CHAPTER 2
STUDY AREA

2.1: Historical Background of the Sanctuary and Wolves

In the early 1970's, Dharmkumarsinhji conducted some surveys in Maharashtra under a project funded by the World Wide Fund for Nature-India (WWF), and recommended certain areas to be declared as Bustard Sanctuary. However, nothing was done for five or six years. In 1979, the State Government of Maharashtra, under section 18 of the Wildlife (Protection) Act of 1972, declared an area of 7818.47 Km$^2$ as a Bustard Sanctuary. This vast area falls under three ‘talukas’ namely Newasa, Shrigonda and Karjat of Ahmednagar and three talukas namely Mohol, Karmala and Madha of Solapur districts (Rego, 1980). In due course of time, on the recommendation of the Bombay Natural History Society (BNHS) in 1985, Nannaj area of North Solapur taluka was also included in the Sanctuary and the total area of the Sanctuary increased to 8,496.44 Km$^2$ (Figure 2.1). The wolf was a rare animal in the Bustard Sanctuary during the field studies of Endangered Species Project of the BNHS in 1980's in the same area (Ali and Rahmani, 1984). The frequency of sighting of wolves was extremely low in the Sanctuary during 1980s. Most of wolf sightings were either of a single wolf or two individuals. However, after establishment of the Sanctuary and protection of the area, in one decade when BNHS started its country wide project on grassland ecosystems in 1991, wolves were frequently sighted in the Sanctuary. This was apparently the result of protection given to the Great Indian Bustard (*Ardeotis nigriceps*) that has benefited this endangered predator-prey system also. Under the Grassland Ecology Project of the BNHS, an extensive and detailed study was carried by Kumar (1998) on ecology and behaviour of wolves. Kumar (1998) reported ecology of two established packs namely Nannaj and Gangewadi. Kumar (1998) also surveyed Solapur district for status and distribution of the wolf (Table 2.1). I started a telemetry study in 2002 when the Nannaj Pack had 10 individuals and adjoining Gangewadi Pack was comprised of 7 individuals. Other than these
two packs there were few more established core packs (comprising a minimum of 2 individuals) surviving in marginal areas. To facilitate monitoring and research of few breeding packs of wolves in the Great Indian Bustard Sanctuary, wolves were radio-collared. These radio-collared wolves were continuously monitored for population dynamics such as dispersal, distribution, reproduction, ranging, mortality, predation on ungulates and livestock depredation. The Blackbuck, which is the primary prey species of the wolf, was seen concentrated most of the times in the protected grassland and woodlot plots of the Sanctuary because of low or no disturbance in these plots. Figure 2.2 shows drainage, road, railway networks and settlements within the Sanctuary limits.

![Figure 2.1: Location map of GIB Sanctuary, Maharashtra, India](image-url)
Figure 2.2: Drainage, Road, Railway Networks and Settlements within GIB Sanctuary
Table 2.1: Approximate density of wolves and their natural prey populations in Solapur Division

<table>
<thead>
<tr>
<th>Taulka</th>
<th>Area** (Km²)</th>
<th>Wolf Density (Per 100 Km²)</th>
<th>Natural Prey</th>
<th>Blackbuck</th>
<th>Chinkara</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akkalkot</td>
<td>199.26</td>
<td>4</td>
<td>30-50*</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Barshi</td>
<td>246.09</td>
<td>3</td>
<td>100-200*</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Karmala</td>
<td>278.09</td>
<td>3</td>
<td>400-500*</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Madha</td>
<td>287.77</td>
<td>1</td>
<td>200-250*</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Malshiras</td>
<td>362.05</td>
<td>3</td>
<td>Not Known</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Mangalvedha</td>
<td>169.26</td>
<td>2</td>
<td>Not Known</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mohol</td>
<td>229.38</td>
<td>3</td>
<td>2000* (500-550)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pandharpur</td>
<td>219.21</td>
<td>1</td>
<td>About 500* (76)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sangola</td>
<td>164.98</td>
<td>5</td>
<td>Not Known</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Solapur North</td>
<td>242.03</td>
<td>4</td>
<td>1000-1200* (700±)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Solapur South</td>
<td>151.86</td>
<td>4</td>
<td>150-200* (182)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Represents the numbers supplied by the local people and the Forest department.
** Wolf habitat or area available to wolves
Numbers in parentheses represent author’s observations (Kumar, 1998)
Source: Kumar 1998

According to Manakadan (1985), no wolves were seen at Nannaj in the year 1981. A pair was first sighted on 6th November 1982. Two more sightings probably of the same pair were recorded in the same year. In 1983 wolf sightings were comparatively more (Table 2.2).

