CHAPTER – 2

Profile of the study area

Introduction

The Chandaka forest was once famous for its dense vegetation and rich wildlife (Mishra & Sarangi, 1984). It is evident from the report of Mishra and Sarangi (1984) that most of the forest was cleared for toila (shifting cultivation) in the 3rd century and the original vegetation of the tract might have been replaced by secondary succession. In 1836, the British gave complete freedom to the tenants of Chandaka for clearing of forest and extension for cultivation, resulting in depletion of the forest resources. In 1871, the then Government imposed certain restrictions on the clearing of these forests. In 1880, forests were notified under chapter IV of the Indian Forest Act and toila was restricted. In 1885, Chandaka, Churang, Barhapita and Tarakai blocks were declared reserves. Demarcation of the protected forest blocks, however, was initiated only in 1916-17 (Mishra 1982). Subsequently management of the forest under Hatt’s plan (1896), Honteath plan (1901), Berry’s plan (1926), Dash (1945), Mitra (1965) and Mishra (1982) has resulted in restoration of the forest to a larger extent. Finally in 1983, the forest was elevated to the rank of Wildlife Sanctuary (vide Govt. Notification NO. 8F(W) 16/82-35500/F.F.A.H.) and was declared an Elephant Reserve (Mishra & Sarangi, 1984) and named as Chandaka Wildlife Sanctuary.

Location:

Chandaka Wildlife Sanctuary, situated in Khurdha and Cuttack district of Orissa lies between the new capital Bhubaneswar and old capital Cuttack, covering an area of 193.39 sq.km. (including the mining area of 17.6 sq.km.)
which lies to the north-west part of the sanctuary). It lies between latitude 20°16'05" to 20°26'03" N and longitudes 85°34'42" to 85°49'30" E. It is very close (25 km north west) to the capital city of Bhubaneswar in Orissa and can be approached by road via Khandagiri (Fig 2.1).

**Topography:**

The terrain is generally undulating which is broken by small low hills. North-western and South-western portions of the reserve are generally hilly with moderate to steep slopes, whereas the mid-eastern portion is mostly gentle to moderately sloppy with abrupt steep slopes at places. North-eastern and Central portions are relatively flat with little undulation. The altitude varies and is 42m at Chandaka, 46m at Dampara, 100m at Nuakua and 217m at Pandari mundia (the highest peak in the reserve) above mean sea level (Mishra and Sarangi, 1984).

**Drainage:**

There are no perennial streams in the area. Owing to the peculiar geological formation of the area, water rapidly drains off from the surface soil and the streams get dry. Small streams or nallahs from the Central plateau of the division radiate generally to South-east and North-west directions. Prominent among these are Jhumka, Deras, Kumarkhunti, Guptapara, Panasjhar and Kankadajhar. Rainwater is stored in Jhumka, Deras and Kumarkhunti dams and serve as major water reservoirs during the summer season. The river Mahanadi lies to the north of the Sanctuary and flows 0.5-1 km from the sanctuary boundary. Elephants have access to the Mahanadi river and have been reported to have visited the rivers on many an occasion, mainly during summer months.
Fig. 2.1: MAP OF THE STUDY AREA
Apart from this, various natural and man made ponds exist inside the sanctuary and in the peripheral area of the forest. These wetlands are utilised by the elephants, though most of them get nearly dry during the summer months. Many of the ponds in the peripheral cultivated and village area are visited by elephants during night in summer months.

Geology, Rock and Soil:

Hills in Tarkai block and Pandra mundia consists of metamorphic igneous rocks, chiefly Gneiss. Quarteites and fire clay are common occurrence in western side near Talabasta and Dampara. Churang Block contain laterite rocks. Elsewhere, major portions of the reserve contains Atagarh sand stones. Occasionally laterite is also met with.

Soil types occurring in the reserve show considerable variation. Prominent type are sandy loam, red clay loam and red clay. Deep sandy loam occur in Sunakhani, Tarakai, Akhanaga and Barhapita Blocks. Rest of the area have lateritic red loam of shallow to moderate depth, clay occurring in pockets (Mishra & Sarangi, 1984).

