2.1 Historical Background of the Sanctuary and wolves

In the early 1970s', Dharmakumarsinhji conducted some surveys in Maharashtra under a project financed by the World Wide Fund for Nature-India (WWF), and recommended certain areas to be declared as Bustard sanctuaries. However, practically 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 sq. km as a Bustard Sanctuary. This vast area falls under three 'talukas' namely Newasa, Shrigondha 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 included in the Sanctuary and the area of the Sanctuary was increased to 8,496 sq. km (Fig. 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 (Asad R. Rahmani 1993, pers. comm.). Most of wolf sightings were either of a single wolf or two. However, after establishment of the Sanctuary and protection to the area, in one decade when the present study on grasslands started, wolves were frequently sighted in the Sanctuary. This was the result of the protection given to the Great Indian Bustard *Ardeotis nigriceps* which has benefitted this endangered predator-prey system also. I started my study in 1991 when the pack had seven
Fig. 2.1 The Bustard Sanctuary of Maharashtra
individuals. 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 lack of disturbance in these plots.

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 2.1).

The study on this endangered predator-prey system at this semi-arid part of India was targeted as one of the major objectives of this project on Indian grasslands. The study focussed on the predation on Blackbuck and livestock, habitat use and preference, parent-pup associations and breeding biology.

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 humans/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 rainfed areas Jawar (Sorghum bicolor = S. vulgare), Wheat (Triticum
Table 2.1: 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>01/08/83</td>
<td>a pair</td>
<td>Grazing lands, east of the Akolakati plot</td>
</tr>
<tr>
<td>17/08/83</td>
<td>a pair</td>
<td>Grazing lands, east of the Akolakati plot</td>
</tr>
<tr>
<td>19/08/83</td>
<td>a male - limping</td>
<td>Shambhar plot</td>
</tr>
<tr>
<td>02/09/83</td>
<td>one - sex (?)</td>
<td>Shambhar plot</td>
</tr>
<tr>
<td>06/09/83</td>
<td>a male - limping</td>
<td>Shambhar plot</td>
</tr>
<tr>
<td>08/09/83</td>
<td>a male</td>
<td>Mardi I</td>
</tr>
<tr>
<td>18/09/83</td>
<td>a male</td>
<td>Shambhar plot</td>
</tr>
<tr>
<td>19/09/83</td>
<td>a male - limping</td>
<td>Mardi I</td>
</tr>
<tr>
<td>17/10/83</td>
<td>two - sex (?)</td>
<td>Mardi I</td>
</tr>
<tr>
<td>06/11/83</td>
<td>two - one with a limp</td>
<td>Shambhar plot</td>
</tr>
</tbody>
</table>

* Taken from Manakadan 1985 (Table : 9, page #109)
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 mauritiana) 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 Ahmednagar 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 Location

Nannaj is a small village 20 km north of Solapur on Solapur-Barshi road, situated between 17° 41'N and 75° 56'E at 486 m elevation (Fig. 2.1). It lies in the drought prone area of the Deccan Plateau which covers an area of about 7,005,000 km². Deccan Plateau lies between Eastern and Western Ghats and south of the line of the Satpura and Hazaribag ranges. The Peninsula is triangular in shape - rising from 500 to 1000m in height, sloping eastwards and westwards.

2.4 Climate

Climate of Solapur is semi-arid. The annual climate cycle includes three seasons: summer (February to mid June), monsoon (mid June to mid October) and winter (mid October to 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 750 mm 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 1991 and 1994 at the Great Indian Bustard Sanctuary, Nannaj varied from 10°C (minimum) in December to 45.5°C (maximum) in May (Fig. 2.2).

2.5 Soil

The substratum comprises of half-decomposed basalt rock formations. The soil is derived from the basic igneous rock called basalt and is commonly called as black soil. The soil is low in organic carbon. The soil has high volume expansion when moist and shrink 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 River Krishna, namely Bhima and Sina flow through this area.
Fig. 2.2 Meteorological data recorded at the GIB Sanctuary, Nannaj (1991-1994)
2.6 Topography

The terrain is 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 which are cultivated under the rainfed 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 on cultivable slopes and tops of the hillocks. These grasslands are either government owned or private and constitute the 'commons' mainly meant for grazing.

2.7 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, benefitted by the effective protection and improvement of the habitat. In the early 1980's, few plantation plots were established under the District Rural Development Agency (DRDA).

According to Dabadghao and Shankaranarayan (1973), the Deccan grasslands of Maharashtra are classified as Sehima-Dichanthium type if allowed to reach the climax stage. And where the soil is gravelly as in Nannaj area, Sehima nervosum
dominates. When the Sehima-Dicanthium cover is subjected to grazing, these communities are replaced by Chrysopogon (mainly C. fulvus) and Bothriochloa (mainly B. pertusa) species. 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, Eragrostis and Melanocenchris species (Fig. 2.3). The degraded sites thus have Heteropogon-Eremopogon and Aristida-Eragrostis-Melanocenchris types depending on the degree of disturbance.

The grazed lands at Nannaj exhibit the Aristida-Eragrostis-Melanocenchris stage. The DPAP plots are still undergoing the different stages of plant succession, with the Aristida-Eragrostis-Melanocenchris stage in some places, the Heteropogon-Eremopogon in other places and also the next stage Chrysopogon-Bothriochloa, 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 grasslands)
2 Unprotected grazing land
3 Crop fields

The protected plots are under the control of the State Forest Department. All DPAP plots are surrounded by grazing or agricultural lands (Fig. 2.4). 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
Fig. 2.3 Succession in Sehima-Dicanthium cover
Fig. 2.4 The Great Indian Bustard Sanctuary, Nannaj (Solapur)
*Leucaena latisiliqua (=L.leucocephala)*, 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 commenced from July 1991 onwards. One of the main reasons for the selection of this site for intensive studies was long association of BNHS with the Sanctuary as well as the the presence of well protected grasslands. 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 grasslands for bustards has created an ideal site for the prosperity of Blackbuck which resulted in very high densities of these animals. Since grasslands are not able to supply the fodder for these animals, the blackbuck resort to crop raiding in the adjoining crop fields. This is creating a conflict between the agriculturists and the Sanctuary authorities regarding the conservation issue itself.