CHAPTER – III
BIODIVERSITY AND ITS EXISTING STATUS

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3.1 INTRODUCTION:

'Earth is known to be the only living planet due to the life it supports. 'Biodiversity' or 'biological diversity' is referred to the vast range of life forms, from simple, microscopic, and unicellular to the evolved, complex and multi-cellular forms on Earth. These include the entire living organism i.e. millions of plants, animals and microorganisms'. (Samant J.: 2005)

Radhanagri Wildlife Sanctuary is abode of variety of wild animals and extremely rich flora and fauna. Some forest study of Radhanagri Sanctuary has revealed that there are 419 faunal species including 20 species of amphibians, 58 species of reptiles, 284 species of birds and 47 species of mammals. Similarly this area has a total 325 floral species, which includes 200 trees, 70 shrubs and herbs, 40 creepers and 15 epiphytes.

Plateau areas of Western Ghats are often considered as wastelands. However these areas have some grassy and bushy vegetation and are generally devoid of tree growth. Even if these areas have no vegetation and have only rocks and boulders, they serve as excellent environtment to the wildlife. As such, this is a typical character of Western Ghats, where dense tree growth and other vegetation are found mainly on the slopes. This area has been found to be the prime habitat of Sloth Bear, Panthers, Bison, Pangolins and Mouse Deer etc. All these animals are under the

wildlife protection Act 1972. Therefore from the point of conservation of biodiversity the area has great importance.

3.2 BIO-DIVERSITY:

India, the country of rich cultural and natural heritage is endowed with equally rich bio-diversity. All the bio-geographical zones of India possess their own peculiar floral and faunal wealth. The country possesses 372 species of mammals, 1175 species of fishes, 181 species of amphibians, 5000 species of mollusks, 60,000 species of insects and 15,000 species of flowering plants.

'Radhanagri Wildlife Sanctuary is home of variety of wild animals including 47 species of mammals, 59 species of reptiles, 20 species of amphibians, 264 species birds and 66 species of butterflies. This area also harbors endemic and threatened flora. Amba, Gaganbavada, Radhanagri, Patgaon are the important places of geographical, botanical interest on main ranges of Sahyadri. Similarly, there are over 200 sacred groves (Dev-Rais) helping in the conservation of bio-diversity of the district. Radhanagri Wildlife Sanctuary forms an important area with rich bio-diversity. In addition, dams and lakes form an important feature giving shelter to number of aquatic and semi-aquatic plants'. (Yadav & Sardesai - 2002)

Tiger, Panther, Sloth Bear, Indian Pangolin, Mouse Deer, small Indian Civet and Jungle Cat are endangered faunal species in the sanctuary.

Table No: 4
Population of Flora & Fauna

Sr. No.	Animal forms	No. in India	No. in Maharashtra	No. in RWS
1.	Mammals	350	85	47
2.	Reptiles	408	100	59
3.	Birds (Avifauna)	1224	466-500	264
4.	Insects (Butterflies)	57548	30,000	66
5.	Fishes	2546	600	-
6.	Amphibians	197	29	20
7.	Plants	-	-	325

RWS: Radhanagri Wildlife Sanctuary

'Biological diversity or bio-diversity is the part of nature which includes the differences in genes among the individuals of a species, the variety and richness of all the plant and animal species at different scales in space, locally, in the region and the world and the types of ecosystems both terrestrial and aquatic, within a defined area'. (Bharucha Erach, 2008)

In other words – biological diversity deals with the degree of nature's variety in the biosphere. This variety can be observed at three levels – the genetic variability within a species; the variety of species within a community; and the organization of species in an area into distinctive plant and animal communities.

According to the scientific definition of bio-diversity, the bio-diversity of Radhanagri Wildlife Sanctuary has been separated in genetic diversity, species diversity and ecosystem diversity.

3.2.1 Genetic Diversity: Genetic diversity defines the difference in a species in its genetic formation. This genetic variability is essential for a growth of species. Sometime due

to the same natural and many times man made or anthropogenic interventions, causes the genetic make up disturbed which leads eventually to the extinction of that particular species. In this area of Radhanagri Wildlife Sanctuary, many plants are declared as genetically endangered.

A famous non governmental oragnization 'ATREE' (Ashoka Trust of Research in Ecology and Ecology and Environment) from Bangalore is intensively engaged in reproduction of a Hubbardia heptaneuron an extinct grass by genetic variables and from the view of a reproductive biology. Prof. Yadav S. R. dept. of Botany, Shivaji University, Kolhapur is also engaged with in situ and ex-situ conservation of such plants species. As far is concern with wild animals not yet genetically extinct but the Tigers are endangered.

3.2.2 Species Diversity: Different types (species) of plants and animals occur in region incorporate species diversity. In the Radhanagri Wildlife Sanctuary some areas are richer in plant species than others. Popularly they are called as Dangs, meaning thick forest. These are also categorized as Hot spots of diversity. Wagache Pani, Patacha Dang, Laxmi Talav, Kokan Darshan point, Zanzuche Pani, Shivagad etc. At present conservation scientist and many scholars have identified and categorized about 15000 species of flowering plants. Many new species are being identified specially in the flowering plants and insects. It is worthy to note that a extinct grass Hubbardia heptaneuron and Ceropegia fantastica are being reproduced through the conventional

methods and biotechnological tools especially Tissue Culture, by Prof. Yadav S. R. and his enthusiastic team from Dept. of Botany, Shivaji University, Kolhapur.

Faunal species are incorporating 47 species of mammals, 59 species of reptiles, 20 species of amphibians, 264 species of avifauna with 66 species of butterflies. Gaur or bison is major animal found in this area whereas panther or leopard, sloth bear, Indian pangolin, mouse deer, jungle cat are endangered animal species.

3.2.3 Ecosystem Diversity: Ecosystem diversity can be described as a specific geographical region. Distinctive ecosystems such as forest, grasslands, deserts, mountains, which are landscape ecosystems where as aquatic ecosystems like rivers, ponds, lakes and seas.

Radhanagri Wildlife Sanctuary itself is amalgamation of many diverse ecosystems. By the landscape it comes into forest, grassland and mountain ecosystem where as by aquatic ecosystem it incorporates rivers, lakes and ponds ecosystems. There are thick reserve forest known as Dangs enriching many plant and animal species, moreover the area is famous for the 'Devrais' or sacred groves where many floral species has being conserved from traditionaly. Sadas occupied by grassland with variety of grasses. Mountain tops and flanks are accoladed with variety of plants and animals habitat. e.g. Shivgad, Zanzuche Pani, Savarai Sada, Hadakyche Sari, Kokan Darshan Kada, Plateau of Shelap etc. Aquatic ecosystem like rivers, lakes and ponds are contributing into the bounty of nature in Radhanagri Wildlife Sanctuary. River ecosystem like Bhogavati and Doodhganga

are major rivers who shaping the landforms in the area with several tributaries and nalas. Many water tanks are forming individual pond ecosystem providing habitat for many distinguished plants, animals and amphibions. However, Shahusagar and Laxmi Lake are major lakes ecosystem which help to symbiosis of varieties of plants and animals.(Table: 5)

3.3 VALUE OF BIODIVERSITY:

Forests are the storehouses of diversified ecosystem, which are vital at the local, regional and global levels. The production of oxygen, depletion of Carbon dioxide, balancing the water cycle, protection of soil are some vital services conducted by the forest and jungles. It is therefore clear that biological diversity is essential for present ecological processes. Directly or indirectly all daily needs of man such as food, clothing, housing, energy, medicine are all linked with biological variance. (Biodiversity) The tribal community fisher man, Agricultural communities are closely related with the forest, marine or fresh water ecosystems. Therefore it is cleared that each element of biodiversity has its different value or importance such as:

3.3.1 Consumptive Use Value:

In the present study area all these communities are directly related with Radhanagri Wildlife Sanctuary for their livelihood. The biodiversity from this area provides forest dwellers all their daily needs such as food, fodder, building material, medicines and variety of other products. These people know the qualities and different uses of variety of plant i.e. trees, shrubs, herbs, climbers and grasses etc.