Soil depth is good except in the rocky areas and steep hill sides. Parent rock is pervious and sub soil moisture is sufficient to promote good forest cover.

Natural, Physiographic, Historical and Archeological features:

Ruins of an ancient fort built by the Ganga dynasty (300 A.D.) is present in Churang Block. Remains of the boundary wall of the fort are present in Churang
and Chandaka Block. Kanjia lake and marshes near Gailabanka and Chudanga Block. There are two springs, one at Guptapara near Medhasal and other at Panasjhar.

**Climate:**

The climate of the study area is probably the most important factor on which the growth of vegetation and thereby the distribution of elephant depends. Chandaka has a sub-tropical climate. Temperature, relative humidity and rainfall are the three important parameters that have been recorded from 1995 to 1998.

**Temperature:**

Data on temperature was collected from two places:

1) Godibari gate – the main entry point of the sanctuary.
2) Kumarkhunti – In Chandaka range and forming part of the core area of the Sanctuary.

The temperature was taken twice daily- once in the morning around 12 Noon which was considered as maximum temperature and in the evening around 5 P.M. which was considered as minimum temperature.

The average monthly maximum temperature recorded was during May, being around 37.1°C in Godibari and around 35.5°C in Kumarkhunti. The maximum temperature recorded was 45.9°C in May, 1998.

The average monthly minimum temperature is around December-January being 14°C in the core area and 16°C in Godibari. The absolute minimum temperature recorded in the core area was 8.5°C in 1997 and 12°C in 1996. The temperature thus varies between 10°C to 45°C. The average minimum and maximum temperature between 1995 to 1998 is shown in figure 2.2 (a-d).
Humidity:

The average relative humidity of the study area is generally very high. The maximum average relative humidity is between 80%-90% during July-September. The average minimum relative humidity is around December-February being around 50%-60%.

Rainfall:

The state of Orissa is the point of convergence of monsoon currents of the Bay of Bengal and the Arabian Sea. Here the monsoon is brought about by the Southwesterly wind, commonly called the SW-monsoon in summer months and to a little extent by northeasterly wind called the NE-monsoon.

The rainy season in the study area generally starts from mid June. The rain bearing SW-monsoon reaches its peak in the month of August. The average rainfall between June to September was recorded to be 40 cm. The highest rainfall recorded was 74.7 cm in the month of August, 1997.

Northeast rain is also recorded in this area during October-November. Average rainfall per month during this period was 80 cm in 1998. Total rainfall recorded during this period in 1998 was 43.09 cm.

The annual rainfall recorded in this area was 97.76 cm, 108 cm, 190.7 cm and 195.7 cm between 1995-1998. The monthly rainfall during this period is shown in figure 2.2(a-d). During the study period, the area received normal rainfall in 1997 and 1998 and about 40%-45% less in 1995 and 1996.
Fig. 2.2a: Average Monthly Temperature and Rainfall of Chandaka Wildlife Sanctuary in 1995

Fig. 2.2b: Average Monthly Temperature and Rainfall of Chandaka Wildlife Sanctuary in 1996
Fig. 2.2c: Average Monthly Temperature and Rainfall in Chandaka Wildlife Sanctuary in 1997

Fig. 2.2d: Average Monthly Temperature and Rainfall in Chandaka Wildlife Sanctuary in 1998
The Season:

The study area experiences three distinct seasons- Summer, Monsoon and Winter.

**Summer:**
This season extends from March to mid June. The average temperature during this period has been around 36°C in Godibari and 34.5°C in the core area with the highest temperature recorded being 45.9°C and 44.5°C in Godibari and the core area. May and June are the hottest months.

**Monsoon:**
This season lies between mid June to mid October. Heavy shower occurs between July-September. Slight rain also occurs in October-November brought about by NE wind. The rainfall for the 1995-98 is shown in Fig. 2.2(a-d).

**Winter:**
This period extends from November to February. The average mean temperature during this period in the core area is around 16°C with the lowest average mean in the month of January being 12.5°C in 1997. The average mean temperature during this period in Godibari was 17.5°C with the lowest average mean in January being 13.8°C in 1997. The lowest temperature recorded in this season was 8.3°C in the core area and 9.5°C in Godibari, both in the month of January.

