

## 1. INTRODUCTION :

We have a rich heritage of wildlife comprising of about 350 species of mammals (Govt. of India, 1983) 1200 species of birds and some 900 species of reptiles (Mukherjee, 1982) and a myriad of other living creatures. Thus we have a tremendous opportunity at the same time responsibility to enjoy, utilize, protect and pass on this vast treasure to posterity in the face of growing demands from about 800 million people and 500 million farm animals. The task is not an easy one in a developing country with democratic set-up where 80% of the population are rural based and wholly dependent for their livelihood on the living natural resources of the country. Only 22.7% of the country spread over 3 million square kilometres is officially claimed as forest area; but this includes unproductive areas with little or no forest covers. Of the 22.7% forest area national parks and wildlife sanctuaries cover 8.6% which represents only 0.5% of the total geographical area of the country (Singh, 1980). By any standard this is utterly inadequate to provide a sustainable base for our living natural resources and a buffer against the increasing threat of ecological and environmental hazards. This lamentable state of affairs as we shall see is of recent origin. Traditionally the Aryan and the Non-Aryan

inhabitants of India were respectful to both forest and wildlife. They followed the principle of living along with nature as is evident from the Vedas particularly Rig Veda and Atharva Veda. To quote one hymn from the latter "What of thee I dig out, let that quickly grow over, let me not hit thy vitals, or thy heart".

Stracey (1963) pointed out that wildlife in India has passed through different phases. In the mythological phase it enjoyed a privileged position of protection through religious myths and sentiments. Rishi Valmiki cursed the hunter who killed a pair of birds in the mating and thereby uttered the first 'Sloka'. Kautilya's "Artha Shastra" refers to 'Abhayaranya' or forest sanctuary where animals could roam about without any fear. Emperor Ashoka (243 B.C.) prohibited animal killing in forests on 72 specified days of the lunar year. In his "Fifth Pillar Edict" we find first laws to protect fish, game and forests. The Moghuls were great hunters but retained keen interest in nature. The era of exploitation, however, had dawned and continued till the recent times with increasing intensity as population increased and more and more land was cleared for cultivation. The British rulers as also Indian Royals indulged themselves in indiscriminate hunting with the advent of high power fire-arms. It is stated that a cavalry officer shot 80 lions

in Kathiawar, a British sportsman hunted 227 tigers in Hyderabad, Moharajah of Rewa killed 616 tigers in his life and Moharajah Nripendra Narayan of Cooch Behar had killed 370 tigers, 208 rhinos, 430 buffaloes and 324 barasingha deer in addition to other animals between 1871 and 1907 (Stracey, 1963). As a result of such ruthless hunting the necessity of enforcing conservation measures was realized and The Indian Forest Protection Act was passed in 1927.

After independence the leaders of the country framed strategies for all round development within a short time particularly in agriculture and industry. As a result massive dams, numerous irrigation canals, National Highways and giant industrial complexes started coming up one after another. At the same time due to improved medical facilities, health and sanitary conditions human population experienced an unprecedented explosive growth rate. Naturally more and more forest areas were taken up under cultivation to materialize the 'Grow more food' campaign. The results were disastrous in general on the forests, the biological support system and on the wildlife in particular. The debacle experienced by the wildlife is evidenced by the fact that the mammalian fauna declined from more than 500 species as early as 1963 (Stracey, 1963) to a mere 350 in 1983 out of

which 66 has been declared as endangered (Negi and Bahuguna, 1983). The story of other groups of animals is similar or even more pathetic. In the course of this situation a new more rigid law i.e. 'The Indian Wildlife (Protection) Act, 1972' was passed and 19 national parks (Area = 6471.22 sq. kms) and 202 wildlife sanctuaries (Area = 69292.01 sq.kms) were established to save the existing wildlives from becoming a thing of the past. Besides, several sites were selected to serve as biosphere reserve (insulated from all forms of interference) and marine parks along with a massive programme of afforestation involving the common people for establishing village and community forests on land not required for other purposes.

The study of wildlife is important not only from academic point of view but also from a host of other considerations such as ethical, aesthetical, cultural, ecological and economical. We, human beings, are rationale animals with capacity to distinguish right from wrong and to evaluate ourselves. This capacity compelled us to think that we have no right to kill other living components of nature.

