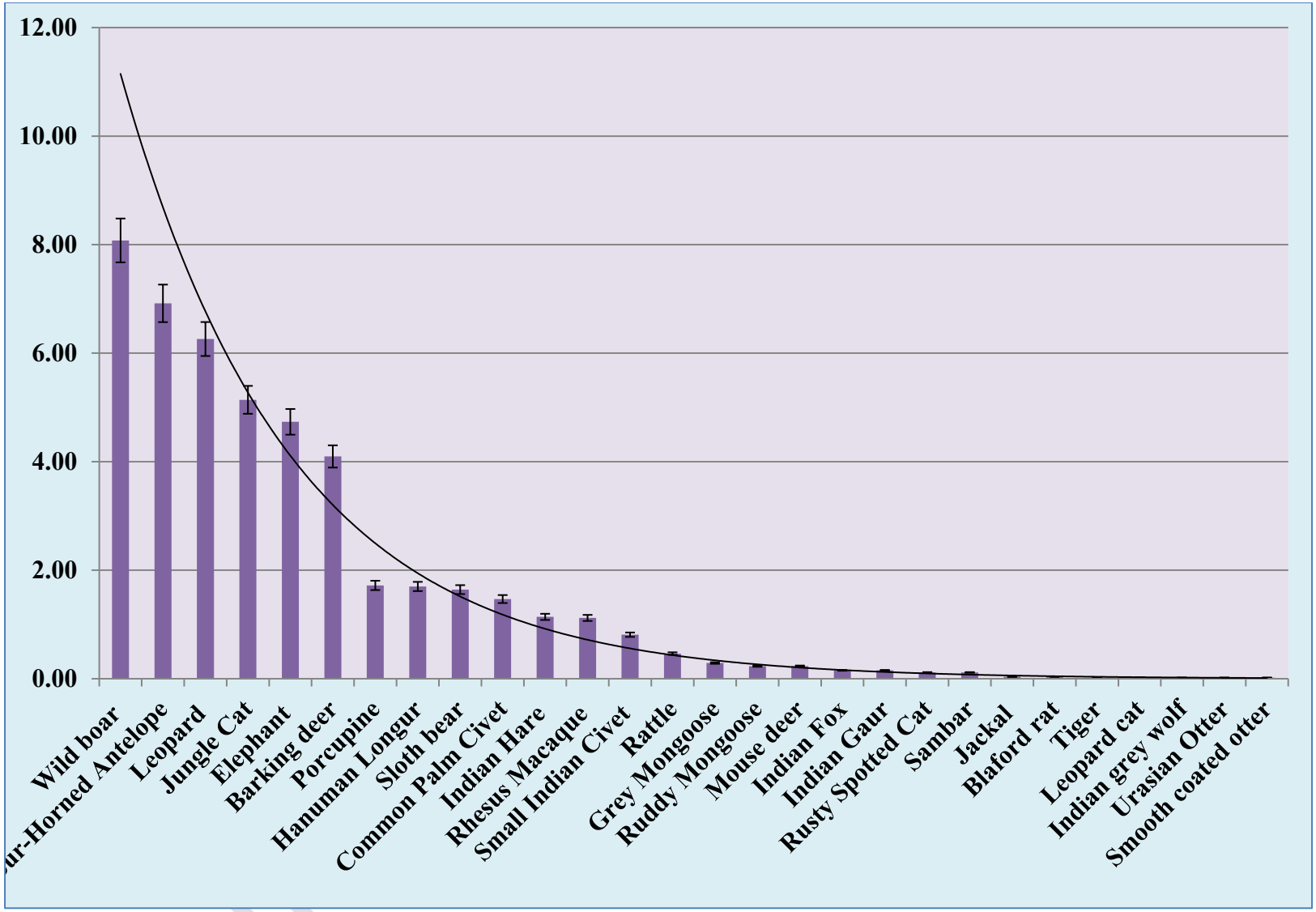


Figure.4.Relative abundance index (RAI) of different mammals in Bonai Forest Division

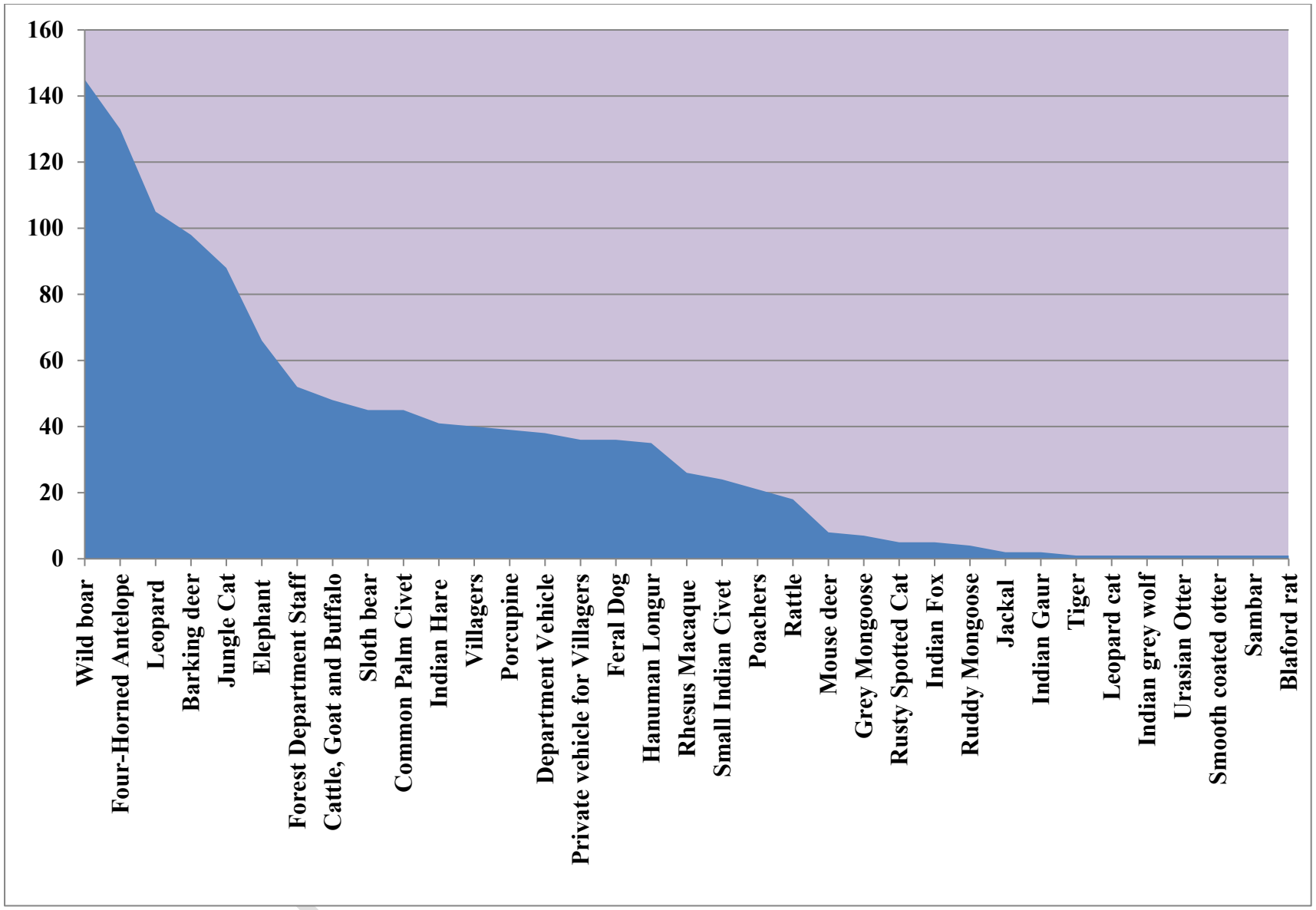


Figure 5. Mammal species recorded in camera trap stations in the study area.

