Chapter II

STUDY AREA

2.1 SUMMARY

Maharashtra, literally meaning the great state, with its rich biodiversity, is a huge irregular triangle with its base facing the Arabian Sea. Physio-graphically the state may be divided into four natural divisions - the coastal strip (the Konkan), the Sahyadri or the Western Ghats, the Deccan plateau, and the forests of North Maharashtra. The Northern region of Maharashtra includes Nashik, Dhule, Jalgaon and Nandurbar districts. The Sahyadri or Western Ghats in this region run almost parallel to the sea coast; and the average height of 1,200 meters.

The Western Ghats, also known as the Sahyadri Hills, are well known for their rich and unique assemblage of flora and fauna. Norman Myers included the Western Ghats amongst the 25 biodiversity hot-spots identified in the world (Daniels, 2011). The Western Ghats mountain system, lying parallel to the west coast of the Indian subcontinent is one of the biodiversity hotspots and is regarded as the most striking and threatened topographical, floristic, faunistic feature of the Subcontinent after the Himalayas (Gaonkar, 1996). In Nashik district western-most part lying along the windward side of the Western Ghats constitute Peint, Harsul, Barhe and Surgana ranges. These areas are generally known as ‘Below Ghats Areas’ (DGND, 2010).

The entire area is occupied by Deccan basalt flows, several hundred metres in thickness. The rocks generally consist of forroaugite, labrodorite, felspar and iron-ore. Soil is deep loamy particularly on lower hill slopes. The upper hill slopes have at places very thin soil spread and at a number of places the parent rock is exposed. The forests of this tract, according to Champion’s classification fall under "Group 3-A-Southern Tropical Moist Deciduous Forests” (Champion, et al., 1968; DGND, 2010). Teak is by far the main specie. Other closely associated species are Sadada or Ain, Hed, Kalam, Sisum, Khair, Tiwas, Bibla and Dhavda in varying proportions. Bamboos are also common except in eastern part of the zone.

No comprehensive systematic account the insect fauna of this mountain range exists today (Beeson, 1941; Nair and Mathew, 1993; Mathew, 1996) excepting that of the butterflies, which is a relatively well studied and documented group (Wynterbluth, 1944; Larsen, 1988; Mathew, 1990).
2.2 GEOGRAPHY AND ABIOTIC ENVIRONMENT

2.2.1 LOCATION

Maharashtra state is included in Oriental zoogeographical region under the administration of Indian Government and has tropical environment. Maharashtra located in the North centre of Peninsular India, with a command of the Arabian Sea through its port of Mumbai.

Figure 2.1: Location map of Maharashtra state in India.

Figure 2.2: District map of Maharashtra showing study area.
The Northern region of Maharashtra state, India, includes Nashik, Dhule, Jalgaon and Nandurbar districts. This area bounded on the North west by Dang forest, Gujarat, on the North side by Madhya Pradesh, by Marathawada region to the east, by Ahemednagar district to the south and towards the south west by Thane district. It located from 18° 33’ to 21° 61’ North and 73° 16’ to 76° 28’ east, covering an area of 40,346 sq. km.

2.2.2 TOPOGRAPHY AND GEOLOGY

The western part of the study area is surrounded by the Western Ghats or Sahyadri range stretching from North to south of varying altitude between 900m to 1567m. South-west region of Northern Maharashtra starts with 900m altitude at Satmala range and increase to its North up to 1416m at Saptashringi gad and up to 1567m at Salher-Mulher. From Salher-Mulher altitude suddenly decline up to 600-300m at panjhare and again increases to 900m at Galana hill and up to 1325m to North-west at Astamba Dongar. The topography does not allow extensive agriculture but only the simplest kind of cultivation is possible.

A major part of Northern region of study area is lying in Satpuda range has altitude of 300m in Nandurbar while it increases up to 600m by North-east Jalgaon. The eastern portion of the study area is placed on the Deccan Plateau of altitude 300-600m. This region is quite spacious, fertile and is good for cultivation.

Figure 2.3: Topographic map of Maharashtra showing variation in altitude.
The soils of study area are residual, derived from the underlying basalts. In the semi-dry plateau, the regur (black-cotton soil) is clayey, rich in iron, but poor in nitrogen and organic matter; it is moisture-retentive (Maharashtra web, 2010). Where redeposit along the river valleys, those kali soils are deeper and heavier, better suited for rabbi crops. Further away, with a better mixture of lime, the morand soils form the ideal kharif zone. The higher plateau areas have pather soils, which contain more gravel. In the rainy Konkan, and the Sahyadri Range, the same basalts give rise to the brick-red laterites productive under a forest-cover, but readily stripped into a sterile varkas when the vegetation is removed. Large, soils of Maharashtra are shallow and somewhat poor (Maharashtra web, 2010).

