BHADRA WILDLIFE SANCTUARY - A FRAGILE ECOSYSTEM

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Introduction

Karnataka once had grand heritage of wildlife that is now concentrated in few pockets of Western Ghats and its fringes. A few decades back Karnataka had more than 35% of forests in its fold to its total geographical area. Unfortunately due to uncontrolled growth of human and cattle population most of the forests became victim to meet the increasing demand of human needs and grazing area resulting in the rapid decline in forest status presently to the extent of 19% in Karnataka. As on today there are 18 Wildlife Sanctuaries and 5 National Parks amounting to extent of 7340.38 km^2 forest area in a reserved status.

General status of the Sanctuary

It was during 1974 that Bhadra Wildlife Sanctuary was constituted by amalgamating the adjoining Lakkavally forest belt to Jagra Valley Sanctuary covering an area of 492.46 km^2. Once again during 1992 Government of Karnataka on the guidelines of Government of India with the sole intention of wildlife management restructured the Bhadra Wildlife Sanctuary by including already declared wildlife areas which were under the control of adjoining territorial Forest Divisions namely the Hebbe forest range from Chikkamagalore Forest Division and part of Umblebyle range from Bhadravathi Division making an exclusive Wildlife Division called Bhadra Wildlife Division. The total area of 492.46 km^2 covers mainly the three component areas like Muthodi, Hebbe and Lakkavally. All these areas are ecologically more or less distinct and almost contiguous excepting few patches of private coffee cultivations in between.

The entire Sanctuary area has been conveniently divided into three main blocks basing on the existing natural boundaries for the purpose of efficient administration and scientific management :

Muthodi Block	135.46 km^2
Lakkavally Block	264.20 km^2
Hebbe Block	92.80 km^2
Total	492.46 km^2

Basing on the guiding principles of wildlife conservation, propagation and eco-tourism management the entire Sanctuary area has been classified into following zones:

Core Zone	145.04 km^2
Buffer Zone and Tourism Zone	347.42 km^2
Total	492.46 km^2

It is very much important to note down that the big chunk of forest area of this Sanctuary towards northern part of Bhadra reservoir mainly the Thanigebyle area is in a highly degraded condition and though

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does not hold any wildlife population in an appreciable manner, mainly to have a contiguous corridor to the animals recently included to the sanctuary.

Materials and Methods

Data on the wildlife population were obtained through periodical animal census conducted by the State Forest Department, also regular animal census by means of ocular counts and other supplementary evidences like droppings, calls, kills, etc, observed during their perambulation in the field.

Location and Physical Features

Muthodi, one of the component area of Bhadra Wildlife Sanctuary, is 32 km away from Chikkamagalore and Hebbe, another component area of Bhadra Wildlife Sanctuary, is 45 km away from Chikkamagalore. The third component Lakkavally is also about 30 km from Shimoga. The sanctuary area stretches between Longitude 70° 15' and 75° 50' N and Latitude 13° 50' E. The major part of the area comprises the best forests of Western Ghats and its fringes.

This Sanctuary is bounded by Bhadra reservoir and cultivated plains on the North Bababudan hill range with coffee estates on the east and south and Bhadra river to the west (Fig. 1).