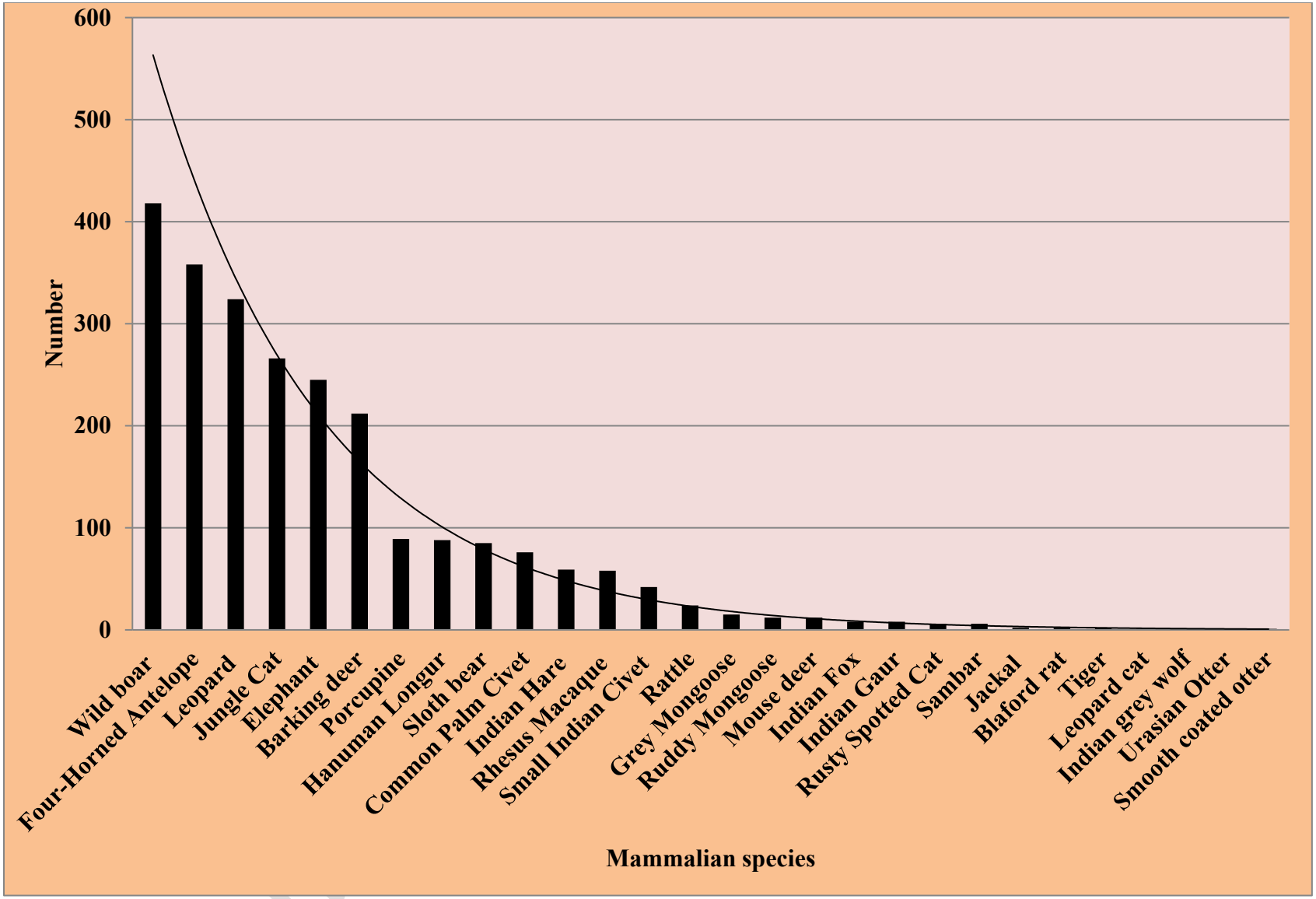


Figure 6. Capture frequency of mammals in the study area.

Table 2. Comparative Relative Abundance Index (RAI) of different wildlife species and others based on camera trap photographs in Bonai Forest Division during the field-work with their current IUCN status and type of encounter.

(EN-Endangered, NT-Near Threatened, VU –Vulnerable, LC- Least Concern)

Sl.N0	Common Name	Order	Families	Scientific Names	WPA Status	IUCN Status	N Camera trap stations with occurrence	%	Total Photo Captured	RAI
	Carnivore									
1	Tiger	Carnivora	Felidae	*Panthera tigris*	Schedule-I	EN	1	0.48	2	0.04
2	Leopard	Carnivora	Felidae	*Panthera pardus*	Schedule-I	EN	105	50.72	324	6.26
3	Rusty Spotted Cat	Carnivora	Felidae	*Prionailurus rubiginosus*	Schedule-I	EN	5	2.42	6	0.12
4	Jungle Cat	Carnivora	Felidae	*Felis chaus*	Schedule-I	LC	88	42.51	266	5.14
5	Leopard cat	Carnivora	Canidae	*Prionailurus bengalensis*	Schedule-I	LC	1	0.48	1	0.02
6	Indian grey wolf	Carnivora	Canidae	*canis lupus*	Schedule-I	LC	1	0.48	1	0.02
7	Jackal	Carnivora	Canidae	*Canis aureus*	Schedule-I	LC	2	0.97	2	0.04
8	Indian Fox	Carnivora	Canidae	*Vulpes bengalensis*	Schedule-I	LC	5	2.42	8	0.15
9	Sloth bear	Carnivora	Ursidae	Melursus ursinus	Schedule-I	EN	45	21.74	85	1.64
10	Rattle	Carnivora	Mustelidae	Mellivora capensis	Schedule-I	LC	18	8.70	24	0.46
11	Small Indian Civet	Carnivora	Viverridae	*Viverricula indica*	Schedule-I	LC	24	11.59	42	0.81

12	Common Palm Civet	Carnivora	Viverridae	*Paradoxurus hemaphroditus*	Schedule-I	LC	45	21.74	76	1.47
13	Grey Mongoose	Carnivora	Herpestidae	*Herpestes edwardsii*	Schedule-I	LC	7	3.38	15	0.29
14	Ruddy Mongoose	Carnivora	Herpestidae	*Herpestes smithii*	Schedule-I	LC	4	1.93	12	0.23
15	Urasian Otter	Carnivora	Mustelidae	*Lutragale persipicillata*	Schedule-I	VU	1	0.48	1	0.02
16	Smooth coated otter	Carnivora	Mustelidae	*Lutra lutra*	Schedule-I	NT	1	0.48	1	0.02
	Herbivores								866	
17	Elephant	Proboscidea	Elephantidae	*Elephas maximus*	Schedule-I	EN	66	31.88	245	4.73
18	Indian Gaur	Artiodactyla	Bovidae	*Bos gaurus*	Schedule-I	EN	2	0.97	8	0.15
19	Sambar	Artiodactyla	Cervidae	*Rusa unicolor*	Schedule-I	VU	1	0.48	6	0.12
20	Four-Horned Antelope	Artiodactyla	Bovidae	*Tetracerous quadricornis*	Schedule-I	VU	130	62.80	358	6.92
21	Barking deer	Artiodactyla	Cervidae	*Muntiacus muntjak*	Schedule-I	LC	98	47.34	212	4.10
22	Mouse deer	Artiodactyla	Tragulidae	*Moschiola indica*	Schedule-I		8	3.86	12	0.23
23	Rhesus Macaque	Primates	Cercopithecidae	*Macaca mulatta*	Schedule-II	LC	26	12.56	58	1.12
24	Hanuman Longur	Primates	Cercopithecidae	*Semnopithecus entellus*	Schedule-II	LC	35	16.91	88	1.70

25	Indian Hare	Lagomorpha	Leporidae	*Lepus nigricollis*	Schedule-I	LC	41	19.81	59	1.14
26	Wild boar	Lagomorpha	Suidae	*Sus scrofa*	Schedule-II	LC	145	70.05	418	8.08
27	Porcupine	Rodentia	Hystricidae	*Hystrix indica*	Schedule-I	LC	39	18.84	89	1.72
28	Blaford rat	Rodentia	Murridae	*Madromys blanfordi*	Schedule-I	LC	1	0.48	2	0.04
	Birds								1575	
29	Crested Serpent eagle	Accipitriformes	Accipitridae	*Spilornis cheela*	Schedule-I	LC	2	0.97	9	0.17
30	Indian Pea fowl	Galliformes	Phasianidae	*Pavo cristatus*	Schedule-I	LC	56	27.05	86	1.66
31	Red Jungle Fowl	Galliformes	Phasianidae	*Gallus gallus*	Schedule-II	LC	89	43.00	129	2.49
32	Painted spurfowl	Galliformes	Phasianidae	*Galloperdix lunulata*	Schedule-IV	LC	6	2.90	12	0.23
33	Oriental Pied-Hornbill	Bucerotiformes	Bucerotidae	*Anthracoceros albirostris*	Schedule-I	LC	1	0.48	1	0.02
34	Emerald dove	Columbiformes	Columbidae	*Chalcophaps indica*	Schedule-IV	LC	1	0.48	3	0.06
35	Great thiknee	Charadriiformes	Charadriidae	*Esacus recurvirostris*	Schedule-IV	NT	2	0.97	7	0.14
	Reptiles									
36	Monitor Lizard		Varanidae	*Varanus bengalensis*	Schedule-I	LC	4	1.93	9	0.17

	Human traffic and Livestock								256	
37	Forest Department Staff						52	25.12	187	3.61
38	Department Vehicle						38	18.36	182	3.52
39	Private vehicle for Villagers						36	17.39	82	1.58
40	Villagers						40	19.32	340	6.57
41	Poachers						21	10.14	46	0.89
42	Cattle, Goat and Buffalo						48	23.19	456	8.81
43	Feral Dog						36	17.39	128	2.47

Figure 7. Camera trap images of mammal species recorded in the study area: a-Tiger | b-Leopard | c-Jungle Cat | d-Leopard cat |e-Rusry-spotted cat| f. India grey Wolf |g-Golden Jackal |h-Bengal Fox |