2.2.3 CLIMATE

This area has a tropical climate, specifically a tropical wet and dry climate under the Koppen climate classification (McKnight & Hess, 1884), with seven months of dryness and peak of rains in July.

The state enjoys a tropical monsoon climate; the hot scorching summer from March onwards yields to the rainy monsoon in early June. The rich green cover of the monsoon season persists during the mild winter that follows through an unpleasant October transition, but turns into a dusty, barren brown as the summer sets in again. The seasonal rains from the western sea-clouds are very heavy on the Sahyadrian crests. The Konkan on the windward side is also endowed with heavy rainfall, declining northwards. The area receives rain from both the Northeast and southwest monsoons.

2.2.3.1 TEMPERATURE

The climate of North Maharashtra region is moderately stable and the temperature ranges between $10^0$ C and $42^0$ C. In each district meteorological observatory available for data collection which fairly represents conditions prevailing in the area.

December is the coldest month with the mean daily minimum temperature at $11.9^0$ C and the mean daily maximum at $28.8^0$ C. Cold waves which pass over Northern India sometimes affect the district and minimum temperatures may drop to within two degrees. Temperature begin to rise steadily from about the beginning of March and by May, the hottest month of the year, the mean daily maximum
temperature reaches to $42.5^0 \text{C}$. Temperatures drop appreciably with the onset or the monsoon after the first week of June. The monsoon period is generally pleasant. With the withdrawal of the monsoon by the end of September day temperatures rise a little in October and both day and night temperatures begin to drop rapidly by November.

### 2.2.3.2 HUMIDITY

Area of North Maharashtra has dry air particularly in the afternoons throughout season except during the monsoon season has some humid environment. Summer is the driest part of the year.

### 2.2.3.3 CLOUDINESS

Skies are generally clear or lightly clouded except during the monsoon when heavily clouded to overcast conditions prevail.

### 2.2.3.4 RAINFALL

Rainfall starts normally in the first week of June. July is the wettest month in Northern Maharashtra, while August also gets substantial rain; but it was observed that there is much fluctuations in rainfall since last 3-4 years and in due period there is no rain in June and July. Since 3-4 years rain fall was observed in August might be the result of global warming and climatic changes (Gurule, et al. 2010). Monsoon starts its retreat with the coming of September from the state. The rainfall in the area is under the influence of both the North-east and South-west monsoons. The period from June to about the end of September constitutes the South-west monsoon season, and October and November form the post-monsoon season (Greater Bombay District Gazetteer 1960; Proceeding Of The Indian National Science Academy (INSA) 1999). However there is uneven distribution of the rainfall in different districts and about 87 percent of annual rainfall is received during monsoon months of June to September.

### 2.2.3.5 SEASONS

Northern Maharashtra has typical monsoon climate, with hot, rainy and cold weather seasons. Tropical conditions prevail all over the state, and even the hill stations are not that cold. Dew, frost, hail can also be happened sometimes according
to the seasonal weather. Seasons in the whole year are basically divided into three seasons i.e. summer, monsoon & winter.

**Summer:** February, March, April and May months represents summer season of which May is the hottest month. During April and May thunderstorms are common all over the state. Temperature varies between 22°C-43°C during this season (DGND, 2010).

**Monsoon:** June, July, August and September represents monsoon season; which starts normally in the first week of June. July is the wettest month, while August too gets substantial rain. Monsoon starts its retreat with the coming of September from the state. Temperature varies between 19°C-35°C during this season (DGND, 2010).

**Winter:** Cool dry spell, with clear skies gentle breeze and pleasant weather prevails from October to February. But the eastern part of Maharashtra sometimes receives some rainfall in October. Temperature varies between 12°C-34°C during this season (DGND, 2010).

### 2.3 BIOTIC ENVIRONMENT

The natural resources in Maharashtra pose several constraints for better utilization because of the peculiar physiographic, geologic and climatic conditions. Two major hills range viz. the Sahyadri and the Satpura traverse the state with their off-shoots spreading in from of small hill ranges. Due to high altitude and favourable conditions the area has an abundant flora and fauna. Northern Maharashtra region has great variety of plants, Vertebrates animal, Invertebrates & insects, a major component of which is the order Lepidoptera (Gurule et al., 2011).