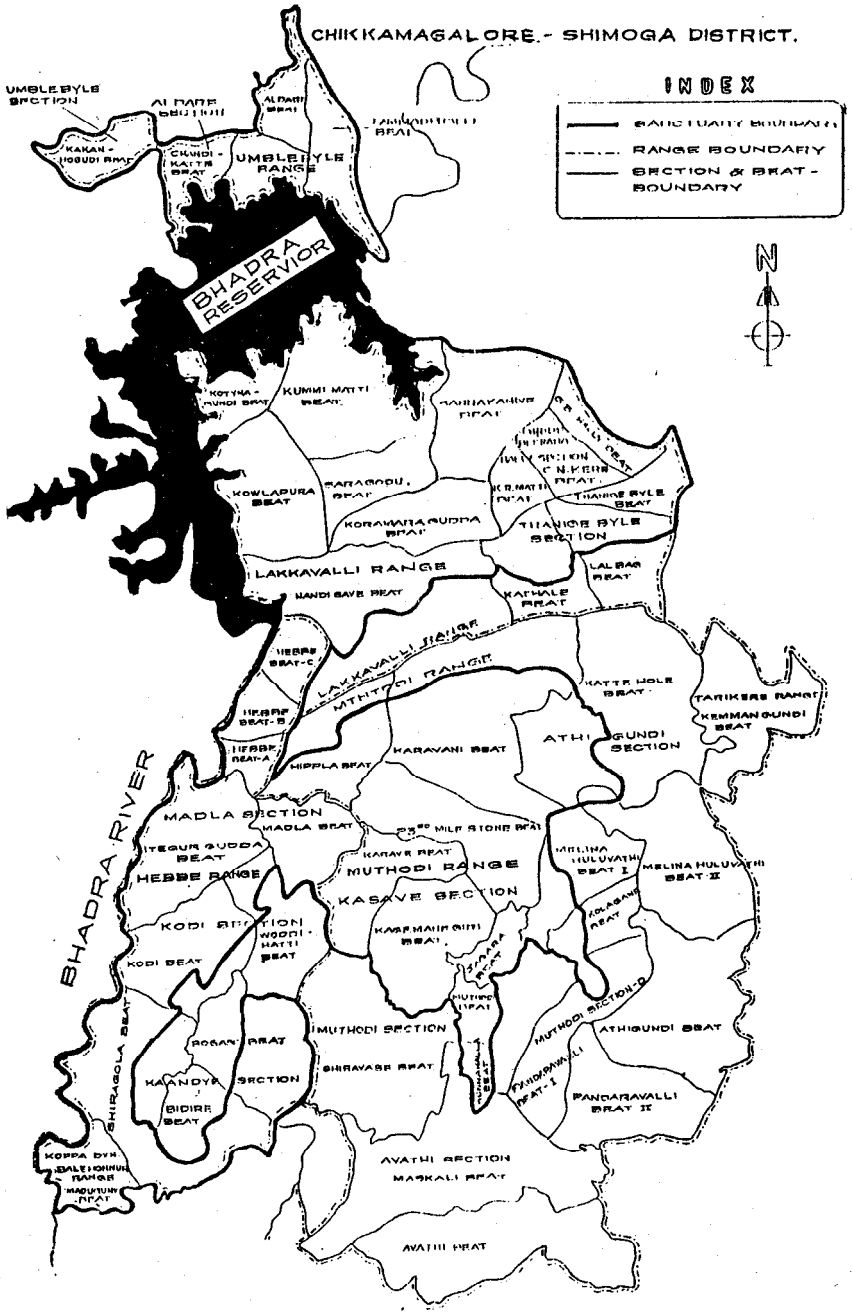
Topography : Bhadra Sanctuary is located in the highland region (i.e. Malnad) belt of Karnataka on the Western Ghats. An abrupt outspur of Bababudan hill ranges from the Deccan plateau forming a rough crescent shape. The terrain is gently undulating. The mountains have the normal elevation of 1000-1500 m. The highest peak of Karnataka called "Mullaiahna giri" (1900 m) is located in the crescent. Inside the crater one more chain of hill range is running splitting three trough like areas Muthodi, Lakkavally and Hebbe. All these are like saucer shaped valleys providing a definite microclimate to each of the areas and round the year contain the wild animals in the valleys. Muthodi area lying between Hebbegiri and Bababundan hills forms a crescent. Lakkavally area lying in between Hebbegiri and Bhadra reservoir forms another crescent and Hebbe area lying in between Kagemane hill range and Bhadra river forms a third crescent.

Climate : Chikkamagalore being situated in the Malnad region enjoys generally cool climate throughout the year and affords a pleasant retreat during the hot months i.e. March to May. The coldest month is December with a mean minimum temperature of 13°C. The hottest month is March with a mean maximum temperature of 36°C.