Figure 8. Camera trap images of mammal species recorded in the study area: i-Sloth Bear j-Ratel |k- Small Indian civet |l-Common Palm Civet| m-Indian Grey Mongoose | n-Ruddy Mongoose| o-Eurasian Otter | p-Smooth coated otter

Figure 9. Camera trap images of mammal species recorded in the study area :| q- Asian Elephant |r-Indian Gaur |s-Sambar | t-Four-horned Antelope | u-Northern Red Muntjac | v-Mouse deer w-Rhesus Macaque x-Hanuman longur

Figure 10. Camera trap images of mammal species recorded in the study area: |y-Indian Hare | z-Wild Pig aa- Indian porcupine ab- Blanfords rat

ADDITIONAL PHOTOGRAPHS

Figure 11.Leopards,Soluguda,Bonai Forest Division

Figure 12 **Leopards,Soluguda,Bonai Forest Division**

Figure 13 Kunjar leopards ,Bonai Forest Division

Figure 14 Leopards,Bonai Forest Division

Figure 15 Sloth bear ,Bonai Forest Division

Figure 16 Rattle, Bonai Forest Division

Figure 17 Small Indian civet cat, Bonai Forest Division

Figure 18 Common palm civet cat,Boai Forest Division

Figure 19 Chowsingha,Bonai Forest Division

Figure 20 Barking deer, Bonai Forest Division

Figure 21 Porcupine, Bonai Forest Division

Figure 22 Hanuman Langur, Bonai Forest Division

C H A P T E R 3

Birds species of Bonai Forest Division, Bonai,Odisha

The avifauna of Odisha have mainly studied by Acharya & Kar (1996), Acharya et al. (1997, 1999), Pandav (1997), Kar et al. 1999, Sahu & Kar (1999, 2000), Singh et al. (2000), Nayak (2003*a*, 2003*b,* 2005), Gopi et al. (2005, 2006), Gopi & Pandav (2007*a*, 2007*b*), Sahu & Rout (2005). Ball (1876, 1877, 1878), Mukherjee (1952), Ripley (1979), Abudalali (1984), Biswas (1954), Beeheler et al. (1985), Majumdar (1988), Singh & Rout (1992), Singh (1993), Kar & Sahu (1993, 1999), Almost all previous information on the birds of Odisha is based on the studies and surveys from its costal region and most of the studies were focused on waterbirds (Kar & Sahu 1993, 1999; Acharya & Kar 1996; Acharya et al. 1997, 1999; Pandav 1997; Kar et al. 1999; Sahu & Kar 1999, 2000; Nayak 2003*a*, 2003*b,* 2005; Gopi et al., 2005, 2006; Gopi & Pandav 2007*a*, 2007*b*). Few studies have done in other parts of Odisha (Ball 1876, 1877, 1878; Mukherjee 1952; Biswas 1954; Ripley 1979; Abudalali 1984; Beeheler et al. 1985; Majumdar 1988; Singh & Rout 1992; Singh 1993; Sahu and Rout 2005). Despite those and other recent works dealing with bird species richness in different areas of Odisha by Palei et al., (2011) Palei et al (2012a), Palei et al (2012b), Palei et al (2014a), Palei et al (2014b), Palei et al (2014c), Palei et al (2014d) , Palei et al (2015), Rajguru (2017) and Pradhan (2012),Palei et al (2011, 2012, 2013), Palei et al (2017), Palei et al (2018a and 2018b), Payra et al (2019, 2019a).

Methodology

Regular surveys were done by walking on fixed routs throughout the study area. Observations were made in the morning and 18:00 hr, depending on the light condition. Recordings were not made at the time of heavy rains. Surveys were conducted on foot in different type of habitat, where sighting chances are more and carried out every day during the study period to encounter the maximum numbers of birds. All identifications were based on Grimmett *et al.* (2001), Balachandran *et al.* (2009), Satyesh*et al.* (2017) and only those species with conformed identification are listed in this paper. Based on the frequency of sightings in the field visits, the following four categories were made on their occurrence. Surveys were conducted twice a week. Birds were observed using 7 X 50 and 7 X 42 Bushnell binoculars and identified. Photograph will be taken by Canon EOS 7D Mark II digital SLR and refined APS-C sized 20.2 megapixel CMOS

sensor with dual DIGIC 6 image andMark II 100-400 lense with Canon EF100-400mm f/4.5-5.6l IS II USM Telephoto Zoom Lens. At each site birds were counted using a binocular before moving to the next point as rapidly as possible without disturbing the birds. We observed details on habitat type, season and status (resident/ migrant). In case of doubtful identification, photographs were taken and the species is identified later by consulting experts. The abundance status and migratory status of birds are categorized into different categorized such as

Common (C): Observed throughout the study in fairly good numbers and abundant in a particular locality. In general, if the percentage of recording is more than 50 times they are grouped in the category.

Uncommon (UC): Found in small numbers and less frequency. Sightings were less than 50 percent and more than 10 percent. (Mostly seasonal migratory birds come to this category.) .

Rare (R): Seen in very small numbers and there frequency of sightings were less than 10 percent.

Occasional (O): Locally distributed but depending on food or nesting purpose visit occasionally.

Winter visitor (WV): A bird which visits a particular area only for the winter season and does not breed there.Summer visitor (SV): A bird which visits a particular area only for the summer season. Partial Visitor (PV): Partial visitor include a part of population of a same species only migrated to another part. Resident (Re): Non migratory birds are said to be Resident birds and they have been able to survive any climate season.

RESULTS

During the study period a total of 189 species of birds belonging to 59 families and 20 orders were recorded from Bonai Forest Division. Detail status, scientific and common names of birds, which shows that the area shows that high diversity of birds in the sanctuary (Table 1). A total 49% (n=114) species resident bird, 44% (n=70) species were winter visitor, 5% (n=12) species were passage visitor and 2% (n=4) species summer visitor recorded to the study area. According to frequency of sighting of birds 93 species (48%) were common, 57 species (28%) were uncommon and 22 species (14%) were rare and 22 species (10%) were occasional recorded from study area.

Table.3 Checklist of birds species of Bonai forest Division Odisha with their current IUCN status.

(R=resident, M=Migratory, W= Winter, S=Summer, FEEDING HABIT: IN=Insectivores, P= Piscivores, CV= Carnivores, GR=Grainivores, FR=Frugivores, OM=Omnivores, ABUNDANCE: C=Common, UC=Uncommon, R=Rare, O=Occasional).

Sl No.	Order/Family	Common Name	Scientific Name	IUCN STATUS	WPA	Abundance	Migratory status
	1.Order: Galliformes						
	1.Phasianidae						
1		Grey francolin	*Francolinus pondicerianus*	LC	II	C	Re
2		Red Jungle Fowl	*Gallus gallus*	LC	II	UC	Re
3		Indian Peafowl	*Pavo cristatus*	LC	I	C	Re
4		Rain quail	*Coturnix coromandelica*	LC	II	UC	Re
		Painted spurfowl	*Galloperdix lonulata*	LC	II	UC	Re
5		Jungle bush quail	*Perdicula asiatica*	LC		UC	Re
	2.Order: Anseriformes						
6	**2.Dendrocygnidae**	Lesser Whistling Duck	*Dendrocygna javanica*	LC	II	C	SV
7	**3.Anatidae**	Ruddy shelduck	*Tadorna ferruginea*	LC	II	C	WV
		Indian Spotbilled duck	*Anas poecilorhyncha*	LC	II	C	WV
		Gadwall	*Mareca strepera*	LC	II		

		Cotton pygmy goose	*Nettapus coromandelianus*	LC	I	UC	Re
		Gargeney	*Spatula querquedula*	LC	II	UC	Re
	3.Order:Podicipediformes						
8	**4.Podicipedidae**	Little Grebe	*Tachybaptus ruficollis*	LC	II	C	Re
	4.Order:Ciconiiformes						
9	**5.Ciconiidae**	Painted stork	*Mycteria leucocephala*	LC	II	R	WV
10		Asian Openbill	*Anastomus oscitans*	LC	II	C	Re
	5.Order: pelecaniformes						
11	**6.Threskiornithidae**	Glossy ibis	*Plegadis falcinellus*	LC	II	UC	WV
12		Black headed Ibis	*Threskiornis melanocephalus*	LC	II	UC	WV
13	**6.Ardeidae**	Black crowned Night Heron	*Nycticorax nycticorax*	LC	II	UC	Re
14		Yellow bittern	*Ixobrychus sinensis*	LC	II	UC	Re
15		Indian pond Heron	*Ardeola grayii*	LC	II	C	Re
16		Grey Heron	*Ardea cinerea*	LC	II	C	WV
17		Purple Heron	*Ardea purpurea*	LC	II	C	WV
18		Cattle Egret	*Bubulcus ibis*	LC	II	C	Re
19		Great Egret	*Casmerodius albus*	LC	II	C	Re