Again, we have the capacity to appreciate and enjoy our magnificent wildlife - their colour, beauty, size, strength, ferocity and speed. To quote Jawahar Lal Nehru

"Life would become very dull and colourless if we did not have these magnificent animals and birds to look at and to play with. We should, therefore, encourage as many sanctuaries as possible for the preservation of what yet remained of our wildlife".

We are also culturally associated with our wildlife. Christmas without rein-deer is unthinkable, at least in Northern nations. The Hindus and many other ethnic communities of the world even worship various wildlives. Coins, stamps, seals of many countries of the world have impressions of wildlife on them. Nations and political parties also use wildlife as their symbol.

From scientific point of view wildlife by its direct and indirect action maintain the ecological balance in other words, the functioning of the ecosystem, is vital for the support of not only human beings but also other living organisms. Mankind had also learned innumerable arts of living from wild animals. It may be worthwhile to mention here that bats might have been instrumental in the discovery of radar and other ultrasonic devices. The birds and other flying creatures provided us with models for constructing air-crafts. Similarly the fishes with air bladder probably inspired us to construct submarines. Rhesus monkeys have served as test animals for intra-uterine birth control devices and new medicines for the welfare of human beings. Similarly the owl-monkey has become

a vital model for the study of human malaria (Southwick et. al., 1970). Chimpanzees (Pan sp.) have been used to study the intensity and duration of pituitary and other hormonal interactions. Kobra (Naja naja) venom is used for the treatment of some kind of cancer. Venom of certain Chinese snakes has been used to trace impulses in the human brain. Armadillos (Dasypus sp) are the only animals other than human beings known to contract leprosy, they are now proving to be invaluable aids in the search for cure of this disease (Storr-Eleanor, 1971). The recent discovery that polar bear's hairs are exceptionally efficient heat absorber, has provided researchers with a clue that may help them design and produce materials for the manufacture of better cold weather clothing and solar energy collectors (Furry Funels, 1978). The list of animals known to serve human interest may be considerably enlarged but the point to underscore is that we still do not know which animal may serve in what capacity in the future. As such we should in general endeavour to protect all animals under the sun.

In many countries of the world wildlife is an important source of income and revenue. It supports a multibillion dollar industry - that of hunting, fishing, camping and trade of wildlife products in the United States of America. In Kenya wildlife-tourist is the third largest foreign exchange earner. The picture is similar in many other African countries.

We have a tremendous scope to utilize our magnificent wildlife towards this ends.

**1.2. EXCELLENCE AND IMPORTANCE OF GAUR :**

The majestic gaur of our hill forest are the third largest land mammal (Prater, 1971) and are undoubtedly the largest and finest member of the family bovidae in both the Old and New Worlds (Lydekker, 1907; Shahi, 1977; Yusof, 1981; Mukherjee, 1982). They are one of the most attractive animals among our wildlife heritage. By dint of its huge size (112 to 183 Cm shoulder height, 152 to 290 Cm length & 900 k.g. body weight), graceful appearance and rather shy nature it has occupied a permanent place in the mind of the nature-lovers and is considered to have a considerable tourist attraction value. Naturalists designated gaur as the most magnificent of all bovines (Powell, 1964; Johnsing, 1979).

Gaur also helps in maintaining the ecological balance as it is an important primary consumer in a major part of our forest ecosystem. As such decrease in its number may cause serious problem in the secondary consumer populations through predator-prey cycle.

Gaurs probably played an important role in speciation among bovines. They are known to breed with domestic cattle

(Bos indicus) when they came to the forest for grazing. In Assam they were found to breed with domestic cattle and thus formed a new group, B. frontalis which are locally called gayal (Powell, 1964; Gee, 1964).

Gaurs are also economically important to human beings. Various types of fancy articles such as lamp-shed, ash-tray, pen-stand, smoking-pipe, etc. are made from the horns and legbones of gaur. Its skin is also used in making shoe, leather-bag, etc. In some tribal areas gaurs are also hunted to provide meat. The stuffed head and the skull with massive horns are of high economic value as these are used by the rich to decorate their drawing-rooms.