Rainfall : Chikkamagalore is the wettest district in the State having annual rainfall of 2000 mm, usually the rainfall falling on the average for 89 days. Heavy and practically continuous rainfall from June to September is experienced. Nearly one third of total rainfall is recorded in July and maximum rainfall received by southwest monsoons. Annual precipitation is 2000-2500 mm. This is primarily due to high altitude, vegetation, topography and also the consequent characteristic Orography of Bababundan hill tract.

Geology and Rocks : The Dharwar schist occurs in well defined hill belts of Bababundan range. The Bababundan belt constitutes the entire chain of the horse shoe shaped mountain ranges, the schists

Fig. 1



Map of Bhadra Wildlife Sanctuary

extending in all directions, considerably away from the foothills. The belt mainly consists of the dark hornblend rocks. The hornblend schists, epidiorites, amphibolites etc., are associated with bands of quartzites, ferrugineous quartzites and haematite bands. These iron ore beds are in a series of bands crumpled and folded following the horse shoe curvature of the contour. On account of their superior resistance to weathering from harder ribs standing out as persistent ridges forming the summit of hills.

Soil : Along the south of Bababundan mountains is a rich tract of black cotton soil, whose fertility is enhanced by the command of an unfailing supply of water from the hill streams, is said formerly to given to the plains of Chikkamagalore the name of 'Honjavanige sime' or land flowing with gold. The high tract of this land is generally gravelly. Along with black cotton soil the red gravelly soil also prevails.

Drainage System

Basically the Sanctuary falls in the hill type steep terrain. Due to this the drainage network is highly predominant forming a perennial source of water to the wild animals. The main rivers of this area are Bhadra and Somavahini rivers. Bhadra originates at 'Gangamula' near Kuduremukh; flows in a northeasterly direction along the foot of the western outer slopes of Bababudans and formulates a demarcation to sanctuary at western side.

River Somavahini draining into the area at the southern part of the Sanctuary passes through a crater in a narrow strip of mountain walls and finally joins Bhadra river. About 200 km^2 of vast impounded water body of Bhadra reservoir whose back water stretches nearly 15 km backwards and lap at the foot of the mountain range serve as perennial water source to the animals.

In addition to these water resources there are number of streams, rivulets and tanks spread all over the sanctuary.

All these streams are originating from the western slopes of Bababudan hills passing through the sanctuary and ultimately join rivers Somavahini and Bhadra.

Vegetation Pattern

Vegetation of Bhadra Wildlife Sanctuary is unique for its bamboo brakes. The general pattern of vegetation broadly falls into 4 types. The forests of the valley floor northern and eastern outer slopes are generally from dry deciduous to moist deciduous type. The inner slopes and inner hill range in the trough are covered by grassy downs with moist deciduous, semi-evergreen and Shola forest. On the outer edges of Hebbe and Lakkavally area the forests tend to integrate into dry deciduous type. Intermittently vast extent of pure teak plantations about 6% of the total Sanctuary area exist, which quite often serve as retrieval area for the bigger mammals in the sanctuary. On the whole Muthodi and Hebbe areas are wetter and more verdant than Lakkavally area particularly during dry seasons.

The vegetation pattern of the sanctuary is as follows :

The dry deciduous hill type forests : These type of forests are characteristic around hills of lower elevation generally below 750 m where the annual rainfall ranges from

1600-2000 mm. These type of forests are seen around some parts of Muthodi, Kagemanegiri, Hebbegiri, Seegekhan, Sirvase, plains of Muthodi, Hebbe and Lakkavally, Tanigebyle area of Bhadra Wildlife Sanctuary.