20		Intermediate Egret	*Mesophoyx intermedia*	LC	II	C	Re
21		Little Egret	*Egretta garzetta*	LC	II	C	Re
	7.Order: Suliformes						
22	**9.Phalacrocoracidae**	Little cormorant	*Phalacrocorax niger (Vieillot, 1817)*	LC	II	C	Re
23		Great Cormorant	*Phalacrocorax carbo*	LC	II	UC	Re
	8.Order: Falconiformes			LC			
24	**10.Falconidae**	Common Kestrel	*Falco tinnunculus*	LC	I	O	Re
25		Peregrine falcon	*Falco peregrinus*	LC	I	O	Re
	9.Order: Accipitriformes						
26	**11.Accipitridae**	Black Winged Kite	*Elanus caeruleus*	LC	II	O	WV
27		Black kite	*Milvus migrans*	LC	II	C	Re
28		Black eared kite	*Milvus ineatus*	LC	II	R	Re
29		Jerdon's Baza	*Aviceda jerdoni*	LC	I	O	Re
30		Crested honey buzzard	*Pernis ptilorhynchus*	LC	II	C	Re
31		Palla's fish eagle	*Haliaeetus leucoryphus*	LC	I	R	PV
32		Brahminy kite	*Haliastur indus*	LC	I	O	PV
33		Osprey	*Pandion haliaetus*	LC	I	UC	PV
34		Short toed snake eagle	*Circaetus gallicus*	LC	I	O	PV
35		Crested Serpent eagle	*Spilornis cheela*	LC	I	UC	PV

36		Booted eagle	*Hieraaetus pennatus*	LC	I	O	PV
37		White eyed buzzard	*Butastur teesa*	LC	I	UC	WV
38		Shikra	*Accipiter badius*	LC	I	C	Re
	9.Order: Gruiformes						
39	**12.Rallidae**	Common Moorhen	*Gallinula chloropus*	LC	II	C	Re
40		White-breasted Waterhen	*Amaurornis phoenicurus*	LC	II	C	Re
41		Grey headed swamphen	*Porphyrio porphyrio*	LC	II	C	WV
42		Common Coot	*Fulica atra*	LC	II	UC	WV
	10.Order: Charadriiformes						
43	**13.Turnicidae**	Yellow legged buttonquail	*Turnix tanki*	LC	II	UC	Re
44		Barred buttonquail	*Turnix suscitator*	LC	II	UC	Re
45	**14.Burhinidae**	Indian Thick Knee	*Burhinus oedicnemus*	LC	II	UC	Re
46		Great Thick knee	*Esacus recurvirostris*	LC	II	R	Re
47	**15.Jacanidae**	Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	LC	II	UC	WV
48		Bronze-winged Jacana	*Metopidius indicus*	LC	II	C	Re
49	**16.Recurvirostridae**	Black winged stilt	*Himantopus himantopus*	LC	II	C	WV

50	**17.Charadriidae**	River Lapwing	*Vanellus duvaucelli*	LC	II	C	Re
51		Grey headed Lapwing	*Vanellus cinereus*	LC	II	UC	WV
52		Yellow wattled Lapwing	*Vanellus malabaricus*	LC	II	C	Re
53		Red wattled Lapwing	*Vanellus indicus*	LC	II	C	Re
54		Little ringed plover	*Charadrius dubius*	LC	II	C	Re
55	**18.Scolopacidae**	Common Snipe	*Gallinago gallinago*	LC	II	C	WV
56		Little Stint	*Calidris minuta*	LC	II	UC	WV
57		Temminck's Stint	*Calidris temminckii*	LC	II	C	WV
58		Ruddy turnstone	*Arenaria interpres*	LC	II	UC	WV
		Common sandpiper	*Actitis hypoleucos*	LC	II	UC	WV
		Marsh sandpiper	*Tringa stagnatillis*	LC	II	UC	WV
		Wood sandpiper	*Tringa glareola*	LC	II		WV
		Common greenshank	*Tringa nebularia*	LC	II	UC	WV
	11.Order: Columbiformes						
59	**19.Columbidae**	Eurasian Collared Dove	*Streptopelia decaocto*	LC	II	C	WV
60		Spotted Dove	*Streptopelia chinensis*	LC	II	C	Re
61		Laughing Dove	*Streptopelia senegalensis*	LC	II	C	Re
62		Common Pigeon	*Columba livia*	LC	II	C	Re

63		Orange breasted green pigeon	*Treron bicinctus*	LC	II	UC	PV
64		Yellow footed green pigeon	*Treron phoenicoptera*	LC	II	UC	PV
65		Oriental Turtle Dove	*Streptopelia orientalis*	LC	II	O	WV
	12.Order: Psittaciformes						
66	**20.Psittacidae**	Alexandrine Parakeet	*Psittacula eupatria*	LC	II	C	Re
67		Rose-ringed Parakeet	*Psittacula krameri*	LC	II	C	Re
68		Plum-headed Parakeet	*Psittacula cyanocephala*	LC	II	R	WV
	13.Order: Cuculiformes						
69	**21.Cuculidae**	Jacobin Cuckoo	*Clamator jacobinus*	LC	II	O	WV
70		Common Hawk Cuckoo	*Hierococcyx varius*	LC	II	C	Re
71		Chestnut winged cuckoo	*Clamator coromandus*	LC	II	O	Re
72		Common cuckoo	*Cuculus canorus*	LC	II	O	Re
73		Plaintive cuckoo	*Cacomantis merulinus*	LC	II	O	Re
74		Grey bellied Cuckoo	*Cacomantis passerinus*	LC	II	UC	WV
75		Asian koel	*Eudynamys scolopacea*	LC	II	C	Re
76		Southern Coucal	*Centropus sinensis*	LC	II	C	Re

	14.Order: Strigiformes			LC			
77	**22.Tytonidae**	Barn Owl	*Tyto alba*	LC	I	R	Re
78	**23.Strigidae**	Indian Scops Owl	*Otus bakkamoena Pennant, 1769*	LC	II	R	Re
79		Spotted Owlet	*Athene brama*	LC	II	C	Re
80		Mottled wood owl	*Strix ocellata*	LC	II	R	Re
		Indian Eagle owl			I		
81		Brown fish owl	*Bubo zeylonensis*	LC	I	R	PV
82		Dusky eagle Owl	*Bubo coromandus*	LC	II	UC	Re
83		Brown hawk owl	*Ninox scutulata*	LC	II	R	PV
84		Jungle Owlet	*Glaucidium radiatum*	LC	II	R	Re
	15.Order: Bucerotiformes			LC			
85	**24.Upupidae**	Common Hoopoe	*Upupa epops*	LC	II	O	WV
	16.Order: Caprimulgiformes			LC			
86	**25.Caprimulgidae**	Jerdon's Nightjar	*Caprimulgus atripennis*	LC	II	C	Re
		Junmgle Nightjar		LC	II		Re
87		Indian Nightjar	*Caprimulgus asiaticus*	LC		C	Re
	17.Order: Apodiformes			LC			
88	**26.Apodidae**	Asian palm swift	*Cypsiurus balasiensis*	LC	II	UC	Re
89		Little swift	*Apus affinis*	LC	II	C	Re
	18.Order: Coraciiformes			LC			

90	**27.Coraciidae**	Indian roller	*Coracias benghalensis*	LC	II	C	Re
91	**28.Halcyonidae**	Stork billed kingfisher	*Halcyon capensis*	LC	II	R	Re
92		Black capped kingfisher	*Halcyon pileata*	LC	II	C	Re
93		White throated kingfisher	*Halcyon smyrnensis*	LC	II	C	Re
94	**29.Alcedinidae**	Common kingfisher	*Alcedo atthis*	LC	II	UC	Re
95	**30.Cerylidae**	Pied Kingfisher	*Ceryle rudis*	LC		C	Re
96	**31.Meropidae**	Blue-tailed Bee-eater	*Merops philippinus*	LC	II	C	Re
97		Green Bee-eater	*Merops orientalis*	LC	II	C	Re
	19.Order: Piciformes						
98	**32.Megalaimidae**	Brown headed Barbet	*Megalaima zeylonica*	LC	II	C	Re
99		Coppersmith Barbet	*Megalaima haemacephala*	LC	II	C	Re
100	**33.Picidae**	Rufous woodpecker	*Celeus brachyurus*	LC	II	UC	Re
101		Grey headed Woodpecker	*Picus canus*	LC	II	UC	Re
		Yellow capped woodpecker			I		
102		Black rumped Flameback	*Dinopium benghalense*	LC	II	C	Re
	20.Order: Passeriformes						