Despite such immense importance gaur population has declined drastically in recent times due to indiscriminate habitat disturbance and outrage of human beings. They are now listed as an endangered species in the Red Data Book of IUCN (International Union for Conservation of Nature and Natural Resources). They are included in the Chapters 9 - 17 (Schedule - 2) of Indian Wildlife (Protection) Act, 1972 for their protection, propagation and survival.

1.3. SYSTEMATIC POSITION :

Colbert (1969) has classified gaur as follows :

Class	-	Mammalia
Sub-class	-	Ungulata
Order	-	Artiodactyla
Sub-order	-	Ruminantia
Super Family	-	Bovidea
Family	-	Bovidae
Sub-family	-	Bovinae
Genus	-	<u>Bos</u>
Species	-	<u>GAURUS</u>

1.3.1. Close Relatives :

The genus Bos include several species other than gaur which are shown in Table 1.1 with their present distribution.

B. gaurus has three sub species i.e. (i) B.g.gaurus, commonly called gaur, found in India, Nepal, (ii) B.g.hubbacki, called seladang, inhabitants of Malaysia and (iii) B.g.readei named as pyong, resident of Burma and Indochina.

1.4. PHYLOGENETIC CONSIDERATION :

Ruminant ungulates probably originated in mid tertiary time (late oligocene or early miocene), but most

of their evolutionary development has been confined to pliocene and subsequent ages. The early bovids were small antelope like ruminants that probably lived in grassland and bushy habitats. They had already acquired high crowned teeth, capacity to ruminate and the skeleton was essentially that of a modern advanced artiodactyle. Bovids had become one of the more successful mammalian herbivore groups during the miocene (24 to 7 million years ago). Except antilocaprids, all members of the family Bovidae arose and evolved in Northern Eurasia during pliocene and pleistocene epochs (Colbert, 1969). The earliest member of the sub-family Bovinae became differentiated from the ancestral stock 'Perimia', found in Potwar Plateau Region at least not earlier than Sametiani.e. about  $14 \times 10^6$  years back (Pilgrim, 1931). The evolutionary history of gaur is similar to that of wild buffalo, Bubalus bubalis (Linn.) var., recorded in pleistocene about  $5 \times 10^6$  years ago in India (Pilgrim, 1931) but the genus Bos has not so far been recorded in India. Bibos, a kin to genus Bos, however, has been recorded from Pinjir and Narboda alluvium areas.

#### 1.5. PAST DISTRIBUTION :

Data on past distribution of gaur in India is rather obscure. It may be conjectured that the species enjoyed wide distribution about the time of Mohenjo-Daro and Harappan

civilization (about 3000 B.C.) as evidenced from impressions of both humped and humpless bulls on the seals discovered from excavation works at those sites. The Moghuls were great hunters and nature-lovers. From the accounts of their hunting expeditions it is obvious that gaurs were probably found almost all over India including forest areas near Delhi (Banerjee, 1964). Blanford (1891) in describing the distribution of gaur demarcated<sup>at</sup> the forests of the Himalayan foot-hills, west of Nepal as the northernmost boundary, the Rajpiple hills near Broach as the westernmost boundary, forests of Karnataka and Western Ghats as the southernmost boundary and the forests of Chota-Nagpur ranges, south of Gange, as the easternmost boundary. Richmond (1935) gave a fair account of its distribution in the south. He stated that gaurs were rather common in Godavari basin, Salem hills of Madura district and in the forests of Malabar district. Similar records of its occurrence in Central India is found in the accounts of Traill (1824). He mentioned that 80 adults were killed by a hunting party in Sarguja area in Madhya Pradesh.

#### 1.6. PRESENT DISTRIBUTION :

Disturbance from various sources such as poaching habitat destruction, mismanagement, etc. has effectively exterminated gaur from a greater part of its past ranges.

At present only 5000 heads (Shahi, 1977; Mukherjee, 1982) are estimated to exist in scattered herds in protected forest reserves in India (Table 1.2).

Past and present distribution of gaur in India as obtained from various sources (Brander, 1923; Elleman and Morisson-Scott, 1951; Stracey, 1963; Banerjee, 1964; Schaller, 1967; Prater, 1971; Krishnan, 1972; Sharatchandra and Gadgil, 1975; Shahi, 1977; Yusuf, 1981; Mukherjee, 1982) is shown in Figure 1.1.