**Vegetation:**

The vegetation of Chandaka is of the semi evergreen type according to Champion and Seth’s classification (1968). But due to severe biotic pressure, edaphic factors and relative humidity, the existing vegetation has lost its original characters (Choudhury,1975; Panda, 1992; Roy et al.,1992; Biswal, 1993; Swain,2000). The Sanctuary is presently covered mostly by bushy/ shrubby
vegetation. Woodlands are present in mostly coppice growth form. Based on species composition, the forest is classified into following types:

1) Semi evergreen forest dominated by Xylia xylocarpa.
2) Dry mixed deciduous forest
3) Bamboo brakes.

Semi evergreen forest:

The major portion of the Sanctuary is covered by semi evergreen forest dominated by Xylia xylocarpa. These are moist deciduous forests mixed with evergreen elements, where the number of top storey trees are deciduous and are leafless for a short period only and not simultaneously and the second storey is almost evergreen. Xylia is scattered throughout the forest and is represented by small and medium size trees due to great biotic pressure. The associated species in this type of forest are Alangium salvifolium, Lagerstroemia parviflora, Careya arborea, Aegle marmelos, Cassia fistula, Strychnos nuxvomica, Bridelia retusa, Madhuca indica, Pterocarpus marsupium, Syzygium cumini, Firmiana colorata, Buchanania lanzan, Terminalia bellirica, Terminalia chebula, Diospyros sylvatica, Grewia tiliaefolia, etc. The second storey is composed of a number of small trees and shrubs. Most conspicuous among them are Holarrhena antidysenterica, Polyalthia cerasoides, Helicteres isora, Cipadessa baccifera, etc. The climbers are plenty and are represented by Combreutum decandrum, Hemidesmus indica, Ichnocarpus frutescens, Gnetum sp., Smilax macrophylla. The forest floor is very rich in herbacious species and notable among them are represented by Andrographis paniculata, Crotalaria striata, Mimoso pudica, etc. The open degraded forest is occupied to a great extent by the weed Eupatorium odoratum (Choudhury, 1975).

Dry mixed deciduous forest:

This type occurs wherever conditions are drier. Sal is present in small patches. The exposed hills are covered with this type of forest. The constituent tree species of this type consists of Shorea robusta, Terminalia bellirica,
Terminalia chebula, Bombax ceiba, Anogeissus latifolia, Dalbergia latifolia, Dalbergia sisso, Diospyrous melanoxylon, Diospyros montana, Diospyros sylvestrica, Grewia tiliaefolia, Madhuca indica, Pterocarpus marsupium, Butea monosperma, Bridelia retusa, Ziziphus xylopyrus, Cassia fistula, Buchanania lanzan, Lannea coromandelica, Chloroxylon swietenia. The shrubs includes Cleistanthus collinus, Gardenia latifolia, Ziziphus oenoplia, Helicteres isora, Flacourtia indica, Glycosmis pentaphylla, etc. The climbers in this forest includes Bauhinia vahlii, Combretum decandrum, Ventilago denticulata, etc.

Bamboo brakes:

The most common species are the thorny bamboo Bambusa arundinacea and small patches of Dendrocalamus strictus. They are found forming clumps along the fringes of streams and hill slopes. But the bamboos have extended their territories further as secondary associates in the semievergreen and deciduous forests. The bamboo forms dense clumps and hardly allows any other plant to come up underneath except a few bulbous perennials, shrubs and grasses. However, Cassia tora and Eupatorium odoratum are weeds invading the areas where the canopy is considerably open. Bulbous perennials like Costos speciesus, Asparagus racemosus, Curuma amada, etc are found on the floor and send off shoots with the first conventional shower of rain. The climbers among the clumps of bamboo are Smilax zeylarica, Abrus precatorius, etc.

Besides the natural vegetation, plantation of Anacardium occidentalis, Tectona grandis, etc have been undertaken at several places by the Forest department in addition to the existing old plantation of Tectona.