Table 2.2: Wolf sightings at Nannaj in the year 1983

<table>
<thead>
<tr>
<th>Date</th>
<th>Number/Sex</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.08.1983</td>
<td>a pair</td>
<td>Grazing land, east of the Akolakati plot</td>
</tr>
<tr>
<td>17.08.1983</td>
<td>a pair</td>
<td>Grazing land, east of the Akolakati plot</td>
</tr>
<tr>
<td>19.08.1983</td>
<td>a male – limping</td>
<td>Shambhar plot</td>
</tr>
<tr>
<td>02.09.1983</td>
<td>one – (sex unknown)</td>
<td>Shambhar plot</td>
</tr>
<tr>
<td>06.09.1983</td>
<td>a male – limping</td>
<td>Shambhar plot</td>
</tr>
<tr>
<td>08.09.1983</td>
<td>a male</td>
<td>Mardi I</td>
</tr>
<tr>
<td>18.09.1983</td>
<td>a male</td>
<td>Shambhar plot</td>
</tr>
<tr>
<td>19.09.1983</td>
<td>a male limping</td>
<td>Mardi I</td>
</tr>
<tr>
<td>17.10.1983</td>
<td>two - (sex unknown)</td>
<td>Mardi I</td>
</tr>
<tr>
<td>06.11.1983</td>
<td>two – one with limp</td>
<td>Shambhar plot</td>
</tr>
</tbody>
</table>

* Taken from Manakadan 1985 (Table: 9, Page No. 109).

2.2: Land Use Pattern

Rego (1980) has described in detail the land use pattern, livestock numbers and human population of the Bustard Sanctuary complex. The Sanctuary area is heavily populated with 101.29 people/km² while cattle population is 100.12/km². In addition to cattle, sheep and
goats also constitute the livestock wealth of the area, especially in villages where more than 75 percent of the population lives.

Wherever irrigation facilities are available cultivation is prevalent and cash crops such as Sugarcane (*Saccharum officinarum*) and Rice (*Oryza sativa*) are grown. Under rain fed areas Jawar (*Sorghum bicolor = S. vulgare*), Wheat (*Triticum aestivum*), Maize (*Zea mays*), Pigeon pea (*Cajanus cajan*), Bengal gram or Chick pea (*Cicer arietinum*), Sunflower (*Helianthus annus*) and Cotton (*Gossypium hirsutum*) are the main crops. Under well-irrigation, commercial crops such as Grapes (*Vitis vinifera*), Pomegranate (*Punica granatum*), Lemon (*Citrus limon*) and ber (*Zizyphus sp.*) are also cultivated.

Most of the land of the Sanctuary is under dry-land farming, except in Madha taluka of Solapur and Newasa taluka of Ahmadnagar districts where canal irrigation facilities are available. Over 90 percent of the land of the Sanctuary is under human habitation, crop fields, grazing lands, settlements, villages and towns.

### 2.3: Climate

Climate of Solapur is semi-arid. The annual climate cycle includes three seasons: summer (mid February to mid June), monsoon (mid June to mid October) and winter (mid October to mid January). Due to the rain shadow created by the Western Ghats, the drought prone area of Solapur and its adjacent areas in the Deccan plateau receive an average rainfall of 700 mm or even less, which is distributed in 3-4 months. The rainfall is erratic and droughts are a common phenomenon.

Monsoon starts in late June or early July. However, there are dry spells during late July and early August. A dry spell occurs when the rainfall in consecutive weeks is less than 15 mm. There is adequate rainfall in late August and September; more than half of the precipitation
occurs in September. Rainfall ceases by mid-October. The rainfall of Solapur region varies from 500 to 720 mm and has bimodal distribution. The first peak is usually experienced during June and the second during September. The temperature between 2002 and 2005 at the Great Indian Bustard Sanctuary, Nannaj varied from 8°C (minimum) in January to 46°C (maximum) in May. Each of the Figures 2.3, 2.4 and 2.5 show variation of temperature (maximum and minimum), rainfall and average humidity.