Table : 5 Plant Species in diversified ecosystems.

Grasslands	River and stream banks	Stream and river beds :	Pond and Lake	Formation on Rocks	Insectivoros Plants	Epiphytic plants	Parasitic plants
Andropogon pumilus, Apluda mutica, Aristida adescensionis, A. redacta, A. stocksii, Brachiaria eruliformis , B. ramosa, chloris virgata, D. carricosum, digitaria ciliaris, sehima, nevosum.	Carallia,brachiata, Diospyros nigrescens, Homalium ceyalanicum, Myristica malabaricea, syzygium cumini, S. beyneanum. Common shrubs are;Ardisia, solanacea,barleria cristata,Melastoma, malabathricum and phyllanthus lawii. Common climber are;Anodendron manubriatum, Bidaria cuspidata,.	A.tenella, Bacopa monnieri, Conscora decurrens, Cleome viscosa, Dentella repens, Eclipta prostrata, H. Schulli, Lagenandra ovata, polygonum plebejum, Rotala serpyllifolia.	Blyxa aubertii, B. Octandra, Hydrilla verticillata, N. indica, P. nodosum, Pistia stratiotes, Rotala, malampuzbensis and R. serpyllifolia.	Aerva lanata, Hybanthus enneaspemns, Justicia glauca, Cyanotis cristata, Drimia indica, Eria exilis, Sonerila scapigera etc.	D. indica, V. aurea, V. exdeta, U. stellaris etc. Sacred groves (Dev-rais) : Aporosa, lindleyana, Blachia, denudata, Capparis tenera, Knema attenuata, Myristica malabarica, Syzygium lactum etc.	A campe pracmorsa, Bulbophyllum fimbriatum, Eria spp., Hoya spp., Molaxis rbecdii, Porpax reticulata and Vanda testacea etc.	Aeginetia indica,B. fungosa, Orobanche cernua var, nepalensis S. asiatica, uscuta chinensis, C. reflexa,H. obtusata, Scurrula parasitica, Viscum angulatum etc.

Moreover non-wood forest products such as Hirda fruits, Kadipatta, Tamalpatra, Shembisal, Amsul, Honey, Wax, and grasses as fodder medicinal plants were seasonally collected. Now this practice has been stopped. Instead of this species of trees and fruits consumed by Bison or Gaur, Sambar, Barking Deer, Giant Squirrel, Mouse Deer and other herbivores.

3.3.2 Productive Use Value:

The productive use value category comprises production of marketable goods such as timber, high value fruits, leaves etc. From 1985 this practice has been stopped and banned permanently to conserve the existing status of biodiversity of Radhanagri Wildlife Sanctuary. However it is recommended strongly that, forest department can produce and do marketing of medicinal plants occur in the region. In India there are over 2000 medicinal plant species of which 443 species have been recorded in the state of Maharashtra. However 600 plant species are enumerated in Kolhapur district. Acacia concinna, Abutilon indicum, Asparagus racemosus, Var. javanica, Biophytum sensitivum, Bombyx micranthus, Cassia fistula, Dillenia indica, Emblica officinalis, Jasminum auriculatum, Jatropha curcas, Mangifera indica, Sesamum orientale, Tamarindus indica etc. are the medicinal species among various medicinal plants. In the other view i.e. from agricultural practices, it is worthy to note that there are various economically important plants which may categorized as follows:

3.3.2.1 Cereal Crops: Eleuine coracana (Nachani), Oryza satira (Rice), Sorghum spp. (Wheat), Triticum aestivum and Zea mays (Maize).

3.3.2.2 Pulses : Aracbis hypogoea (Groundnut), Cajanus cajan (Tuwar), Cicer arietinum (Gram), Lablab purpyreus (Chavali), Psophocarpus tetragonolobus (Gavar), Vigna aconitifolia (Mataki), V. mungo (Udid), V. radiata (Mung), Pisum sativum (Vatana).

3.3.2.3 Fruits Vegetables : Abelmoscbus esculentus (Bhendi), Benincasa hispida (Kohala), Capsicum annuum (Chilli), Coccima grandis (Tondli), Cucumsmelo var. melo (Kalingad), C. sativus (Cucumber), Cucurbia maxima (Bhopala), Laganaria siceraia (Dudhi Bhopala), Luffa acutangula (Dodaka), L. eylindrica (Gilka), Lycopersicon lycopersicum (Tomato), Momordica charantia (Karle), Moringa oleifera (Shevaga), Solauum melongena (Wangi).

3.3.2.4 Leaf Vegetables : Amaranthus cruentus (Tandulka), Brassica oleracea (Kobi), Cicer (Chana), Colocasia esculenta (Alu), Hibiscus (Ambadi), Raphanus sativus (Mula), Sesbania grandiflora (Hadga), Spinaeia oleracea (Palak), Trigonella foenum (Methi).

3.3.2.5 Root & Tuber Vegetables : Beta vulgaris (Beet), Daucus carota (Ginger), Ipomoea batatas (Ratalu), Solanum tuberosum (Potato).

3.3.2.6 Fruits : Anacardium occidentale (Cashew), A. reticulata (Ramphal), A. squamosa (Sitaphal),

Artocarpus beterophyllus (Phanus), Carica papaya (Papai), Citrus spp. (Limbu), Cocos nucifera (Coconut), Emblica officinalis (Awala), Ficus carica (Anjir), Garcima indica (Amsul), Mangifera indica (Mango), Malinilkara zapota (Chikku), Meyna laxiflora (Alu), Musa pradisiaca (Banana), Pithecellobium dulce (Vilayati Chinch), Psidium guajava (Peru), Semecarpus anacardium (Bibba), Spondias pinnata (Ambada), Syzygium cumini (Jambhul), Tamarindus indica (Chinch), Ziziphus mauritiana (Bor) are the plants having some economic and productive use of value.