The characteristic tree species of this type are *Albizia lebbek, Anogeissus latifolia, Bridelia retusa, Cassia fistula, Diospyros montana, Grewia tiliaefolia, Mitragyna parvifolia, Pterocarpus marsupium, Terminalia arjuna, Terminalia paniculata.* Among shrubs *Flacourtia indica, Ziziphus oenopolia* formulate second canopy. Some of the common climbers are *Argyreia cuneata, Cardiospermum halicacabum, Cayratia pedate,* and species of *Ipomea* and *Lantana camara.* There are also species of *Calamus* and *Phoenix.* The bamboos are mainly of *Bambusa arundinacea* and *Dendrocalamus strictus.*

The moist deciduous type forests : These type of forests are found where the altitude ranges from 600 to 1200 m and the rainfall from 2000 to 3000 mm. They normally merge into evergreen types at the valleys and pockets. Many deciduous trees of lower elevations and evergreen trees of higher elevations intrude into this zone. Maximum chunk of moist deciduous forests in this sanctuary are interspersed with the existence of dowga bamboo i.e. *Bamboosa bambos* which normally grows in these forests with average mean height of 30 m and 50 cm in girth. These bamboo brakes serves as staple food for Elephants and Bisons in addition to Deer family, and also retrieval area to many of the larger animals of the sanctuary.

Floristic composition of this type of forests mainly represents timber species like *Anogeissus latifolia, Pterocarpus marsupium, Dalbergia latifolia, Tectona grandis, Grewia tiliaefolia, Terminalia* sps. Some important middle canopy includes shruby sps. like *Antidesma diandrum, Gmelina arborea, Grewia hirsuta, Kydia calycina, Sterculia guttata,* and *Stereospermum personatum.*

The undergrowth consists of many species of zingiberace and many orchids and ferns are seen on the tree trunks. Some of the climbing shrubs and twiners are *Asparagus racemosus, Hemidesmus indicus* etc.

These forests in the sanctuary serve as main feeding area for the animals, because of the existence of many palatable fodder species in the Floristic composition.

The evergreen type of forests : These forests are common around the hills and valleys of Kemmangundi where the altitude ranges from 500 to 1500 m. These forests are on the windward side of the Western Ghats where the rainfall ranges from 2500 to 4500 mm. The heavy rainfall favours the thick tropical forest growth. Faulting and differential erosion makes this region an extremely rough tract.

Top canopy normally consists trees like *Artocarpus hirsuta, Elaeocarpus tuberculatus, Mesua nagesarium, Mimusops elengi, Vateria indica* are found here and usually covered with epiphytic orchids *Arodis* and Ferns.

Second storey characterized by the presence of *Bischofia javanica, Garcini morella, Microtropis latifolia, Sapindus laurifolius* etc., which themselves adapt to more shady condition. Third storey consists normally woody shrubs and small trees such as *Agrostistachys indica, Wrightia*

tinctoria, *Mallotus* species, *Trema orientalis*, *Salix tetrasperma* etc.

The ground vegetation is formed by thick carpet of herbs and shrubs including ferns, Wild ginger (*Globba* sps.) which are common and grow luxuriantly.

Though the evergreen forest patches in this sanctuary offer shelter to many reptiles like Python, King Cobra etc., the other larger animals like Bisons, Elephants, Sambars and Deer prefer this area during all summer and whenever pinch period persists in the sanctuary for both food and shelter.

The Sholas and Grassland type : Sholas and grassland in this sanctuary normally interpose at the elevations of 1200 m and above, characteristically on Bababudan hill, Kemmangundi, Hebbegiri etc. The Shola vegetation includes both tropical and subtemerate mixed together. The Sholas may be considered to be a climax type. The most conspicuous trees and shrubs here are *Acronychia laurifolia*, *Allophylus cobbe*, *Diospyros* species, *Michelia nilagirica*, *Gordonia obtusa* etc. Some of the semiparasites like *Dendrophthoe falcata*, and species of viscum are common on the branches of trees.

Like evergreen forests the role of offering shelter and fodder to wildlife during summer and pinch period is also seen in case of Sholas. Further Sholas in this sanctuary are being used as escape grounds for herbivores because of the elevation and closed canopy at the time of predatism, fire and pinch period etc.