#### 2.3.1 VEGETATION

The major vegetation type of the area comes under the Tropical moist deciduous forest type (Champion and Seth, 1968) interspersed with scrub jungle and bamboo. Generally the shrubs and herbs are better represented in this forest than the trees. The area is rich with higher proportion of plants from families Cupressaceae, Menispermaceae, Fabaceae, Malvaceae, Solanaceae, Convolvulaceae, Tiliaceae, Euphorbiaceae, Mimosaceae, Ebenaceae, Sapotaceae, Sapindaceae, Brassicaceae, Asteraceae, Poaceae, Linaceae, Chenopodiaceae; with subsequent less proportion of plants from families Myrtaceae, Rutaceae, Rhizophoraceae, Periplocaceae, Combretaceae, Thymeliaceae, Fagaceae, Santalaceae. It is also observed that due to
topographical changes and habitat loss of natural habitats the population of many plant species has also declined (Mahajan, 2004).

2.3.2 FOREST

Based on the type of vegetation, the forest types found in the area are classified as Tropical moist deciduous forest and Tropical dry deciduous forest (Champion & Seth, 1968; Gurule & Nikam, 2011).

2.3.2.1 TROPICAL MOIST DECIDUOUS FOREST

Major part of the vegetation from the area categorise habitat of Tropical moist deciduous forest type in which Teak is far the main species. Other closely associated species from tropical moist deciduous forest are Sadada or Ain, Hed, Kalam, Sisum, Khair, Tiwas, Bibla and Dhavda in varying proportions. Bamboos are also common except in eastern part of the zone. Two main varieties of bamboos are found, which are locally known as Manvel and Kashti.

The shrub layer was also comparatively more diverse the exotic weed *Lantana camara* being the most dominant species. Forests of this type are scattered throughout the length and breadth of the tract situated to the south of the Tapi river. The chief species in this tract are khair (*Acacia catechu*), babhul (*Acacia arabica*), bor (*Zizyphus jujuba*), dhavda (*Anogeissus latifolia*), palas (*Butea frondosa*), tembhurni (*Diospyros melanoxylon*), hiver (*Acacia leucophlea*), etc.

2.3.2.2 TROPICAL DRY DECIDUOUS FOREST

The central zone which spreads over the easier eastern slopes of Sahyadri is generally very rugged and uneven. The forests in this tract are of dry deciduous type with much poorer quality than that of the forests of western zone. In these forests as well, teak is the main specie, but its quality can hardly stand in comparison with the teak found in western zone. Other common associates of teak in this tract are Dhavda, Sadada, Kakad, Salai, Modal, etc. These forests are comparatively open with large blanks not very uncommon. On account of exposed portion of the rocks, these forests lack continuity and appear to have been scattered all over in small bits.
2.3.3 WILD ANIMALS & GENERAL FAUNA

In spite of the disturbance in vicinity of study area, wild animals were present in the area. The chief of the wild animals is the Tiger (Wagh, Panthera felis), Panther or Bibla (Panthera Felis pardus), Wild Cat or Ran manjar (Felis chauss), Hyena or Taras (Hyena striata), Wolf or Landga (Canis lupus), Jackal or Kolha (Canis aureus), fox or Khokad (Vulpes bengalensis), Wild Dog (Cuon rutilans), Wild Bear or Dukkar (Sus cristatus), Stag or Sambhar (Rusa unicolor), Spotted Deer or Chital (Axis axis), Barking Deer or Bhekar (Tetraceros quadricornis), Four horned antilope and the barking deer are seen occasionally in the Satpuda, Indian Gazelle or Chiukara (Gazella bennettii) and Common Hare (Lepus ruficaudatus). Apart from these, indirect evidences of many species of nocturnal small mammals were also observed in the study area.

Due to high altitude and favourable conditions the area has an abundant fauna. Major part of the fauna is invertebrates includes variety of insects, a major component of which is the order Coleoptera, Lepidoptera, Hemiptera, Diptera, Odonata, Dictyoptera etc. Still scientific documentation of such diverse fauna is lacking is because less conservation efforts towards invertebrates than that of other large vertebrates. Besides the area also has good avian diversity with many endemic birds.

Area also has rich in herpeto- fauna which includes variety of poisonous and non-poisonous snakes, lizards and tortoise. And amongst freshwater fishes there are a few genera Notopterus, Barilius, Rasbora, Puntius, Labeo, Clarias, Aplocheilus, Mastacembelus, Garra, Aphanius that are common to water bodies & rivers in the area.