3.3.3 Social Value:

The biodiversity always has a social value as it provides life supporting resources to the society. The consumptive and productive value of biodiversity is closely related to the social value of biodiversity because these values are utilized by traditional communities to the modern society. Social value of biodiversity is always related with cultural and religious sentiments. In the concern study area, there are some pockets of the thick forest are kept conserve in the name of God and popularly they are known as Devrai, it means sacred groves. There are more than 200 sacred groves in the Kolhapur district. In the Radhanagri Wildlife Sanctuary, several such Devrais are present. These sacred groves are directly or indirectly help to conserve the biodiversity. Some Hindu religious festivals are directly related to the biodiversity which are being practiced in this area e.g. Vat Pornima, Naga Panchami, Dashara, Navratra,

Bendur etc. Moreover, agricultural practices by mass community, which assure the sustainable supply of food to the mass society. Beside these, Radhanagri Wildlife Sanctuary provides employment to the local people. It also controls drought and floods in the area.

3.3.4 Ethical and Moral Value:

Our ancestors always have ethical & moral values of biodiversity. By the several generations, the nature has been conserved by local tradition it may be through the various festivals, may be by mythological traditions. The people were well aware and sensitive about the conservation and protection of the jungles. Various species of plants were sacred value e.g. Bell tree, Peeple tree, Audumbar tree, Tulsi herb, even grass like Harali offere to Shri Ganesha idol.

Many animals also have some sacred value e.g. King Cobra, Cow, Tiger etc. This region therefore also under the impact of such types of ethical and moral value.

3.3.5 Aesthetic Value:

Aesthetic value is concern with panoramic & spectacular views of the forests and jungles. Aesthetic value is always important for the tourist's attraction. Biodiversity is a beautiful and wonderful creation of nature alike from the other forests & jungles. Radhanagri Wildlife Sanctuary has got panoramic multidimensional and spectacular scenic views. Radhanagri Wildlife Sanctuary has a spectacular location at the rim of Sahyadri Mountain and Konkan. Several passes are there, which precipitates in Konkan. There are several tourist attraction spot located. e.g. Konkan Kada, Watch Tower, Indarganj plateau, Ugavadevi Mandir,

Rautwadi waterfall, Savrai Sada, Patyacha dang, Sambar kond etc. The Radhanagri Wildlife Sanctuary always called as tourist's heaven particularly from the adventure tourism point of view. There are some tracking roots i.e. Gaganbavada- Borbet – 18 km, Gaganbavada-Watch Tower -Dajipur – 25 km., Padli –Digus- Dajipur- 22 km. etc.

3.3.6. Option Value:

Option value describes possibilities of future uses of the natural resources. It further clarifies the expecting uses of the natural resources. This area as a sanctuary having importance in Indian Biotic Environment. India has been divided in to 10 biotic or biographic region based on geography, climate, types of vegetation, mammals, birds, reptiles and other Fauna. The Western Ghats in Maharashtra is one of them incorporating Radhanagri Wildlife Sanctuary.

India's Biotic Zones:

1) The cold mountains snow covered Trans Himalayan region of Ladakh.
2) The Himalayan ranges and valleys of Kashmir, Himachal Pradesh, Uttarakhand, Assam and other North-Eastern states.
3) The Terai, the lowland where the Himalayan Rivers flow into the plains.
4) The Gangetic and Brahmaputra plains.
5) The Thar desert of Rajasthan.
6) The semi-arid grassland region of the Deccan plateau, Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu.
7) The North-Eastern states of India.

8) **The Western Ghats in Maharashtra, Karnataka and Kerala.**
9) The Andaman and Nicobar Island.
10) The long Western and Eastern coastal belt with sandy beaches,
forests and mangroves.

3.4 THREATS TO THE BIODIVERSITY:

The forest & Jungles are depleting due to the unwanted anthropogenic intervention which lead to the fatal disturbance of biodiversity. Forests and grasslands have turned into barren lands & deserts. The major parts of the jungles have been cleared for fuel wood & fodder illegal cutting of medicinal plants, shifting cultivation is proving to decrease in the habitat loss of the many rare species of Flora & Fauna.

According to the revised IUCN red list categories prepared by the IUCN species survival commission (SSC) and approved at the 40th meeting of the IUCN Council, Gland, Switzerland in 30th November 1994 are as follows:

1. Extinct (Ex), Possibly Extinct (PE): Synnema Nomatum (Blatt) Sant.
2. Extinct in the Wild (EW): None
3. Critically Endangered (CR): Maluaceae, Alutilon ranadei, cyperaceae- eleocharis lankana.
4. Endangered (EN): Asclepiadaceae-cerupegia huberi, C. Lawii, Poaceae- Isachne bicolor.
5. Vulnerable (VU): None
6. Low Risk (LR): Niligirianthus Reticulatus (stapf) The Bremek, Ceropegia Evansii McC.
7. Data Deficient (DD): None

8. Not Evaluated (NE): None

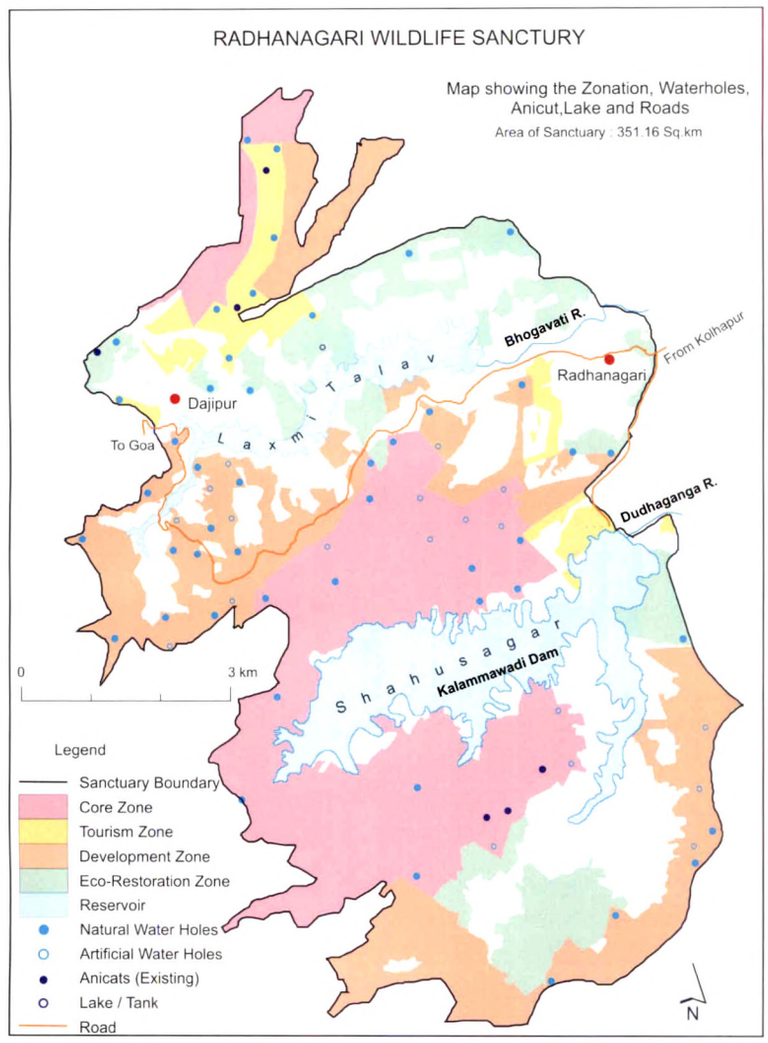
The Radhanagri Wildlife Sanctuary though under control of mighty forest department, it is not free from the acute problems such as encroachment, poaching, habitat loss, illegal cutting of trees, domestic livestock grazing, wildfires, unwanted growth of grassland, wildlife health, man/wildlife conflict etc.