103	**34.Aegithinidae**	Common Iora	*Aegithina tiphia*	LC		C	Re
104	**35.Artamidae**	Ashy woodshallow	*Artamus fuscus*	LC	II	UC	WV
105	**36.Campephagidae**	Large cuckooshrike	*Coracina macei*	LC	II	UC	WV
106		Black winged cuckooshrike	*Coracina melaschistos*	LC	II	R	WV
107		Rosy minivet	*Pericrocotus roseus*	LC	II	O	PV
108		Black headed cuckooshrike	*Coracina melanoptera*	LC	II	R	WV
109	**37.Lanidae**	Long tailed Shrike	*Lanius schach*	LC	II	C	WV
110		Brown Shrike	*Lanius cristatus*	LC	II	C	Re
111		Bay backed Shrike	*Lanius vittatus*	LC	II	R	WV
112		Black Drongo	*Dicrurus macrocerus*	LC	II	C	Re
113		Spangled drongo	*Dicrurus bracteatus*	LC		C	Re
114		White bellied drongo	*Dicrurus caerulescens*	LC	II	C	Re
115		Ashy drongo	*Dicrurus leucophaeus*	LC	II	UC	Re
116	**38.Oriolidae**	Indian golden Oriole	*Oriolus oriolus*	LC	II	C	WV
117		Black napped oriole	*Oriolus chinensis*	LC	II	UC	Re

118		Black hooded Oriole	*Oriolus xanthornus*	LC	II	C	Re
119	**39.Corvidae**	Rufous Treepie	*Dendrocitta vagabunda*	LC	II	C	Re
120		House Crow	*Corvus splendens*	LC	II	C	Re
121		Jungle Crow	*Corvus macrorhynchos*	LC	II	C	Re
122	**40.Hirundinidae**	Streak throated Swallow	*Hirundo fluvicola*	LC	II	O	WV
123		Barn Swallow	*Hirundo rustica*	LC	II	C	Re
124		Wire tailed swallow	*Hirundo smithii*	LC	II	UC	Re
125		Red rumped Swallow	*Hirundo daurica*	LC	II	UC	WV
126	**41.Alaudidae**	Jerdon's bushlark	*Mirafra affinis*	LC	II	C	Re
127		Indian bushlark	*Mirafra erythroptera*	LC	II	UC	Re
128		Bengal bushlark	*Mirafra assamica*	LC	II	O	WV
129		Ashy crowned sparrow Lark	*Eremopterix grisea*	LC	II	O	WV
130		Oriental Skylark	*Alauda gulgula*	LC	II	C	Re
131	**42.Pycnonotidae**	Red-vented Bulbul	*Pycnonotus cafer*	LC	II	C	Re
132		Red-whiskered Bulbul	*Pycnonotus jocosus*	LC	II	C	Re
		Black headed bulbul		LC	II	UC	

133		White browed Bulbul	*Pycnonotus luteolus*	LC	II	UC	WV
134	**43.Cisticolidae**	Ashy prinia	*Prinia socialis*	LC	II	UC	SV
135		Plain Prinia	*Prinia inornata*	LC	II	C	Re
136		Zitting Cisticola	*Cisticola zuncidis*	LC	II	UC	WV
137	**44.Sylvidae**	Greenish Leaf warbler	*Phylloscopus trochiloides*	LC	II	C	WV
138		Yellow eyed Babbler	*Chrysomma sinense*	LC	II	C	Re
139		Common Tailor Bird	*Orthotomus sutorius*	LC	II	C	Re
140		Clamorous Reed Warbler	*Acrocephalus stentoreus*	LC	II	UC	WV
141		Blyth's Reed Warbler	*Acrocephalus dumetorum*	LC	II	UC	WV
142		Booted Warbler	*Iduna caligata*	LC	II	UC	Re
143		Western crowned warbler	*Phylloscopus occipitalis*	LC	II	R	Re
144		Common Chiffchaff	*Phylloscopus collybita*	LC	II	C	Re
145	**45.Locustellidae**	Striated grassbird	*Megalurus palustris*	LC		C	Re
146	**46.Pellorneidae**	Puff throated Babbler	*Pellorneum ruficeps*	LC	II	O	WV
147	**47.Leiothrichidae**	Jungle Babbler	*Turdoides striatus*	LC	II	C	Re
148	**48.Sturnidae**	Jungle myna	*Acridotheres fuscus*	LC	II	C	Re

149		Common myna	*Acridotheres tristis*	LC	II	C	Re
150		Asian pied starling	*Gracupica contra*	LC	II	C	Re
151		Chestnut tailed starling	*Sturnus malabaricus*	LC	II	C	WV
152		Brahminy starling	*Sturnus pagodarum*	LC	I	C	WV
153		Rosy starling	*Sturnus roseus*	LC	II	C	WV
154	**49.Monarchidae**	Indian paradise flycatcher	*Terpsiphone paradisi*	LC	II	O	WV
155		Black naped monarch	*Hypothymis azurea*	LC	II	R	WV
156	**50.Muscicapidae**	Orange headed Thrush	*Zoothera citrina*	LC	II	O	WV
157		Oriental Magpie Robin	*Copsychus saularis*	LC	II	C	Re
158		Indian Robin	*Saxicoloides fulicata*	LC	II	C	Re
159		Pied bushchat	*Saxicola caprata*	LC	II	C	Re
160		Blue rock Thrush	*Montocola solitarius*	LC	II	R	WV
161		Blue capped rock thrush	*Munticola cinclorhyncha*	LC	II	C	Re
162		Asian brown flycatcher	*Muscicapa dauurica*	LC	II	UC	WV
163		Blue throated blue flycatcher	*Cyornis rubeculoides*	LC	II	UC	WV

164		Tickell's blue flycatcher	*Cyornis tickelliae*	LC	II	R	WV
165		Verditer flycatcher	*Eumyias thalassinus*	LC	II	UC	SV
166		Taiga flycatcher	*Ficedula albicila*	LC	II	UC	WV
167	**51.Irenidae**	Jerdon's Leafbird	*Chloropsis cochinchinensis*	LC	II	C	Re
		Golden fronted leafbird		LC	II	C	Re
168	**52.Dicacidae**	Pale bellied Flowerpecker	*Dicacum erythrohynchos*	LC	II	UC	WV
169	**53.Nectariniidae**	Purple rumped sunbird	*Nectarinia zeylonica*	LC	II	C	Re
170		Purple sunbird	*Nectarinia asiatica*	LC	II	C	WV
171	**54.Passeridae**	House sparrow	*Passer domesticus*	LC	II	UC	Re
172		Black breasted weaver	*Ploceus benghalensis*	LC	II	C	Re
173		Baya Weaver	*Ploceus philippinus*	LC	II	R	WV
174		Red Munia	*Amandava amandava*	LC	II	R	WV
175		White-throated Munia	*Lonchura malabarica*	LC	II	O	WV
176		White-rumped Munia	*Lonchura striata*	LC	II	O	WV
177	**55.Estrildidae**	Scaly breasted munia	*Lonchura punctulata*	LC	II	C	WV
		Red Munia			II	UC	Re

		Indian Silverbill			II		
178		Black-headed Munia	*Lonchura malacca*	LC	II	UC	WV
179	**56.Motacillidae**	Yellow wagtail	*Motacilla flava*	LC	II	C	WV
180		Citrine wagtail	*Motacilla citreola*	LC	II	C	WV
181		Forest Wagtail	*Dendronanthus indicus*	LC	II	R	SV
182		Grey wagtail	*Motacilla cinerea*	LC	II	UC	WV
183		White wagtail	*Motacilla alba*	LC	II	C	WV
184		White browed wagtail	*Motacilla maderaspatensia*	LC	II	UC	WV
185		Blyth's pipit	*Anthus godlewskii*	LC	II	C	Re
186		Paddyfield pipit	*Anthus rufulus*	LC	II	C	Re
187		Olive backed pipit	*Anthus hodgsonii*	LC	II	O	WV
188	**57.Paridae**	Cinereous tit	*Parus cinereous*	LC	II	O	WV
189	**58.Chloropseidae**	Golden-fronted leaf bird	*Chloropsis enrifrons*	LC	II	O	WV

Crested Serpent Eagle

Common kestrel

Brahmini kite

Black kite

Indian [illegible]ps owl

Jungle Owlet

Spotted Owl

Crested Serpent Eagle(Juvenile)