The grassland on the high elevated hill tract acts as feeding ground to larger mammals like Bison and Deer as it has got number of palatable grasses. Some of the important species of grasses are *Themeda tremula*, *Habenaria lorgicorniculata*, *Cymbopogon caesius*, *Heteropogon contortus*, *Eulalia trispicata*, *Jansenella griffithiana*, etc.

On low lying area of valley floor and even on the plains of Muthodi, Lakkavally and Hebbe area are found often Marshy glades (called "Hadlus" in local language) clothed in luxuriant growth of grasses. There are also grassy blanks on hill slopes and all along the edge of back waters. These are the main feeding grounds for the sanctuary animals. However from the point of fodder availability the dry season though prevails for 90 to 120 days the "pinch period" seems very less in this area compared to any other South Indian Sanctuaries.

Wildlife

Bhadra Wildlife Sanctuary once said to have been paradise of wildlife more particularly of Bisons is now perhaps left with few countable populations of each local representatives.

The various reasons for such decline in wildlife population are being investigated in our present studies, which would be published in later course. However the present status of wildlife, has been determined as accurately as possible during 1993 census conducted by the Department of Forests Government of Karnataka. Since present study is confined only to larger mammals with special reference to Gaurs, due importance is not given on other lower vertebrates. Therefore Amphibians, minor reptiles, common rodents and Bats have been less subjected for observations.

Reptiles : The prominent reptiles here are

the marsh Crocodiles which are found all along Bhadra river where less disturbance is there. More commonly these are found after Sangameswarpet through where river Bhadra enters into the sanctuary and further flows through midst of the undisturbed moist deciduous forests till it joins Bhadra reservoir back water. Very rarely the marsh Crocodiles are also found in the river Somavahani around forest villages Kesave, Madla and Hipal areas. Illicit fishing using dynamite is very frequent by locals in Bhadra river particularly within the sanctuary area. Due to this the Crocodile population is believed to be decimated. Other interesting reptiles like rock Pythons and King Cobras are frequently seen in Muthodi area.

Birds : It is estimated that about 250 Bird species are found in Sanctuary. Probably the prevailing micro-climate to the area, non-devastating natural calamities made this area paradise for the Birds. Once in 1991 November the first author during brief survey recorded 88 species apart from few escaped unidentified. The more frequently seen Birds in this area are King fisher, Ibis, Malabar pied horn bill, Common grey horn bill, Paradise fly catcher, Myna, Grey jungle fowl, Fishing eagle, Pea fowl, Malabar trogan, Great black wood pecker, Black naped oriole, South Indian black bulbul, water birds like Cormorants, Darter, Larger egret, River tern etc.

Mammals : The representative mammals seen here are the Common Langur, which are quite abundant in all the three component areas of Sanctuary. Few families of Bonnet Macaques also rarely occur but their presence is normally confined to Hebbe and Lakkavally blocks probably because of their liking for dry forests.

(a) *Tigers* : Tigers though not common but they are not unusual in their sightings in the Sanctuary. Frequent cattle killings are noticed around Tagurgudda, Kagemanegiri, Huluvathi, Hipla and Madla areas. The 1993 census reveals the existence of 25 Tigers.