During the present study, Chandaka Wildlife Sanctuary having an area of 193.39 sq km was divided into 5 zones based on vegetation structure, natural boundaries and general condition of the habitat. These include: Godibari (GODBR), Kumarkhunti (KUMKD), Dampara (DAMPR), Minchinpatna (MINCH) and Bharatpur (BHPR).
The people:

The sanctuary has 5 villages inside with a population of about 2500 people. In addition, over 100,000 people living along the periphery in 52 villages also have their impact on the sanctuary as most of them depend for the fuel wood on the forest. The people living inside the sanctuary are tribals being dominated by Sawra (Kabari). Other tribals are also present though few in number. They include Gond, Gopal and Khandayat. Recently some other tribals like Kolh, Munda, Shabar, etc have also migrated and settled in the peripheral areas. All the tribals have their own lifestyle and language and speak a dialect of Oriya as a common language of communication. The rapid growth of the capital city of Bhubaneswar has resulted in development of housing colonies very close to the peripheral area.

In the 5 villages situated inside the sanctuary, the average number of persons in a family is 7.8 with the sex ratio for both adult female and male tipped towards males. The average number of children per family is 3.8 to 4. The family depends basically on farming for 7 months. 16.6% of the people are in Government jobs and 5.5% have their own business. Hence, the majority are either dependent on agriculture or are daily labourers (Mohanty-Hejmadi, 1994).

Agriculture and land use pattern:

The principal crop of the area in and around the sanctuary is paddy. Apart from paddy, other agricultural products include pulses, sugarcane, potato, maize and vegetables. Land is mainly unirrigated. A few medium irrigation dams have come up. These include Deras, Jhumka, Kajalagandha and Kumarkhunti. Agriculture is thus mainly rainfed. Primitive and traditional agricultural implements are mainly used, few use tractors and pumps. High yielding paddy varieties have
also reached this area. The main agricultural seasons are Kharif (Sarad) and Rabi (Trichun). Kharif paddy are sown around June and harvested around November end-December. Rabi crop is sown around January end and harvested between April end and May.

Tourism:
The Sanctuary has a great tourist potential, which has not been explored fully. Visitors are allowed only in the daytime. The Deras and Jhumka reservoir along with its wildlife wealth attracts tourists round the year. There are 4 watch towers inside the Sanctuary—in the eastern side is the Kochilaberna, in the north-eastern side is the Pitagadia and Kumarkhunti and in the southern part is the Ambilo. The watch towers at Ambilo and Kumarkhunti is provided with lodging facilities (only for staffs). The water body and the saltlick attract animals, providing an easy and safe monitoring of the activities of the wild animals. A proper planning and development will help attract tourist flow, thus improving the local economy and decreasing biotic pressure on the forest. The adjacent Nandankanan Biological park attracts 8-10 lakhs tourists every year.

Vertebrate Fauna of the study area:

Orissa is very rich in biodiversity and the study area is equally diverse in its flora and fauna. A list of the vertebrate fauna of the study area is given below.

Amphibia:

Amphibian species recorded from this area includes – Common Indian toad (Bufo melanostictus), Ornate Microphylid (Microhyla ornata), Marbled Baloon frog (Uperodon systoma), Common Indian tree frog (Polyedates
maculatus), Skipper frog (Rana cyanophlychis), Paddy field frog (Rana limnocharis), Indian Bull frog (Rana tigerina), Spade foot frog (Tomopterna rolandae) and Bowing frog (Tomoptema breviceps). Recently Dutta (1998) has reported a new species Tomoptema dobsonii, first time from Orissa. Thus a total of 10 species are reported from the study area compared to 14 species recorded from Orissa (Sarkar, 1993).