Pied kingfisher

Common kingfisher

Indian Roller

Black naped monarch

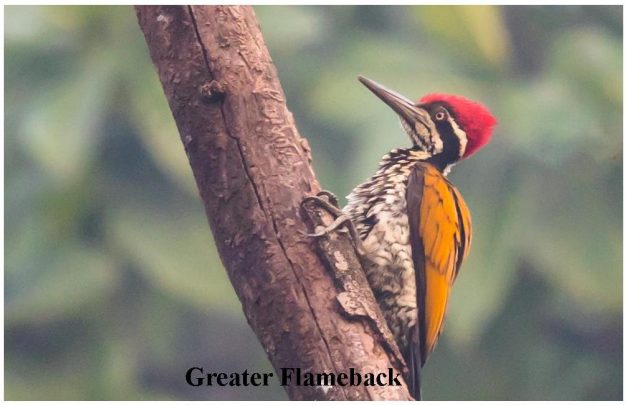
Black winged Cuckooshrike

Common Iora

Cinereous Tit

Golden fronted Leafbird


Gray Wagtail


Greater Flameback


Greenish Warbler


Indian Yellow tit


Jungle Nightjar


Large Cuckooshrike


Little ringed plover


Oriental Magpie Robin

Oriental White eye

Red vented bulbul

Shaheen falcon

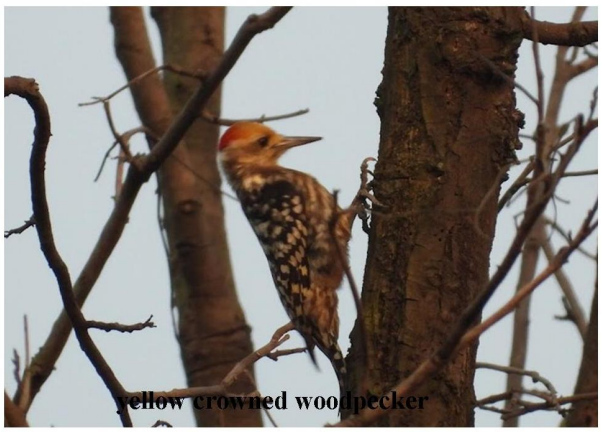
Scarlet minivet

Scaly brested Munia

Taiga Flycatcher

Verditer Flycatcher

Wire tailed swallow



Yellow crowned woodpecker

White rumped shama

Yellow footed green pegion

Yellow throated sparrow

Oriental white eye

Green bee eaters

Indian peocock

Red jungle fowl

Herpetofauna of Bonai Forest Division, Bonai,Odisha

HERPETOFAUNA

Herpetofauna play a very important role in the food chain of both terrestrial and aquatic ecosystems. The tropical forest of India is one of the most complex and richest forests in the world, rich not only in terms of numbers of species but also in terms of diversity of habitats and ecosystems. India as one of the world's most biologically diverse countries, the forest supports support extensive reptile and amphibian communities. Herpetofauna play a very important role in the food chain of both terrestrial and aquatic ecosystems. The general ecological importance of herpetofauna lies in them being predators acting as primary and secondary carnivores on insects, some of which are crop pests or disease vectors (Behangana 2004). They are widely considered to be useful as indicator species (Welsh and Ollivier 1998, Sheridan and Olson 2003). Amphibians in India are highly diverse with 342 species of which 305 are anurans (Dinesh et al. 2012; Anil et al. 2011; Biju et al. 2011). Most of the studies on amphibians have been concentrated in the Western Ghats (biodiversity hotspot); on the west coast of India, and other areas remain understudied (Aravind and Gururaja 2011). Unfortunately, this region is greatly threatened by habitat loss and fragmentation caused by mining and mining related activities, logging and population growth (Chowdhury 2015). The aim of this study is to present an extensive updated list of the reptiles in the Bonai Forest Division.

Results

The reptiles were represented by 59 species from 13 families. In the study area, 21 species of snakes, 17 species of Lizards, and one species of Turtles were recorded (Table 5.2 and Fig 5.2). Highest eleven species were from family Colubridae, 5 species from families Gekkonidae and Scincidae, 4 species from family Elapidae, 3 species from Agamidae and Viperidae, 2 species from family Boidae, and 1 species from families Trionychidae, Chamaeleonidae, Varanidae and Typhlopidae.

Table 4. Herpetofauna of Bonai Forest Division, Bonai, Odisha with their current IUCN status.

	PHYLUM: CHORDATA, CLASS: REPTILIA ORDER : TESTUDINES, Suborder: Cryptodira, Family : Geoemydidae				
1	*Melanochelys trijuga indopeninsularis (*Annandale, 1913*)*	Indian black turtle	Sch. I	VU	Uncommon
2	*Melanochelys tricarinata (Blyth,1856)*	Tricarinate hill turtle	Sch. I	VU	Uncommon
	Family Trionychidae		Sch. I		
3	*Lissemys punctata punctata (Lacépède, 1788)*	Indian flapshell turtle	Sch. I	LR/LC	Common
	ORDER : SQUAMATA, Suborder : Sauria, Family : Agamidae				
4	*Calotes versicolor (Daudin, 1802)*	Indian gardenlizard	None	NA	Common
5	*Psammophilus blanfordanus (Stoliczka,, 1871)*	Blanford's rock agama	None	LC	Common
6	*Sitana ponticeriana(Cuviar, 1844)*	Fan throated lizard	None	LC	Uncommon
	Family:Chamaeleonidae				
7	*Chamaeleo zeylanicus Laurenti, 1768*	Indian Chameleon	Sch. I	LC	Uncommon
	Family Eublepharidae				
8	*Eublepharis hardwickii Gray, 1827*	East Indian leopard gecko	None	LC	Common
	Family : Gekkonidae				
9	*Cyrtodactylus nebulosus Beddmi, 1870*	Clouded geckoela	None	LC	Uncommon
10	*Hemidactylus parvimaculatus(*gray, 1845)	Spotted indian house	None	LC	Common

		gecko			
11	*Hemidactylus frenatus Duméril & Bibron, 1836*	Asian house gecko	None	LC	Common
12	*Hemidactylus flaviviridis* Ruppell, 1835	Indian house gecko	None	NA	Common
13	*Hemidactylus lelchenaulti* Dumeril & Bibron, 1836	Bark gecko	None	NA	Common
14	*Hemidactylus sp.*	East Indian forest gecko		LC	Uncommon
	Family Lygosomidae				
15	*Lygosoma albopunctatum (Gray, 1846)*	White-spotted supple skink	None	NA	Common
16	*Lygosoma punctata (Gmelin, 1799)*	Common snake skink	None	NA	Rare
	Family Mabuyidae				
17	*Eutropis beddomii(Jerdon, 1870)*	Beddome's grass skink	None	NA	Rare
18	*Eutropis carinata (Schneider, 1801)*	Common keeled skink	None	LC	Common
19	*Eutropis macularia (Blyth,1853)*	Bronze grass skink	None	NA	Common
	Family : Varanidae				
20	*Varanus bengalensis (Daudin, 1802)*	Bengal monitor	Sch. I	LC	Common
21	*Varanus flavescens (Hardwicke & Gray, 1827)*	Yellow monitor	Sch. I	LR/LC	Uncommon
	Suborder: Serpentes, Family : Colubridae				
22	*Argyrogena fasciolatus (Shaw, 1802)*	Banded racer	Sch. IV	NE	Uncommon
23	*Boiga flaviviridis Vogel & Ganesh, 2013*	Yellow-bellied cat snake	Sch. IV	NA	Rare
24	*Boiga forsteni (Duméril, Bibron & Duméril, 1854)*	Forsten's cat snake	Sch. IV	LC	Common

25	*Boiga trigonata (Bechstein,1802)*	Common cat snake	Sch. IV	LC	Common
26	*Coelognathus helena helena (Daudin, 1803)*	Common trinket snake	Sch. IV	NA	Common
27	*Coelognathus helena nigriangularis Mohapatra, Schulz, Helfenberger, Hofmann & Dutta, 2016*	Arrow-headed trinket snake	Sch. IV	NA	Rare
28	*Coelegnathus radiatus (schlegel, 1837)*	Copper-headed trinket snake	Sch. IV	LC	Uncommon
29	*Enhydris enhydris (Schneider, 1799)*	Rainbow water snake	Sch. IV	LC	Uncommon
30	*Lycodon aulicus (Linnaeus,1754)*	Common wolfsnake	Sch. IV	NA	Common
31	*Lycodon jara (Shaw, 1802)*	Twin- wolf snake	Sch. IV	LC	Uncommon
32	*Lycodon striatus (Shaw, 1802)*	Barred wolf snake	Sch. IV	NA	Common
33	*Oligodon arnensis (Shaw, 1802)*	Bamded kukri snake	Sch. IV	NA	Common
34	*Oligodon taeniolatus (Daudin,1803)*	Russels kukri		LC	
35	*Ptyas mucosa (Linnaeus, 1758)*	Indian Rat snake	Sch. II	NA	Common
36	*Sibynophis sagittarius (Canter, 1839)*	Cantor's black headed snake	Sch. IV	NA	Uncommon
	Family : Ahaetulidae				
37	Ahaetulla anomala (Annandale, 1906)	Variable vine snake	Sch. IV	NE	Common
38	Ahaetulla laulankia (Deepak etal., 2019)	Laudankia vine snake	Sch. IV	NA	Rare
39	Ahaetulla nasuta (Andersson, 1898)	Common vine snake	Sch. IV	LC	Uncommon
40	Dendrelaphis tristis (Daudin,1803)	Common bronzeback	Sch. IV	LC	Common
41	Chrysopelea ornata (Shaw,1802)	Ornate flying snake	Sch. IV	LC	Uncommon
	Family : Elapidae				