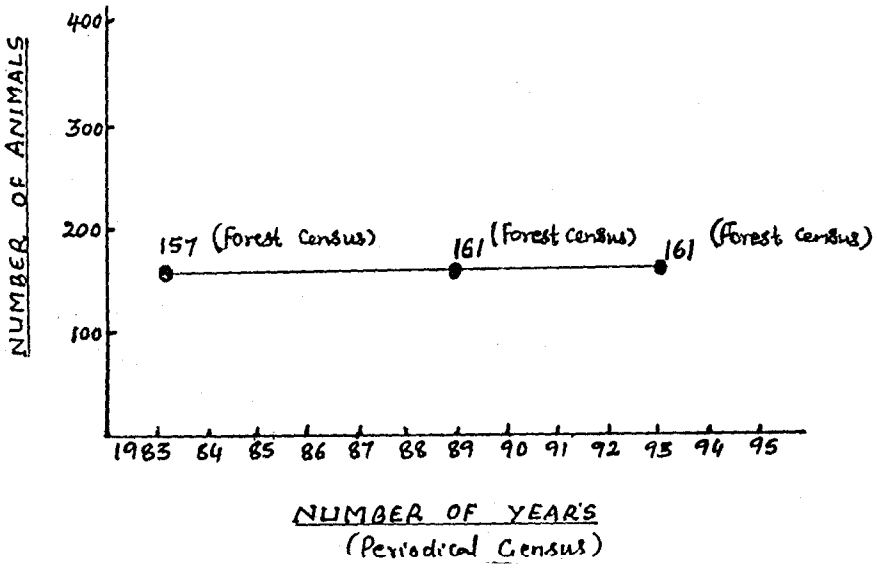
(b) *Leopards* : Leopards are uncommon in this Sanctuary. The 1993 census reports that there are 11 Leopards in this Sanctuary, out of them 8 are reported to have seen in Lakkavally area, this congregation of Leopards is probably due to dry and open type of forests.

(c) *Sloth Bear* : Sloth Bears are rare and mostly confined to Lakkavally and Tanigebyle areas and also Tegurgudda and Kodi areas of Hebbe block. The Giant squirrels (Malabar squirrel) are quite abundant in block but they are also found in Lakkavally and Hebbe areas.

(d) *Elephant* : Elephant population occurs in all parts of the Sanctuary and periodically keep migrating all along the stream banks and thus migrate between Muthodi, Hebe, Lakkavally and Tanigebyle area. Very rarely the crop riding complaints are received from farmer's unlike in other areas of Mysore and Shimoga Districts. During summer all the Elephants congregate in the Bhadra back water area. Regular human deaths are noticed around Muthodi and Lakkavally area by Elephant trampling. Availability of the lush green Bamboo perennial water source and Bhadra back water is the boon for the Elephants of this area. No poaching incidence are so far noticed. 1993 census reports the presence of 161 Elephants in the Sanctuary (Fig. 2).

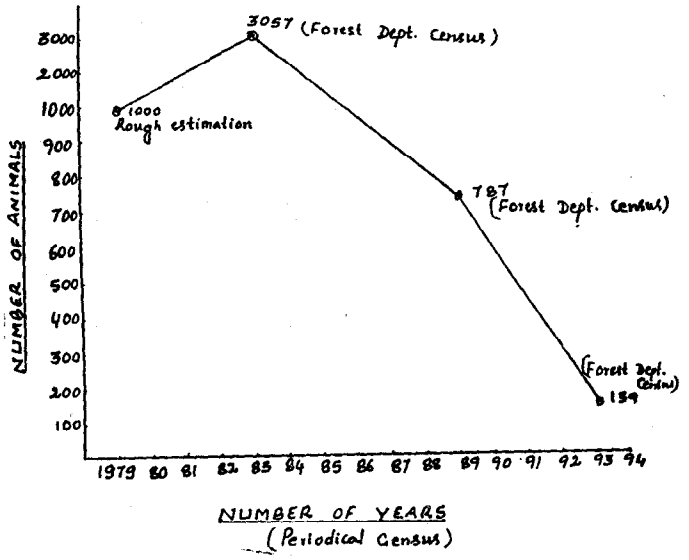
(e) *Gaur* : Gaurs certainly are the pride of Bhadra Wildlife Sanctuary. Ecologically