3.4.1 Encroachment:

The problem concern with encroachment is not existed in this protected area. However, some sporadic cutting of the trees is occurring specially at the border of forest and private farms. Such practices we have noticed during the intensive fieldwork. In this concern, some farmers are interviewed, they always grievance regarding the force full acquire of the land by the government. Temporally, encroachment especially during the rainy season is occurred. At the time of extension of Radhanagri Wildlife Sanctuary it was proposed to exclude 14 villages from Radhanagri Wildlife Sanctuary, whereas 11 villages with 30 hamlets are included into the Radhanagri Wildlife Sanctuary. According to government policy there is a provision to migrate & rehabilitate such settlements. However, there is dispute of 14 villages namely Radhanagri, Banachiwadi, Fejiwade, Adoli, Gaonthanwadi, Dublewadi, Sawarde, Vadachiwadi, Chaphodi, Rajapur, Savardhan, Padali, Manbet etc. (Daily Sakal, 30/08/2008).

3.4.2 Poaching :

The poaching of the wild animals is not practiced. However, some sporadic cases of illegal killing of Sambar, Hares, Peacock, Wild boar. Hunting and shooting of any wild animal is prohibited but possessing firearms by the farmers to protect



Map 12 : Water Resources of RWS (Map Based on CFW Kop.)

their crops is proving a danger to the wild animals specially herbivores animals such as Wild boar, Porcupine, Rabbits, Deer and birds like Painted Partridges, Jungle fowls, P. fowls, Peacocks for their meat. However, from every now & then one can read news about the illicit killing of some wild animals e.g. There was a killing of Sambar in Sawarde range of forest. (Daily Pudhari, 30/03/2008)

3.4.3. Habitat Loss:

There are many cases of the loss of wild habitats are prevailed this takes place due to the fast population growth and greedy short term beneficial so called economic development projects which lead to the complete destruction of biodiversity. This area is the unique characteristic habitats of the many rare plant species and wild animals. Habitat defines a natural home or place of occurrence of plant or animal. Radhanagri Wildlife Sanctuary, as stated earlier is having a ecosystem diversity, where the landscape ecosystems like thick forest (Dangs), grasslands, rocky exposed surfaces, hill tops and slopes, deep valley floors and aquatic ecosystem like rivers and streams, lakes and ponds, waterholes are nothing but the wild natural habitat of Flora & Fauna. The thick forests (Dangs) are exclusive habitat of Gaur (Bison) and some wild animals (Image No. 7) where as grasslands are the habitat of some herbivores and some avifauna like Jungle fowls, P. fowls, Painted Partridges, Peacocks, and Hares etc. The habitat of these Flora and Fauna is a seldom disturbed by the temporarily encroachment of undisciplined tourists. The passing of a State Highway through the dense forest is also a great disturbance to the fear free migration of the wild animals. Incase of land

mining Inderganj Bauxite mining area comes under RWS. About 770-hector area of land has been given to the INDAL Company for the lease of 30 years. The company had built 6 km. of the road, office building, pump house, storehouse that has distrusted the habitat of rare Flora & Fauna. Some Rare Flora and their Habitats are as follows:

Grasslands: Andropogon pumilus, Apluda mutica, Aristida adescensionis, A. redacta, A. stocksii, Brachiaria eruliformis, B. ramosa, chloris virgata, D. carricosum, digitaria ciliaris, sehima, nevosum. (Image No.6)

River and Stream Banks: Common trees are; Carallia, brachiata, Diospyros nigrescens, Homalium ceyalanicum, Myristica malabaricea, syzygium cumini, S. beyneanum. Common shrubs are; Ardisia, solanacea, Barleria cristata, Melastoma, malabathricum and phyllanthus lawii. Common climber are; Anodendron manubriatum, Bidaria cuspidata, Hisbiscus hirtus, Luvunga eleutherandra, Paramignya monnophylla, Schefflera elliptica.

Grasses: Arthraxon, jubatus, A. spicat, Bhidea burnsiana, Coelachne minuta, Dimeria hohenacheri, Glyphochloa divergen, Isachne bicolor, Paspalum canarac etc.

Stream and River Beds: A.tenella, Bacopa monnieri, Conscora decurrens, Cleome viscosa, Dentella repens, Eclipta prostrata, H. Schulli, Lagenandra ovata, polygonum plebejum, Rotala serpyllifolia.

Pond and Lake: Blyxa aubertii, B. Octandra, Hydrilla verticillata, N. indica, P. nodosum, Pistia stratiotes, Rotala, malampuzbensis and R. serpyllifolia.

Insectívoros Plants: D. indica, V. aurea, V. exdeta, U. stellaris etc.

Sacred Groves (Devrais): Aporosa, lindleyana, Blachia, denudata, Capparis tenera, Knema attenuata, Myristica malabarica, Syzygium lactum etc.

Formation on Rocks: Aerva lanata, Hybanthus enneaspemns, Justicia glauca, Cyanotis cristata, Drimia indica, Eria exilis, Sonerila scapigera etc.

Parasitic Plants: Aeginetia indica, B. fungosa, Orobanche cernua var, nepalensis S. asiatica, Cuscuta chinensis, C. reflexa, H. obtusata, Scurrula parasitica, Viscum angulatum etc.

3.4.4. Illegal Cutting of Trees:

The peripheral part of the RWS around the villages and human habitat is affected by illegal cutting of the trees. Generally, this happens to procure firewood and fodder. Moreover same illicit removal of leaves of Kadipatta, Tamalpatra, Palas, Hirda fruits and grass as a fodder takes place which also distribute micro level ecosystem and wild habitat.

3.4.5 Domestic Livestock Grazing:

Domestic livestock grazing has been banned but the total grazing control has become extremely difficult because the cattle of villagers are frequently grazing into the jungle and disturbed the wild habitat.

3.4.6. Wildfires :

By virtue of semi-evergreen and moist deciduous forest, fire is not a serious menace. However, some patches of grasslands are not free from the forest fire. Some time grasslands near villages are deliberately burns down by the villagers.

3.4.7. Karvi Plethora :

The plethora or uncontrolled growth of Karvi is an unprecedented threat to the sanctuary. Karvi is observed rapidly encroaching forestland, which is proved as a major obstacle to the growth of a grass, legumes & other herbs and shrubs. Other stray species of grass, weeds or herbs like congress grass is also observed in this area which is main cause of reduction of meadows.

3.4.8. Soil Degradation:

Soil degradation is another problem facing by Radhanagri Wildlife Sanctuary. Particularly in rainy season, the fluvial type of erosion degrades the land along the rills, streams, tributaries and river. However, soil conservation work like Nala bunding, gulli plugging has checked little bit.

3.4.9 Wildlife Health:

Some years before, there were sudden death of 5 to 6 Bison were occur. It has later declared as an epidemic. Therefore, the mortality in wild animals in this area is at large scale. This may due to the encroachment of domestic animals into the sanctuary.