42	*Naja naja (Linnaus, 1758)*	Spectacled cobra	Sch. II	LC	Common
43	*Naja Kaouthia (Lesson, 1831)*	Monocled cobra	Sch. II	LC	Uncommon
44	*Bungarus caeruleus* (Schneider, 1801)	Common krait	Sch. IV	LC	Common
45	*Bungarus fasciatus* (Schneider, 1801)	Banded krait	Sch. IV	LC	Uncommon
46	*Ophiophagus hannah (Cantor,1836)*	King cobra	Sch. II	VU	Rare
	Family : Erycidae				
47	*Eryx conicus* (Schneider, 1801)	Common sand boa	Sch. IV	NA	Uncommon
48	*Eryx Johnii (Russell, 1801)*	Red sand boa	Sch. IV	NA	Uncommon
	Family : Natricidae				
49	*Amphiesma stolatum (Linnaeus,1758)*	Striped keelback	Sch. IV	NA	Common
50	*Atretium schistosum (Daudin,1803)*	Olive keelback	Sch. II	LC	Rare
51	*Rhabdophis plumbicolor(Cantor,1839)*	Green keelback			
52	*Fowlea piscator (schneider, 1799)*	Checkered keelback	Sch. II	NA	Common
	Family Pythonidae				
53	*Python molurus (Linnaeus, 1758)*	Rock python	Sch. I	VU	Common
	Family :Asiatyphlopidae				
54	*Indotyphlops braminus (Daudin, 1803)*	Brahminy worm snake	Sch. IV	NA	Common
55	*Grypotyphlops acutus (Duméril & Bibron, 1844)*	Beaked worm snake	Sch. IV	LC	Uncommon
	Family Viperidae				
56	*Daboia russelii (Shaw & Nodder,1797)*	Russell's viper	Sch. II	LC	Common
57	*Echis carinatus carinatus (Schneider, 1801)*	Indian saw-scaled viper	Sch. IV	NA	Rare

Invertebrate (Butterflies) of Bonai Forest Division, Bonai,Odisha

The Indian sub-region hosts about 1,504 species of butterflies (Kunte 2009; Roy et al. 2010) of which peninsular India hosts 351, and the Western Ghats 334. In central India, the butterfly diversity reported by D'Abreau (1931) totaled 177 species occurring in the erstwhile Central Provinces (now Madhya Pradesh, Chattisgarh & Vidarbha). Although many pioneer workers carried out research on the butterflies species diversity in different parts of India(Mason and Niceville,1886, Talbot, 1939,1947;Wynter-Blyth,1975; and Varshney and Chanda, 1971), Few works has been undertaken for documenting the butterflies diversity in Orissa (Anonymous,1995;Sethy,2004 Sahu et. al,2006 and Nair, 2007) al Most of the butterfly studies have been carried out Similipal Tiger Reserve, and Nandankanan Wildlife Sanctuary, Mishra (2010)

Results

The study on butterflies diversity of Bonai Forest Division, Odisha was carried out between 1st April 2023 to 30th September 2023. During the survey period a total 136 butterfly species, belonging to the families Nymphalidae, Pieridae, Lycaenidae, Papilionidae and Hesperiidae. Butterflies survey was undertaken along five different transect in the sanctuary for a period of five months. Maximum number of species were observed in the family Nymphalidae (31%,n=128), followed by Lycaenidae (27%), Hesperidae (17%) Pieridae (13%), Papilionidae (12%) and respectively.

Table 5. Invertebrate (Butterflies) of Bonai Forest Division, Bonai,Odisha

	FAMILY NYMPHALIDAE			
SL No	**Common Name**	**Scientific Name**	**Habitat**	**Larva Food Plant**
1	Tawny Coster	*Acraea violae*	OF,GL	Passifloraceae plants
2	Common Evening Brown	*Melanitis leda*	SEG,MDF	Oryza, Panicus,
3	Common Palmfly	*Elymnias hypermnestra*	MDF	Bamboos and Palms
4	White-bar Bushbrown	*Mycalesis anaxias*	SEG	Oryza, and other Grasses
5	Common Bushbrown	*Mycalesis perseus*	SEG,MDF,OF	Oryza, and other Grasses
6	Darkbrand Bushbrown	*M.mineus*	MDF	Microstegium,
7	Nigger	*Orsotrioena medus*	MDF	Oryza, Imperata sp.
8	Common Fivering	*Ypthima baldus*	MDF,SEG	Grasses
9	Common Fourring	*Y.hubenri*	MDF,SEG	Grasses
10	Tawny Rajah	*Charaxes polyxena*	SEG	Tamarindus (Leguminosae),
11	Black Rajah	*C.solon*	SEG,MDF	Tamarindus (Leguminosae)
12	Common Nawab	*Polyura athamas*	SEG,MDF	Acacia, Delonix, Albizia,
13	Angled Castor	*Ariadne aradne*	MDF,OF	Ricinus communis
14	Common castor	*A.merione*	MDF	Ricinus communis, Tragia
15	Common Leopard	*Phalantha phalantha*	MDF,SEG	Flacourtia, Smilax

16	Indian Fritillary	*Argyreus hyperbius*	GL, MDF	Violaceae herbs
17	Yellow Pansy	*Precis hierta*	OF,GL	Barleria, Hygrophila
18	Blue Pansy	*P.orithya*	OF,GL	Justicia, Lepidagathis
19	Lemon Pansy	*P.lemonias*	MDF,GL	Barleria, Sida
20	Peacock Pansy	*P.almana*	MDF,OF	Acanthus, Barleria,
21	Grey Pansy	*P.atlites*	MDF,OF	Barleria, Hygrophila
22	Chocolate Soldier	*P.iphita*	SEG,MDF	Justicia, Hygrophila
23	Danaid Eggfly	*Hypolimnas misippus*	MDF	Portulaca oleracea
24	Great Eggfly	*H.bolina*	SEG,MDF	Sida, Portulaca,
25	Common Map	*Cyrestis thyodamas*	SEG	Ficus sp
26	Common Sailor	*Neptis hylas*	SEG,MDF,OF	Bombax, Helicteres, Grewia,
27	Chestnut-streaked	Sailor *N.jumbah*	SEG	Grewia, Bombax, Xylia
28	Common Lascar	*Pantoporia hordonia*	SEG,MDF	Acacia, Albizia
29	Colour Sergeant	*Parathyma nefte*	SEG,MDF	Glochidion
30	Common Sergeant	*P.perius*	MDF	Glochidion
31	Baronet	*Symphaedra nais*	MDF,OF	Shorea, Diospyros
32	Common Baron	*Euthalia aconthea*	MDF,OF	Mangifera, Anacardium
33	Grey Count	*Tanaecia lepidea*	OF,GL	Melastoma Careya arborea
34	Commander	*Moduza procris*	SEG,MDF	Mussaenda,

35	Glassy Tiger	*Parantica aglea*	MDF	Cryptolepis, Calotropis
36	Blue Tiger	*Tirumala limniace*	SEG	Vallaris, Dregea
37	Common Tiger	*Danaus genutia*	SEG,MDF,OF	Marsdenia,Asclepias
38	Plain Tiger	*D.chrysippus*	SEG,MDF	Calotropis, Cryptolepis,
39	Common Crow	*Euploea core*	SEG,MDF	Ficus, Sreblus,
40	Common Beak	*Libythea lepita*	MDF,OF	Celtis sp.
	FAMILY HESPERIIDAE			
1	Common Banded Awl	*Hasora chromus*	MDF, SEG, OF	Derris sp.
2	Brown Awl	*Badamia exclamationis*	MDF, SEG, OF	Combretum extensum,
3	C.Spotted Flat	*Celaenorrhinus leucocerca*	MDF, SEG, OF	(Combretaceae)
4	Suffused Snow Flat	*Tagiades gana*	MDF, SEG	Eranthemum sp.
5	Water Snow Flat	*Tagaides litigiosa*	SEG	Dioscorea sp.
6	Common Small Flat	*Sarangesa dasahara*	MDF,OF	Dioscorea sp.
7	Indian Skipper	*Spialia galba*	GL,OF	sp.(Liliaceae)
8	Chestnut Bob	*Iambrix salsala*	MDF,GL	Acanthaceae plants ,.
9	Indian Palm Bob	*Suastus gremius*	GL , OF	Waltheria indica
10	Grass Demon	*Udaspes folus*	GL,OF	Grasses and bamboo
11	Common Redeye	*Matapa aria*	OF,GL	Phoenix acaulis

12	Giant Redeye	*Gangara thyrsis*	MDF,OF	Curcuma sp., Zingiber sp. (Zingiberaceae)
13	Dark Palm Dart	*Telicota ancilla*	SEG,MDF	Bamboos (Graminae)
14	Bevan's Swift	*Borbo bevani*	DD, MD, EG,	Flowering plants, wet ground, bird dropping
15	Small Branded Swift	*Pelopidas mathias*	DD, MD, EG,	Flowering plants, wet ground, bird dropping
16	Large Branded Swift	*Pelopidas subochracea*	DD, MD, EG,	Flowering plants in fringe forests
17	Blank Swift	*Caltoris kumara*	DD, MD, EG, RF	Flowering plants, wet ground, bird dropping
18	Tree Flitter	*Hyarotis adrastus praba*	DD, MD, EG,	Flowering plants, wet ground, bird dropping RF
19	Palm Redeye	*Erionota torus*	DD, MD, EG,	Flowering plants, wet ground, bird dropping RF
20	Giant Redeye	Gangara thyrsis	DD, MD, EG,	Flowering plants, wet ground, bird dropping RF
21	Common Redeye	*Matapa aria*	DD, MD, EG,	Flowering plants, wet ground, bird dropping RF
	FAMILY PAPILIONIDAE			
1	Common Bluebottle	*Graphium sarpedon*	SEG,MDF	Polyalthia longifolia, Miliusa sp., Michelia doltsopa
2	Tailed Jay	*G.agammemnon*	SEG,MDF	Polyalthia longifolia, Michelia doltsopa, Annona