2.4: Soil

The substratum is comprised of half-decomposed basalt rock formations. The soil is derived from the basic igneous rock called basalt and is commonly referred as black soil. The soil is low in organic carbon. Moreover, the soil has volume expansion when moist and shrinks when dry producing deep cracks. Infiltration rate is moderately slow (0.5 to 0.9 cm hour\(^{-1}\)). Crack development accelerates the process of soil moisture loss. Two major tributaries of the river Krishna, namely Bhima and Sina flow through this area.

2.5: Topography

The terrain in gently undulating with mild slopes and flat-topped hillocks with intermittent shallow valleys, which form the major drainage channels. These valleys have the black cotton soils that are cultivated under the rain fed regime. Grasslands are distributed in disjunct, fragmented patches forming a mosaic of grazing and agricultural lands and human settlements. Most of the grasslands are present in cultivable slopes and tops of the hillocks. These grasslands are either government owned or private and constitute the ‘commons’ mainly meant for grazing.
**Figure 2.3:** Monthly Metrological data of GIB Sanctuary recorded at Nannaj for the year 2003

**Figure 2.4:** Monthly Metrological data of GIB Sanctuary recorded at Nannaj for the year 2004

**Figure 2.5:** Monthly Metrological data of GIB Sanctuary recorded at Nannaj for the year 2005
2.6: The Sanctuary

In 1975 the Drought Prone Areas Programme (DPAP) financed by the World Bank was initiated in Solapur district. The DPAP is essentially an area development programme, aimed at integrating efforts in agriculture and allied sectors to mitigate the adverse effects of drought. It seeks to develop land, water, vegetation, livestock and the restoration of ecological balance. The establishment of pastures and woodlots by the Forest Department under this scheme witnessed resurgence of wildlife, benefited by the effective protection and improvement of the habitat. In the early 1980's, few plantation plots were also established under the District rural Development Agency (DRDA).

According to Dabadghao and Shankaranarayan (1973), the Deccan grasslands of the Maharashtra have been classified as Sehima-Dichanthim type if allowed to reach the climax stage. And where the soil is gravelly as in Nannaj area, Sehima nervosum dominates. When the Sehima-Dichanthim cover is subjected to grazing, Chrysopogon (mainly C. fulvus) and Bothriochloa (mainly B. pertusa) species replace these communities. Further grazing results in their replacement by Heteropogon (mainly H. contortus) and Eremopogon (mainly E. foveolatus) type communities. Still further grazing pressure results in a community represented mainly by Aristida, Eargrostis and Melanocenchris species (Figure 2.6). The degraded sites thus have Heteropogon-Eremopogon and Aristida-Eragrostis-Melanocenchris types depending on the degree of disturbance.

The grazing lands at Nannaj exhibit the Aristida-Eragrostis-Melancenchris stage. The DPAP plots are still undergoing the different stages of plant succession, with the Aristida-Eragrostis-Melancenchris stage in some places and also the next stage Chrysopogon-
othriochloa, and finally in some areas, it has already reached the climax stage of Sehima nervosum.

The area around Nannaj can be broadly divided into:

1). Protected DPAP/DRDA plots (Plantation and Grassland)

2). Unprotected grazing land and

3). Crop fields

---

**Figure 2.6:** Succession in Sehima-Dicanthium cover

The protected plots are under the control of the State Forest Department. Grazing and agricultural lands surround all DPAP plots. The DPAP plots can be sub-divided into plantation and grassland. Many new plots are coming up in the area under Social Forestry Plantation Schemes. The plantations include Subabul Leucaena latissiqua (= L. lucocephala), Babul Acacia nilotica, Neem Azadirachta indica, Khair Acacia catechu, Anjan Hardwickia binata, White acacia Acacia leucophloea, Siris Albizzia lebbeck and Israeli babul Acacia tortilis.
The study at Nannaj started from July 2002. One of the main reasons for selection of this site for intensive telemetry studies was availability of background information on the Sanctuary and Wolves. Previous study by Kumar (1998) at the GIB Sanctuary Nannaj was the background for the study. Nannaj provides an ideal site for studying the significance of protection on the grassland fauna from the conservation point of view with special reference to important species such as Blackbuck, Wolf and Great Indian Bustard. Moreover, protection of grassland habitat for bustards has also created indirectly an ideal site for protection of Blackbuck, which resulted in very high densities of these animals. Since grasslands are not able to supply enough fodder for these animals, the Blackbuck resorts to crop damage in the adjoining crop fields. This has given rise to a conflict between the agriculturists and the Sanctuary authorities regarding their protection and conservation.