Reptiles:

33 species of reptiles are reported from the study area. These includes: Marsh crocodiles (Crocodylus palustris), Flapshell turtles (Lissemys punctata), Spotted house Gecko (Hemidactylus brookii), Indian house Gecko (Hemidactylus flaviviridis), Smooth house gecko (Hemidactylus frenatus), Fan throated lizard (Sitana ponticeriana), Garden lizard (Calotes versicolor), India rock lizard (Psammophilus blanfordanus), Indian Chameleon (Chamaeleo zeylanicus), Common Indian Skink (Mabuya carinata), Spotted supple Skink (Lygosoma punctatus), Eastern bronze Skink (Mabuya macularis), Common monitor lizard (Varanus bengalensis), Yellow monitor lizard (Varanus flavescens), Common blind snake (Ramphotyphlops braminus), Beaked worm snake (Typhlops acutus), Indian Rock Python (Python molurus), Common Vine snake (Ahaetulla nasutus), Striped keelback (Amphiesma stolata), Common Kukri snake (Oligodon amensis), Western rat snake (Ptyas mucosus), Cantor’s black-headed snake (Sibynophis sagittaria), Russel viper (Daboia russelii), Monocellate Cobra (Naja kaouthia), Binocellate Cobra (Naja naja), Forstein’s cat snake (Bioga forsteni), Common Cat snake (Bioga trigonatus), Common bronze back tree (Dendrelaphis tristis), Smooth water snake (Enhydris enhydris), Common wolf snake (Lycodon aulicus), Green keel back (Macropisthodon plumbicolor), Cheekered Keel back (Xenochrophis pascator), and Common Indian Krait (Bungarus caeruleus). Thus out of 57 species reported from Orissa (Sanyal, 1993), 33 are found in Chandaka.
Aves:

The study area is equally rich in avifauna. Some of the important areas where birds congregate in the study area includes- Kumarkhunti, Deras, Ambilo and Godibari deer pond. Various migratory birds including Pintail (Anas acuta), Spot bill duck (Anas poecilorhyncha), Shoveller (Anas clypeata), Common Pochard (Aythya ferina), Tufted duck (Aythya fulignla), etc. visit these area. A total of 154 species of birds have been reported from the study area. 189 species of birds have been reported from Orissa by Mazumdar and Dasgupta (1993).

Mammals:

The mammalian fauna of the sanctuary has been thoroughly worked out. A total of 37 species of mammals have been reported from the Sanctuary by Tiwari, et.al. (1997). These include- House Shrew (Suncus murinus), Indian tree shrew (Anathana elioti), Indian fulvous fruit bat (Rousettus leschenaulti leschenaulti), Indian flying fox (Pteropus giganteus), Short nosed fruit bat (Cynopterus sphinx sphinx), Indian Pipistrella (Pipistrellus coromandra), Indian Pangolin (Manis crassicaudata), Rhesus macaque (Macaca mulatta mulatta), Common Langur (Presbytis entellus), Bengal Fox or Indian Fox (Vulpes bengalensis), Asiatic Jackel (Canis aureus), Indian Wild dog (Cuon alpinus), Stripped Hyaena (Hyaena hyaena), Sloth Bear (Melursus ursinus), Ratel (Mellivora capensis), Small Indian Civet (Viverricula indica), Common Palm Civet or Toddy Cat (Paradoxurus hemaphroditus), Common Mongoose (Herpestes edwardsi), Small Indian Mongoose (Herpestes auropunctatus), Jungle cat (Felis chaus), Leopard (Panthera pardus), Indian Elephant (Elephas maximus), Indian Wild Boar (Sus scrofa), Barking Deer (Muntiacus muntjak), Spotted Deer (Axis axis), Sambar (Cervus unicolor), Indian Chevrotain or Mouse Deer (Tragulus meminna), White tailed
Wood rat (*Rattus blanfordi*), Common House rat (*Rattus rattus*), Little Indian field mouse (*Mus booduga*), Indian Bush rat (*Golunda elliotti*), Indian mole rat (*Bandicota bengalensis*), Large Bandicoot (*Bandicota indica*), Indian crested Porcupine (*Hystrix indica*), Three striped Palm Squirrel (*Funambulus palmarum*), Five stripped Palm squirrel (*Funambulus pennanti*) and Indian Hare (*Lepus nigricollis*). Thus out of 77 species reported from Orissa by Das *et al.*, (1993), 48% of them have been reported from the sanctuary.
Plate-3: Ruins of the fort at Bualigarh of the Ganga dynasty (300 A.D.)

Plate-4: Dahanagiria: one of the hamlets inside the Sanctuary