3	Common Jay	*G.doson*	SEG,MDF	squamosa
4	Common Rose	*Pachliopta aristolochiae*	MDF,OF	Polyalthia sp., Michelia sp., Trachelospermum
5	Common Birdwing	*Troides helena*	SEG	asiaticum
6	Spot Swordtail	*Graphium nomius*	MDF,OF	Aristolochia sp.
7	Fivebar Swordtail	*Graphium antiphates*	SEG	Aristolochia sp.
8	Lime Butterfly	*Papilio demoleus*	MDF,OF	Miliusa tomentosum,
9	Common Mime	*Chilasa clytia*	SEG,MDF	Annona sp., Miliusa sp.
10	Common Mormon	*P.polytes*	SEG,MDF,OF	Citrus sp. (Rutaceae)
11	Blue Mormon	*Papilio polymnestor*	MDF,OF	Litsea sp, Alseodaphne sp.
12	Yellow Helen	*P.chaon*	SEG	Citrus sp. , Murraya sp., Zanthoxylum sp. (Rutaceae)
13	Common Banded Peacock	*Papilio crino*	MDF,OF	Citrus sp, Glycosmis sp.
14	Crimson Rose		DD, MD, EG, RF	Flowering plants
15	Paris Peacock	*Princeps paris*	SEG	Citrus sp Zanthoxylum sp. (Rutaceae)
	FAMILY PIERIDAE			
1	Psyche	*Leptosia nina*	MDF,OF	Capparis sp., Crataeva sp. (Capparidceae)
3	Indian Cabbage White	*Pieris canidia*	MDF,OF	Capparidaceae plants
4	Common Gull	*Cepora nerissa*	MDF,OF	Capparis sp., (Capparidceae)

5	Common Wanderer	*Pareronia valeria*	SEG,MDF,OF	Capparis sp., Crataeva sp. (Capparidceae)
6	Chocolate Albatross	*Appias lyncida*	SEG	Loranthus sp.
7	Painted Jezebel	*D.hyparete*	MDF,MDF	Loranthus sp., Viscum sp.
8	Common Jezebel	*D.eucharis*	MDF,OF	Cassia sp., Butea sp., Bauhinia sp. (Leguminosae)
9	Common Emigrant	*Catopsila pomona*	MDF,OF	Cassia sp., Butea sp., Bauhinia sp. (Leguminosae)
10	Mottled Emigrant	*C.pyranthe*	MDF,OF	Cassia sp., Acacia sp.,
11	Common Grass Yellow	*Eurema hecabe*	MDF,OF,GL	Sp.(Leguminosae)
12	Small Grass Yellow	*Eurema brigitta*	DD, MD, EG,	flowering plants
13	Common Grass Yellow	*Eurema hecabe*	DD, MD, EG,	flowering plants
14	Tree Yellow	*Gandaca harina,*	DD, MD, EG,	flowering plants
15	Common Wanderer	*Pareronia valeria*	DD, MD, EG,	flowering plants
16	Painted Jezebel	*Delias hyparete*	DD, MD, EG,	flowering plants
17	Pioneer	*Belenois aurota*	DD, MD, EG,	flowering plants
	FAMILY LYCAENIDAE			
1	Common Acacia Blue	*Surendra quercetorum*	MDF,OF	Acacia sp.
2	Common Silverline	*Spindasis vulcanus*	OF	Clerodendrum, Zizyphus
3	Common Leaf Blue	*Amblypodia anita*	SEG,MDF,OF	Olacaceae plants

4	Yamfly	*Loxura atymnus*	SEG,MDF	Dioscorea sp.
5	Common Imperial	*Cheritra freja*	SEG	Numerous foodplants
6	The Monkey Puzzle	*Rathinda amor*	MDF,OF	Ixora sp.
7	Common Red Flash	*Rapala jarbas*	SEG,MDF	Rubus sp.
8	Common Caerulean	*Jamides celeno*	SEG,MDF,OF	Derris, Xylia, Abrus and other Legumes
9	Dark Caerulean	*J.bochus*	SEG,MDF	Xylia xylocarpa
10	Zebra Blue	*Syntarucus plinius*	OF	Plumbago, Indigofera,Albizia, Sesbania
11	Common Pierrot	*Castalius rosemon*	MDF,OF,GL	Zizyphus sp.
12	Angled Pierrot	*Caleta caleta*	SEG,MDF	Zizyphus rugosa
13	Rouded Pierrot	*Tarucus nara*	OF,GL	Zizyphus sp.
14	Grass Jewel	*Zizeeria trochilus*	OF,GL	Oxalis sp
15	Pale Grass Blue	*Pseudozizeeria maha*	GL	Oxalis, Legumes,
16	Common Hedge Blue	*Acetolepis puspa*	SEG,MDF	Schleichera oleosa,
17	Lime Blue	*Chilades laius*	OF	Citrus sp.
18	Pea Blue	*Lampides boeticus*	OF	Legumes
19	Plains Cupid	*Chilades pandava*	GL	Xylia xylocarpa, Cycas sp.
20	Forget-me-not	*Catochrysops strabo*	MDF,GL	Desmodium sp.
21	Red Pierrot	*Talicada nyseus*	OF,MDF	Kalanchoe sp

22	Dark Grass Blue	*Zizeeria knysna*	SEG,MDF,OF	Grasses and flowering plants at ground level
23	Pale Grass Blue	*Pseudozizeeria maha*	SEG,MDF,OF	Grasses and flowering plants at ground level
24	Lesser Grass Blue	*Zizina otis*	SEG,MDF,OF	Grasses and flowering plants at ground level
25	Tiny Grass Blue	*Zizula hylax*	SEG,MDF,OF	Herbs
26	Grass Jewel	*Freyeria trochylus,*	SEG,MDF,OF	Herbs
27	Indian Cupid	*Cupido lacturnus*	SEG,MDF,OF	Herbs
28	Lime Blue	*Chilades lajus*	SEG,MDF,OF	Flowering plants,
29	Blue Tiger	*Tirumala limniace*	SEG,MDF,OF	Flowering plant
30	Dark Blue Tiger	*Tirumala septentrionis*	SEG,MDF,OF	Flowering plant
31	Striped Tiger	*Danaus genutia*	SEG,MDF,OF	Flowering plant
32	Plain Tiger	*Danaus chrysippus,*	SEG,MDF,OF	Flowering plant
33	Glassy Tiger	*Parantica aglea*	SEG,MDF,OF	Flowering plant
34	Blue Spotted Crow	*Euploea midamus*	SEG,MDF,OF	Flowering plant
35	Common Crow	*Euploea core*	SEG,MDF,OF	Flowering plant

Habitat Codes

SEG: Dense forests (Semi-evergreen & Moist-deciduous forests, MDF: Moist deciduous forests with

OF: Dry deciduous forests and degraded forests with scrub, GL: Grasslands and Edges of grassland-forests


Commander butterfly


Baronet


Common grass yellow


common map butterfly


©Digvijaya Pattnaik
Common nawab


Common evening brown


Tawny rajah


Red pierrot


Common crow


common banded peacock


Bluemoon butterfly


common sailor


White Orangetip


Painted Jezebel


Pioneer


Psyche

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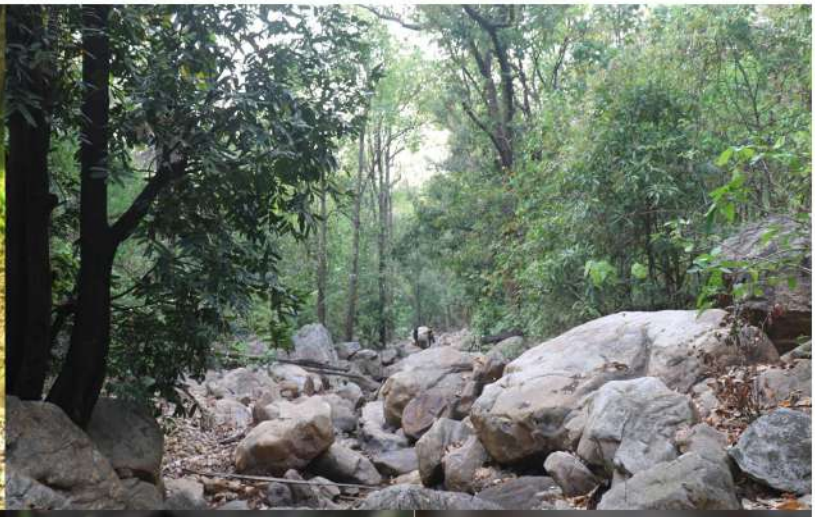






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