2.7: Flora

Most of the plants of the area belong to what are known as ‘monsoon ephemerals’. Life of these plants begins with the onset of the monsoon and the majority reaches senescence by the end of December or early January. Flora at Nannaj is represented by 34 families with 147 species (Rahmani, 1989).

The general feature of the natural vegetation of Nannaj is that of a typical grassland habitat with a few scattered shrubs and trees (introduced trees of the woodlot plots are not considered here). The common grasses are Aristida funiculate, A. stocksii, Chrysopogon fulvus, Heteropogon contortus, Lophopogon tridentatus, Melanocenchris jacquemontii, Oropetium thomaeum and Sehima nervosum. Common forbs are Boerhavia diffusa, Borreria stricta, Indigofera cordifolia, I. linifolia, Husticia procumbens, Lepidoganthis cristata and Polygala spp. Shrubs and trees were few being represented by Acacia
leucophloea, A. nilotoca, Cassia articulate, Tephrosia purpurea, etc. Species richness at
Nannaj is 42 species in the protected plots and 44 in the grazing land (Rahmani, 1989)

2.8: Fauna

The faunal diversity of GIB Sanctuary includes about 8 species of mammals, 136 species of
birds, 15 species of reptiles including four poisonous species of snakes, 5 species of lizards
and 7 orders of insects with 40 different species.

Out of the 8 species of mammals Indian fox (*Vulpes bengalensis*), Five Striped Squirrel
(*Funambulus pennantii*), Blacknaped Hare (*Lepus nigricollis*) and Blackbuck (*Antilope
cervicapra*) are common. Other species like Common Mongoose (*Herpestes edwardsi*) is
uncommon and Jungle Cat (*Felis chaus*), Wolf (*Canis lupus*) and Jackal (*Canis aureus*) are
rarely found.

Among reptiles 15 species of snakes are found which are Common Worm Snake (*Typhlina
bramina*), John’s Earth Boa (*Eryx johni*), Trinket Snake (*Elaphe helena*), Common Rat
Snake (*Ptyas mucosus*), Cat Snake (*Boiga trigonata*), Common Kukri Snake(*Oligodon
arnensis*), Russel’s Kukri (*Oligodon taeniolata*), Wolf Snake (*Lycodon aulicus*), Grass
Snake (*Macropisthodon plumicolar*), Checkered Keel Back (*Xenochrophis piscator*)
Common Indian Krait (*Bungarus caeruleus*), Indian (Spectacled) Cobra (*Naja naja*),
Russell’s Viper (*Vipera russelli*), Saw Scaled Viper (*Echis carinatus*). Five species of
lizards are found which include Common Garden Lizard (*Calotes versicolor*), Fan-throated
Lizard (*Sita ponticeriana*), Common or Brahminy Skink (*Mabuya carinata*), Little Skink
(*Mabuya macularia*) and Common Indian Monitor Lizard (*Varanus bengalensis*) (Ali and
2.9: People

Considering my research to be on wolves I believe it will be incomplete if I will not talk about the people of the area. Ultimately the conservation of the wolf will depend on the local people and people's attitude can make the difference (Habib, 2005). Indians of earlier times respected the wolf for its skills as a predator and its devotion to the welfare of its companions, a model of social behaviour for humans of modern age. The song "Labad Landga Dong Karta in English Wolves are genius and use devil ness to fool" signifies a deep cultural relationship between wolves and the Marathi culture. The song intones of the genius and dexterity of wolves and the theme signifies the deep understanding of the animal that the people of the time had. Although I am unaware of the origins of the song, it is one of the most 'frequently-hummed' tunes amongst the Marathi people.

Culturally sound, people who love to be Marathi, with average life below par but still wearing the white dress signifies the people. Influenced by Shivaji Maharaj, The Great Maratha the great leader of the people of Maharashtra. Simple, soft-spoken but anti wolf and blackbuck. Wolf loss, which is economically high at local level, is directly linked with wolf conservation. To conserve wolf in such areas, public awareness can make the difference.