3.4.10 Man-Wildlife Conflict:

During the extension of Radhanagri Wildlife Sanctuary, 25 villages and 30 hamlets (Wadis) are including under the protected area of Radhanagri Wildlife Sanctuary. In the core area i.e. inside the outer boundary of Radhanagri Wildlife Sanctuary, there are 29 Wadis where people live moreover on the rim of the sanctuary. There are several Wadis where day to day life of villagers depends upon forest for their needs of fuel wood and grazing of their domestic

livestock. The Radhanagri Wildlife Sanctuary is infested with wild animals. Many incidences of cattle lifting by carnivorous, wild animals. Sometime man/wildlife conflict also occur the destruction of crops by Bison, Sambar, Wild boar is very common in this area. It is the common problem of villagers that their crops especially Paddy and Nachani crops are destructed by wild animals mostly Bison, Sambar and Wild boar. Some remote area of Yeni, Farale, Bhandane villages of Radhanagri Taluk threat of wild tuskars has been experiwnced. The sugarcane and paddy cultivation is run over by the herd of wild tuskars. There are some sporadic incidence in which people were attacked by Tiger, Bison and other wild animals.

Recently some wild tuskers are frequently visiting the southeastern part of sanctuary i.e. near Kalammawadi dam. The Tiger is also sighted at Kitewadi (Chandgad) area. However, there is government provision to give compensation in such cases. In the case of human killing by the wild animal one has to see the total account of Kolhapur district in which cbout five such incidents were ocuuerd in which descesead killed by the elephants , however one person is killed by the bison till year 2007 whereas two persons were seriously injured by the attack of eliphants. By the attack of the bison seven persons were injured till year 2006. Two persons injured by panthers, one person by wild boar and one person by hyena in the same year. In other incidents 1323 cases of crop destruction by the wild tuskers were registered since 2003 till 2007. 1291 cases of crop destruction by the bison were registered. The total loss of Rs.

48.69 lakh was resulted. Chandgad and Ajra taluk are mostly affected by the raids of eliphants and Radhanagri taluk is affected by the attacks of bisons (Wildlife Report2007).

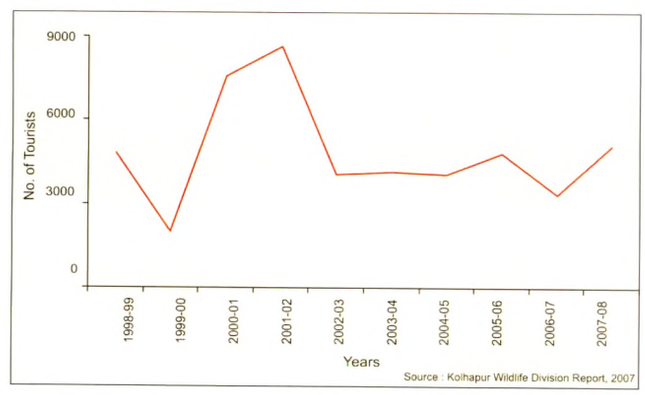
3.4.11 Undisciplined Tourism:

Radhanagri Wildlife Sanctuary is open for tourists. Many tourists visit the sanctuary particularly in the month of October to March. It is estimated that around 2000 to 8000 tourists visit the sanctuary every year (Graph: 3) However, only stipulated area is opened for them to visit i.e. from checkpoint of Dajipur to the 1st and 2nd watch tower over the hill. Visitors are allowed to use their motor vehicles. In such cases, due to the noise of their vehicles and smell of diesel, Petrol and gas irritate the wild animals they are getting disturbed. Some time they change or flee from their habitat. Moreover, the junk of food packets, plastic carry bags, pet bottles, beer cans is left behind in jungle by tourists. There is always danger of consuming these junks by wild animals, which can be hurt to the wild animals. We have many times noticed this during our intensive fieldwork.

3.5 CONSERVATION OF BIODIVERSITY :

The overall degradation of biodiversity in India is a burning problem. It is very dangerous to humankind the destruction of very delicate and fragile ecosystems in Indian jungles. Therefore, it is need of hour to preserve, conserve the balance of biodiversity.

Biodiversity can be conserved by In-situ and Ex-situ methods.



Graph 3 : Tourist visited to Radhanagari Wildlife Sanctuary

3.5.1 In-Situ Conservation:

Preservation of biodiversity in its all forms i.e. genetic biodiversity, species biodiversity & ecosystem biodiversity in its natural habitat, where it is existed at present. e.g. in reserve forests, protected forests, wildlife sanctuaries, national parks etc. In the program of In-situ biodiversity conservation, the individual species can not be conserved or protected, as it is conglomeration of diversified species of Flora & Fauna. Each species habitat is inter-linked with each other; it is really a symbiosis of all living creatures in mass. Therefore, it is to be preserved, conserved amass in form at reserve forest, protected forest, national park or wildlife sanctuary. However, some breeding programs of endangered Fauna and reproduction of some rare Flora can be hold near their habitat. E.g. in Radhanagri Wildlife Sanctuary, breeding of Bison, Sambar, project Tiger can be implemented.

In the sanctuary, restoration programs of some important plant species are required. e.g. Adenoon indicum data (Motha sonaki), Achryanthes malbamica (Herb), Bombax insigne (tree) (Deo savan), Clelistanthus malbaricus (tree), Clematis smilacifolia (Herb) (Devasi), Griffithella hookeniana (Herb), Iphigenia stellata (Herb), Solanum bigeminatum (Herb), Saccopetalum tomentosum (tree), Wagatea spicata (Climber) wakeri, Pygeum gardneri (tree) (Gapsunde).

Besides these habitat development for some faunal species should taken into consideration. Dangs i.e. thick vegetation patches, valley floors, waterholes, some rock cuts, pits should be created. There is an opportunity to accommodate Indian Tiger, Panther and considerable scale. Project Tiger should important here to conserve some wild animals at In-situ. There should be

integrated protection program of this geographical region. Radhanagri Wildlife Sanctuary represents fragile ecosystem with highly species diversity. There should be free corridor maintained within Karnataka, Chandgad, Radhanagri, Gagan Bawada, Koyna, Chandoli etc. to fare free migration of wild animals. The other boundaries of the sanctuary should use for re-plantation of fodder tree. (Image:5)

3.5.2 Ex-Situ Conservation:

In-situ conservation species are conserved at their own natural habitat. However, there are situations in which some species are about to extinct. In such cases, unless we don't try to conserved and reproduce. Such species in laboratory i.e. outside its natural habitat in scientifically controlled environments. e.g. Botanical garden, Zoological parts etc where an attempt is made to multiple reproduction of species. Off course the method is expensive, sometime in Western countries such rare species of plants and animals are preserving by their germplasm in gene banks.

As far is concerned, ex-situ conservation some rare species of plants and grasses are being conserved and reintroduced in their wild habitat by some non governmental organization from Bangalore.

3.6 EXISTING STATUS OF FLORA:

This area is abode of several endemic and threatened Flora and Fauna also. The rare species of plants seems to be on destruction. So to conserve them is to be total protection of ecosystem.