Fig. 2



Population dynamics of Elephants in Bhadra Wildlife Sanctuary

Fig. 3



Population dynamics of Gaurs in Bhadra Wildlife Sanctuary

suitable habitat for Bisons with rich fodder and perennial water supply makes this area unique and ecologically suitable for Bisons than any other Sanctuary. This area due to characteristic geographical barriers not only provides protection but ensures potentiality for preservation and perpetuation of this species. Karanth (1979) estimated the presence of around 1000 Gaurs in this area. 1983 census reports that there are 3057 Gaurs in the Sanctuary. Further, 1989 census reports 787 Gaur (215 Gaurs from Bhadravathi Division in Lakkavally area and 562 Gaurs from Chikkamagalore Division including few Gaurs outside the Sanctuary area in Mudigere and Aldur ranges but majority are from Muthodi and Hebbe area). The latest census conducted during 1993 reports the presence of only 139 Gaur's in the Sanctuary. It is important to note that the out break of Rinderpest, a dreaded disease, spread in Bhadra Sanctuary during 1990 has victimized large number of Guars. But still as per the natural principles of population dynamics the population size is drastically varying not giving any definite reasons for such high fluctuation in population.

Table 1

Present status of the major animals of Bhadra Wildlife Sanctuary

Scientific Name	Mut	Heb	Lak	Fav. Localities
Macaca radiata (Bonnet macaque)	D	C	C	Around villages
Presbytis ontelus (Common Langur)	A	A	A	All over
Panthera tigris (Tiger)	B	C	C	
Panthera pardus (Tiger)	D	D	D	
Canis aures (Jackal)	A	A	A	
Cuon alpinus (Wild Dog)	A	B	C	
Melursus ursinus (Sloth Bear)	D	B	C	
Rutufa indica (Malayan gait sq)	A	A	B	
Hystrix Indica (Indian Porcupine)	B	B	B	
Elephas maximus (Elephant)	B	B	B	
Bos gaurus (Guar)	A	B	A	
Tetracerus quadri (Four horned antelope)	C	D	D	
Cervus unicolor (Sambar)	B	B	B	
Axis axis (Spotted Deer)	A	B	A	
Muntiacus muntjak (Barking Deer)	B	C	B	
Sus scrofa (Wild Pig)	A	A	A	
Python molurus (Python)	B	B	B	
Ophophagus hannah (King Cobra)	C	-	-	
Crocodylus palust (Marsh Crocodile)	-	D	-	

Mut = Muthodi, Heb = Hebbe, Lak = Lakkavally
A = Very Common, B = Frequent, C = Present
D = Rare.

Table 2

Census Statistic of important animals of the Sanctuary

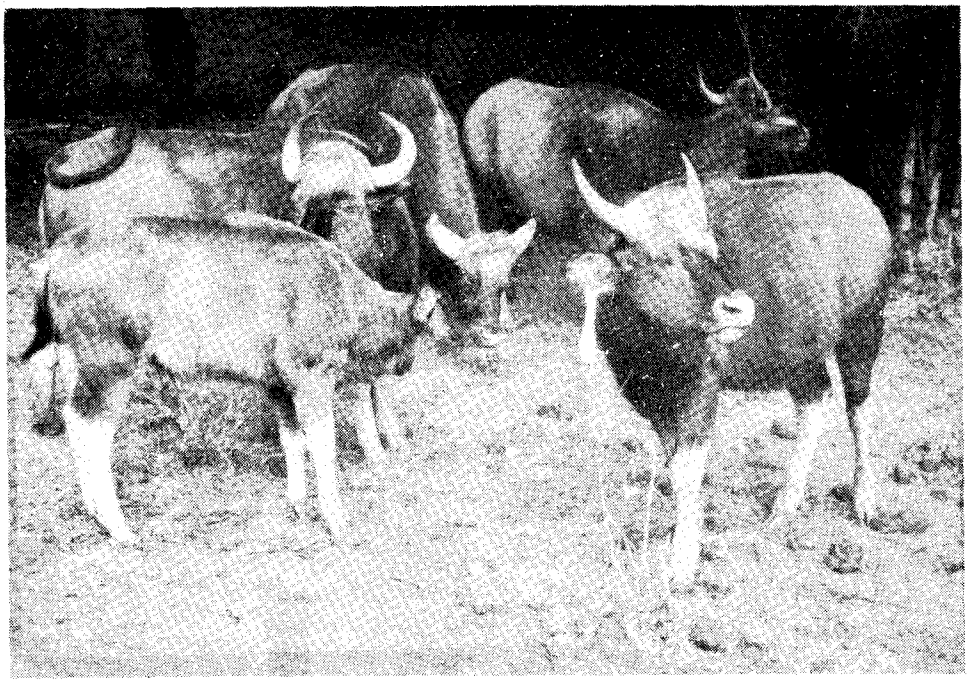
Animal	1979	1983	1989	1993
Bison	1000	3057	787	139
Elephant	-	157	161	161
Tiger	-	-	20	25
Leopard	-	-	10	11
Sambar	-	-	-	150*
Spotted Deer	-	-	-	5000*