The area falls under the Western Ghat. The plateau tops in this region are lateritic in origin, small grasses and stunted vegetation of syzygium and mimoxyion is common on such plateaus have got very good vegetation. According to the Champion and Seth's classification the major three types of forests are seen over this area such as Southern Tropical Semi Evergreen and West Coast Semi Evergreen Forest which occurs in and around the places like Manbet, Walwan, Hasne, Nidankhan, Sawarde, Dublewadi with the main species like Jamun, Mango, Anjani, Hirda, Surangi and Par Jambul. The shrubs like Bhoma, Shendri, Jangli Limbu, Pendri, Karvi. Southern Tropical moist mixed deciduous forest This occurs mainly at places like Taliye, Borbet, Shelep, Fejivade, Farale and Wakibelt. The species like Ain, Kinjal, Hirda, Bibla, Nana, Behada. The species like Jamun, Mango, Umbar, Assana, Kumaba, Kumkum etc. also found to a lesser extent. The underwood consists of Lantana, Rametha, Karvand, Murud Sheng, Wavding, Chikni etc. West Coast Tropical evergreen forest where Zulumb is a common species. Species like Kali, Shisvi, Kalvan, Jambha and Holigama Grahmil are common (Map:12).

Table: 6

Flora of Radhanagri Wildlife Sanctuary

Botanical Name	Vernacular Name
Memecylon umbellatum	Anjan
Syzygium cumunii	Jambhul
Randia dumetorum	Gel
Terminalia chebula	Hirda
Terminalia tomentosa	Kinjhal
Gnidia glunca	Narkya
Bambusa arundinacea	Bamboo
Carissa congesta	Karvanda
Carvia callosa	Carvi
Plaeocaulis ritchii	Bahara
Acacia concinna	Shikekai
Ixora brachiata	Lokhandi
Lagerstroemia parviflora	Nana

Besides these, there are many other trees like *Manquifera indica* (Aamba), *Memecyclon edule* (Anjani), *Bauhinia recemosa* (Apta), *Phyllantus emblica* (Avala), *Aeqle marmelos* (Bel), *Semecarpus anacardium* (Biba), *Zizyphus jujuba* (Bor), *Michelia champaea* (Chafa), *Machilus macrantha* (Gulab), *Terminalia belerica* (Behada), *Teminalia chebula* (Hirda), *Pongamia glabra* (Karanj), *Anacardium occedentale* (Kaju), *Feronia elaphantum* (Kavath), *Ficus tsiakela* (Kel), *Acacia catecha* (Kheir), *Terminalia paniculate* (Kinjal), *Legerstyroemia lanceolata* (Nana), *Azadirachta indica* (Neem), *Erythrina indica* (Pangara), *Olea dioica* (Jambhul), *Ficus religiosa* (Pimpal), *Sapindus emarginata* (Ritha), *Tectona grandis* (Sag), *Phoenix sylvestrix* (Shindi), *Dalberqia latifolia* (Shissam), *Borassus flabellier* (Tad), *Ficus*

qlomerata (Umbar). Common shrubs are – *Adhatoda vasica* (Adulsa), *Hamidemsus indicus* (Anantmul), *Strobilanthes ciliatus* (Davana), *Aqave sisalana* (Ghaypat), *Loranthus longiflonis* (Bandgul), *Carissa carandas* (Karvand), *Strobilanthes callosus* (Karvi), *Glisqualis indica* (Chameli), *Mimosa pudica* (Lajalu), *Opuntia dillen* (Nagphani), *Vitex nequndo* (Nirgudi), *Vitex trifolia* (Nigdi), *Euphorbia noriifolia* (Nivdung), *Catsoopia gigantea* (Rui), *Euphorbia turuealli* (Sher), *Zizyphus ruqosa* (Toran), *Ocimum sanctum* (Tulus), *Embelia ribes* (Vavding), *Capparis zeylanica* (Wegati) etc. (Ref. govt. management plan)

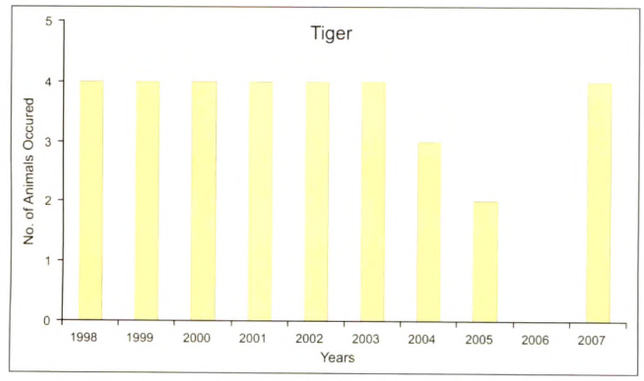
3.7 EXISTING STATUS OF FAUNA:

India has rich heritage of species and genetic strains of flora and fauna. Overall 6% of world species are found in India. It is estimated that India is 10th among the plant rich countries of the world, 11th in terms of endemic species of higher vertebrates and 6th among the centers of diversity and origin of agro-diversity. The total number of living species identified in India so far is 1, 50,000. Out of the 18 biodiversity hotspots in the world, India has two, the 'Western Ghats' and the 'North Western Himalayas'. (Dr. Jay S. Samant : 2005)

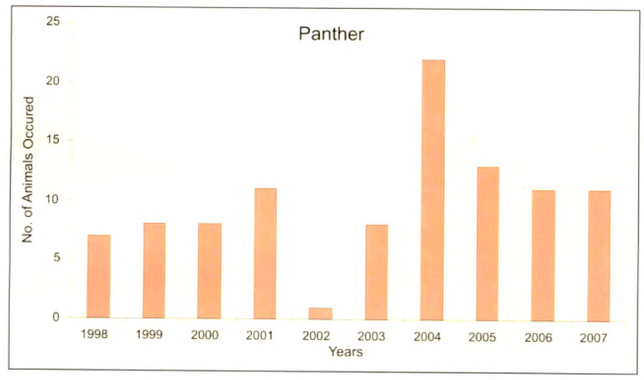
The whole area is interrupted with human habitation and the state highway passes through the sanctuary and they are the main barriers for forest migration of wild animals. Animal in the present context refers to the faunal life of the protected area. Sanctuary has diverse wildlife, though no scientific wildlife survey of this region has been made so far, the records are prepared from the study of pugmarks droppings and actual sighting by the field staff and reports from local people. There is no uniform method for

population estimation of different species. Considering the hilly terrain, scattered water holes, biotic interference on the periphery, it is not possible to follow a particular technique to estimate the number of wild animals within the sanctuary. Hence the pugmarks technique as well as water counting methods is followed simultaneously for the Tiger and Panther. The population estimation of other wild animals such as Gaur, Sambar, Barking deer, Wild boar, Mouse deer, Sloth bear etc. is done by using the water hole counting method and 20% block counting method in the month of May every year since 1994.

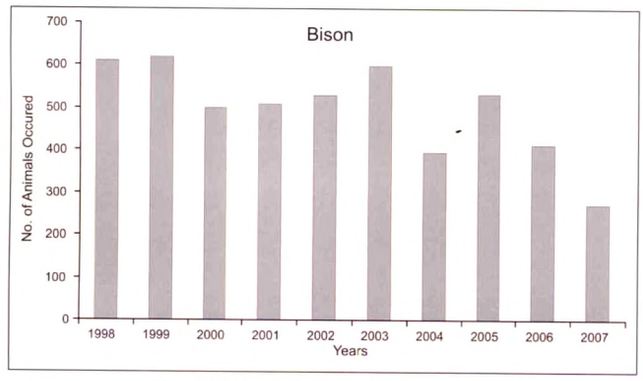
The sanctuary is home of variety of wild animals. Out of the 47 species of mammals recorded in this area, 7 species of mammals are endangered status, namely Tiger, Leopard, Sloth bear, Gaur, Mouse deer and Pangolin. There are as many as 264 species of avifauna recorded in the sanctuary. There are 59 species of reptiles, 2 of which are of endangered status, namely Indian Python and Indian Monitor Lizard. There are 66 species of Butterflies recorded from the protected area. Amphibians are generally found in rainy seasons in most of the area and some times in decaying ground vegetation in the forest. All together 20 species from second orders, 5 families and 10 genera are listed in the sanctuary. The status of species found in the the sanctuary is as follows : **Common Mammals of Western Ghats are,** *Pteropus giganteus* (Indian Flying Fox), *Manis crossicaudata* (Indian Pangolin), *Vulpes bengalensis* (Common Fox), *Cuon alpinus* (Indian Wild Dog), *Melursus ursinus* (Sloth Bear), *Felis chaus* (Jungle Cat), *Panthera pardus* (Panther), *Panthera tigris* (Tiger), *Sus scrofa* (Wild Boar), *Tragulus meminna* (Mouse Deer), *Muntiecus mutjak* (Barking Deer), *Cwrvus unicoolor* (Samber), *Bos gaurus* (Gaur), *Ratufa*



Graph 4: Tiger Population (1998-2007)



Graph 5: Panther Population (1998-2007)



Graph 6: Bison Population (1998-2007)

Indica (Giant Squirrel), *Rattus rattus* (House Rat), *Mus musculus* (House Mouse) etc.

Reptiles like, Crocodylus palustris (Indian Crocodile), Sitana ponticeriana (Fan Throated Lizard), Typhilina acutus (Blind Snake), Python molurus (Python), Naja naja (Indian Cobra), Vipera russelli (Russell's Viper) etc.

Amphibians like, Bufo melanostictus (Common Indian Toad), Bufo stomaticus (Marbled Toad), Rana tigerina (Indian Bull Frog), Polypedates maculatus (Common Tree Frog) etc.

Birds like , *Accipiter nisus* (Sparrow Hawk), *Ictinaetus malayensis* (Black Eagle), *Gyps bengalensis* (Indian Whitebacked Vulture), *Circus cyaneus* (Hen Harrier), *Falco biarmicus* (Lagger Falcon), *Columba livia* (Blue Rock Pigeon), *Columba elphinstonii* (Niligiri Wood Pigeon), *Sterptopeila decaocto* (Indian Ring Dove), *Cuculus micropterus* (Indian Cuckoo), *Eudynamys scolopacea* (Koel), *Tyto alba* (Barn Owl), *Alcedo atthis* (Common Kingfisher), *Tockus griseus* (Malabar Grey Hornbill), *Dryocopus Javense* (Indian Great Black Woodpecker), *Dicrurus adsimilis* (King Crow), *Acridotheres tristis* (Common Myna), *Acridotheres fuscus* (Jungle Myna), *Corvus splendens* (House Crow), *Hypsipetes madagascariensis* (Black Bulbul), *Orthotomus sutorius* (Tailor Bird), *Copsychus malabaricus* (Shama) etc.

Butterflies like; *Argyannis hyperbius* (Indian Fritillary), *Danis plexippus* (Common Tiger), *Papilia demoleus* (Lemon Butterfly), *Udaspes folus* (Grass Demon), *Anaphaeis aurota* (Pioneer), *Cyntarucus plinius* (Zebra Blue) etc.

Bison is the flagship species of this sanctuary however many distinguished wild animals are found in this area. Tigers and panthers are seldom sighted in the area but gaur, sambar, wild boar,

barking deer, mouse deer, are found through out the sanctuary in varying numbers. Sloth bear found in Geazekada , Nidan khan, Kaladang, Waghache pani of the dense forest and undulating surface where the caves and den are found. Barking deer take refuge in the hilly and woody area where its fodder will easily available with assured shelter. On the rocky hillsides mouse deers are located where growth of grass is very vigorous. Giant squirrel has been sighted at Patyach dang, Kala dang and Surangee area. Radhanagri Wildlife Sanctuary also harbors some endangered fauna species such as Indian Pangolin, small Indian Civet, Jungle Cat, Wild Dogs etc. these wild animals are very rarely sighted in this area.

3.7.1 Tiger/ Panther: India is the home of 60% of world's tiger population and therefore is the only place of hope for the survival. The Indian tiger is in a vulnerable state because of habitat reduction and poaching for Chinese Medicine. With only 2000-3000 tigers left in severely damaged habitats in India, there is a distinct threat that the wild tiger could collapse into the extinction zone in the near future and disappear forever.

In the Radhanagri Wildlife Sanctuary there is a rare occurrence of the Indian Tiger however leopards or panther has been seen or sighted by the forest staff or some villagers. Every now and then there is news that some unidentified animal has attacked the domestic animals like cow, goat, sheep, dog etc.

Range and Habitat: The possible tiger or leopard habitat in the dense forests or Dangs. Tiger is sighted at Geazekada, Nanivale Surangi, Waghache pani, Shelap, and Bambarde. There is a list of tigers occurred in these area acquired by the regular population

survey which was taken from the year 1998 to 2007 the graph shows the tiger population during these years. From 1998 to the year 2003 there is a same population which has some speculation and doubt only four tigers are spotted in these years. The population of Tiger is constant from 1998 to 2003. i.e. 4. In the year 2004 & 2005, the population of Tiger unfortunately decreased. In the year 2006, the Tiger is not found in the sanctuary area. (Graph No. 4, 5)

Table: 7
Population Estimation of Wild Aniimals

Sr. No.	Year	Tiger	Panther	Bison	Sambar	Barking Deer	Sloth Deer
1	1998	4	7	400-610	95-130	110-150	20-30
2	1999	4	8	410-620	90-130	150-160	20-30
3	2000	4	8	500	115	165	25
4	2001	4	11	510	120	170	26
5	2002	4	1	530	135	180	40
6	2003	4	8	599-892	47-155	150-249	40
7	2004	3	22	395-610	78-195	187-298	15-102
8	2005	2	13	532-840	85-210	157-289	38
9	2006	0	11	413-639	219-392	295-516	38
10	2007	4	11	273	42	48	4

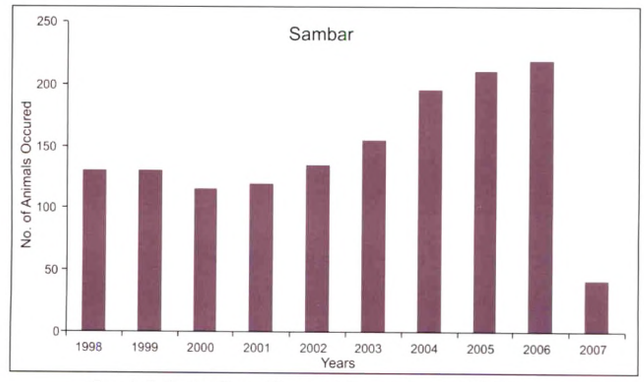
Gaur (Indian Bison): The Gaur or Indian Bison is a large endangered herbivore, and can be seen in protected sanctuaries in India. In the wild its young are preyed upon by tigers and leopards and the loss of its habitat due to human encroachment has led to the reduction in its population across India. The gaur is very famous in this area even the sanctuary is well known for this animal only.