Note : *Approximately.

Conclusion

Bhadra Wildlife Sanctuary vegetation wise enjoys one of the richest habitats in the country and has the potentiality to harbour

Fig. 4



Gaurs once flourished, now threatened

large number of bigger mammals like Bisons and Elephants. Dry to wet tropical forests of this sanctuary have three storied canopy with a steep terrained topography making the area unique. Major chunks of the area at this Sanctuary are characterized by lofty and thick Bamboo brakes offer round the year food and shelter to the animals. Wide patches of marshy glades and large extent of manmade Teak plantations interspersed with Bamboo brakes in the area offer feeding and breeding grounds. Geographic barriers like Bhadra reservoir and its back water to the north, contiguous Bababundan hill ranges to the east and south and Bhadra river to the west makes this Sanctuary isolated by cutting off the continuity from the neighbouring forest belt, ensures adequate protections to the inhabited wildlife.

These factors are favourable to the wildlife in this Sanctuary. Unfortunately the wildlife population in this Sanctuary is not perpetuating as expected, inspite of the rich availability of food and water with adequate protection. Further, the population of Bison and Elephant is declining posing grave threat of disappearance of these species from this Sanctuary. Therefore this Sanctuary is presently in a state of "fragile ecosystem" which has ecologically vital significance and requires habitat enrichment and planned conservation and propagation of these threatened populations of Bisons and Elephants.

SUMMARY

Nature nas endowed India with a magnificent asset in its rich and varied wildlife. It is estimated that there are over 500 species of mammals in the country. In bird population India possesses one of the richest avifauna in the world. Wildlife, an important constituent of natural biotic complex, could exist in a natural state of equilibrium with its environment, governed by the laws of natural selection if there is no human interference. Man however has been persecuting wildlife for his demands without appreciating its importance in maintaining the equilibrium of dynamic nature. As a result of this folly several species of animals and birds have become either extinct or are threatened with extinction.

भद्र वन्यप्राणि अभयारण्य - भंगुर परिस्थिति संहति

आर० राजू व एस०एन० हेगड़े

सारांश

प्रकृति ने अपने सम्पन्न और विविध वन्यप्राणियों के रूप में हमें शानदार परिसम्पत्ति प्रदान की है । अनुमान है कि हमारे देश में 500 से अधिक स्तनि जातियाँ है । पक्षियों की दृष्टि से भारत में संसार के सम्पन्नतम पक्षी मिलते हैं । वन्यप्राणी प्राकृतिक जैविक जटिल संहति का महत्वपूर्ण संघटक है और वे उस पर्यावरण के साथ संतुलन बनाकर प्राकृतिक हालत में ही रह सकते हैं जो मानव हस्तक्षेप हुए बिना प्राकृतिक संवरण नियमों से चला करता है । परन्तु मानव अपनी उछलती हुई मांग की पूर्ति के लिए गतिमान प्रकृति में संतुलन बनाए रखने में इसके महत्व के सम्मान दिए बिना वन्यप्राणियों को सताता आ रहा है । उसकी इस मूर्खता के कारण पशुओं और पक्षियों की कई जातियाँ विलुप्त हो चुकी हैं अथवा उन्हें विलुप्ति का भारी खतरा खड़ा हो गया है ।

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