Physical Characteristics: The Gaur or Indian Bison is a large animal. Male Gaurs are black in color, while female Gaurs are brown. Both the hide of male and female Gaurs is white below the knee of each leg, giving the gaur an appearance of wearing white stockings. Gaurs calves are light brown and do not have "stockings." Adult Gaur bulls can grow almost 2 m tall and weigh from 650 to 1000 Kg. Female Gaur are smaller in size. Older male Gaurs have a big dorsal ridge along the length of their backs and huge dewlaps.

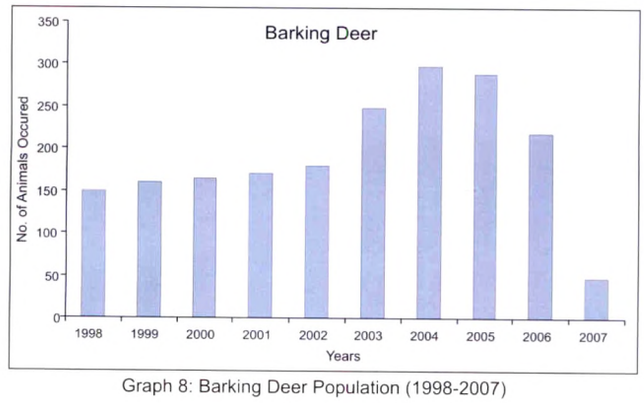
Range and Habitat: The Gaur lives in grassy clearings and in evergreen and deciduous forest. The Gaur or Bison is the flagship species of this sanctuary. Gaur usually spends the night in a forest. the population of Bison is in range of 273 to 892 in the sanctuary area (Graph:6) In the year 1999, the population of Bison is 410-620. In the year 2007, the population of Bison is decreased to 273. (Image: 1)

Diet: Gaurs are herbivores. They feed mainly on grass. During times of drought Gaurs will eat leaves, creepers and plants. Some tree species browsed by gaur are terminalia alata, terminalia tomentosa, dalberkis latifora, calicarpa lanata, ficus species etc. , fruits consumed by gaur are vanquira spinosa, ficus comerata, cassia fistula, terminalia bellerica etc. Being ruminant animals they usually feed during the morning rest and ruminate in the afternoon, feed some more in the evening and return to the forest cover to rest at night.

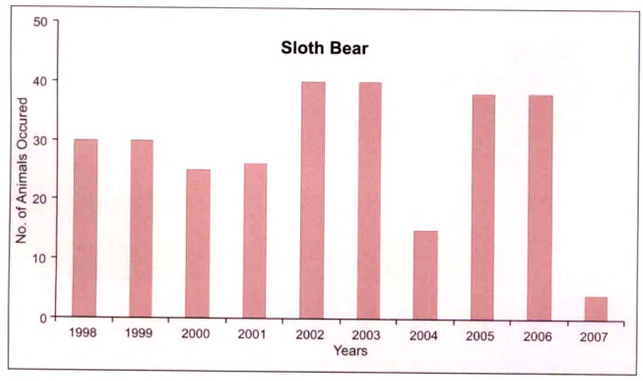
Behavior: Gaurs usually live in herds of around 10 animals. However herds of more than ten be seen. Herds are led by an adult male bull. Bulls fight amongst themselves to establish dominance



Graph 7: Antler Deer (Sambar) Population (1998-2007)



Graph 8: Barking Deer Population (1998-2007)



Graph 9 : Population of Sloth Bear (1998-2007)

over a herd. Male bulls may also live in bachelor herds. Gaurs vocalize to warn the herd of danger and to communicate among themselves. Licking is another means of communication among Gaurs.

Indian Pangolin (Ud-Manger): The **Indian Pangolin** (*Manis crassicaudata*) is a pangolin that is found in many parts of India and some parts of Sri Lanka. Like other pangolins, it has large, overlapping scales on the body which act like armour. It can also curl itself into a ball as self defense against predators such as the tiger. It is an insectivore and feeds on ants and termites, digging them out of their mounds using its long claws that are as long as its forelimbs. It lives mainly in burrows and is known to climb trees. It is also considered to be a curious animal and has been killed for so-called medicinal value.

In the area of Radhanagri the Indian pangolin is rarely sighted by the forest staff and some tiome by the visitars mainly in deep forest of waghche pani and sarounding area. However from here and after the occurance of sambar, barking deer and sloth bear is recognized. From 1998 to 2007 the population of the samber is increasing considerably but in 2007 it came dowen surprisingly (Graph: 7). After exploring the resion behind this, it is informed that because of migration their number has slacken dowen, however it is dubious it is same in case of the barking deer and sloth bear(Graph:8,9). There is a wide scope to investigate the real numbers of these animals.

REFERENCES:

1. Almeida M. R. (1996): Flora Of. Maharashtra, Mumbai: Thomas Paul almeida orient.

2. Davidar Priya, M. Arjunan, Pratheesh. (Dec. 2007) : Forest degradation in the Western Ghat biodiversity hotspot : Resource collection, livelihood concerns and sustainability, Current Science, Vol. 93, No. 11, 10 Pp. 1567.

3. Fenhell, David A (1999): Ecotourism : An introduction. 2nd edition, London.

4. Gupta Vikas, Kakodkar Nitin , Kumar Devendra (2008) : Working plan for the forest of Kolhapur forest division, Government of Maharashtra. Vol. I Text (part I, II).

5. Heywood V. H. & Watson R. T. (1995): Global bio-diversity assessment, Cambridge University Press.

6. Kotpal R. L. (1999): Vertibrates modern textbook of Zoology.

7. Kunte Krushnamegh (March 2008) : The Wildlife (Protection) Act and Conservation prioritization of Butteflies of the Western Ghats, South Western India, Current Science, Vol. 94, No. 6, 25 Pp. 729.

8. Rathore M. S. (1996): Environment and development. Rawat publication, Jaipur.

9. Saharia V. B. (1982): Wildlife in India, Natraj publication, Dehradun.

10. Samant Dr. Jay (2007): Environmental studies, Shivaji University, Kolhapur.

11. Samant J. S. and Ahmed (1989) : Potential and Environmental impact of Wildlife tourism in the Western Ghats of Maharashtra, presented at National Seminar, Department of Geography, Shivaji University, Kolhapur.

12. Sharma B. R. & Gupta Brij Kishor (2008): Breeding for the future, Conservation breeding inititatives in India, Science Reporter, Feb. 2008, pp. 9.

13. Singh Tej Vir (1994): Ecotourism A Guide for Planners and Managers tourism recreation research. Vol. XIX No. 1

14. Wildlife Conservation Society. www.wcs.org

15. Yadav S. R. & Sardesai M. M. (2002): Flora of Kolhapur District, Shivaji University press, Kolhapur.