#### 1.7. OBJECTIVES OF THE PRESENT STUDY :

The general objectives of this research work was to study the ecology and behaviour of Gaur at Garumara Wildlife Sanctuary and the adjoining reserve forests of North Bengal. The specified objectives were to study :

- (i) the physical characteristics of gaur of different age and sex classes,
- (ii) the population dynamics of gaur with special reference to size, composition, density, natality, and mortality,
- (iii) the types of habitats used and preferred by gaur,
- (iv) the food species of gaur with special reference to food preference rating and drinking behaviour,

- (v) the daily activity patterns of the species,
- (vi) the various movement patterns with special reference to daily round and migration,
- (vii) the social behaviour patterns of gaur, herd size, composition and leadership phenomenon,
- (viii) the agonistic behaviour patterns of gaur,
- (ix) the lactation behaviour with special reference to cow-calf relationship and other associated behaviour,
- (x) the problems of conservation and management of gaur and its natural habitat.

Table 1.1 : LIST OF SPECIES UNDER THE GENUS BOS WITH  
PRESENT DISTRIBUTION.

Name of the species	Local name	D/W*	Distribution	Authority
1. <u>B. indicus</u>	cattle	D	Throughout world	
2. <u>B. taurus</u>	cattle	D	Do	
3. <u>B. banteng</u>	Banteng	D	Java, Borneo, Indo-China, Indonesia etc.	Schaller (1967)
4. <u>B. souveli</u>	Kouprey	W	Cambodia	Do
5. <u>B. grunniens</u>	Yak	D	Indo-Nepal	Do
6. <u>B. frontalis</u>	Gayal	D	Assam, Burma	Schaller (1967) Gee, (1964)

\* D = Domestic; W = Wild.

**Table 1.2 : SHOWING THE FOREST RESERVES IN INDIA  
WHERE GAUR RESIDE AT PRESENT.**

<b>Province</b>	<b>Forest Reserve</b>	<b>Authority</b>
1. Andhra Pradesh	Eturnagram Wildlife Sanctuary	Krishnan (1972)
		Mukherjee(1982)
	Kinnersani Wildlife Sanctuary	Mukherjee(1982)
2. Arunachal	Nam Dapha National Park	Mukherjee(1982)
3. Assam	Kajiranga National Park	Spillett (1967)
		Mukherjee(1982)
	Lokhoa Wildlife Sanctuary	Mukherjee(1982)
	Orang Wildlife Sanctuary	Mukherjee(1982)
	Sonai-Rupa Wildlife Sanctuary	Mukherjee(1982)
4. Bihar	Baresand Wildlife Sanctuary	Mukherjee(1982)
	Kerh Wildlife Sanctuary	Mukherjee(1982)
	Palamu National Park	Krishnan (1972)
		Shahi (1977)
		Mukherjee(1982)
5. Goa	Bondla Wildlife Sanctuary	Mukherjee(1982)
	Cotigao Wildlife Sanctuary	Mukherjee(1982)
	Molen Wildlife Sanctuary	Mukherjee(1982)
6. Karnataka	Bandipur National Park	Prater (1971)
		Sharatchandra & Gadgil (1975)
		Mukherjee (1982)
	Dandeli Wildlife Sanctuary	Mukherjee(1982)
	Someshwara Wildlife Sanctuary	Mukherjee(1982)

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Province	Forest Reserve	Authority
7. Kerala	Ereavikulam Rajmally National Park	Mukherjee (1982)
	Idukki Wildlife Sanctuary	Mukherjee (1982)
	Parambikdam Wildlife Sanctuary	Mukherjee (1982)
	Periyar Wildlife Sanctuary	Krishnan (1972)
8. Madhya Pradesh	Barnawapara Wildlife Sanctuary	Mukherjee (1982)
	Bandhavgarh National Park	Mukherjee (1982)
	Bori Wildlife Sanctuary	Mukherjee (1982)
	Dubari Wildlife Sanctuary	Mukherjee (1982)
	Kanha National Park	Schaller (1967), Krishnan (1972)
	Kutra Wildlife Sanctuary	Mukherjee(1982)
	Panchmahli Wildlife Sanctuary	Mukherjee(1982)
	Pench Wildlife Sanctuary	Mukherjee(1982)
	Semarsot Wildlife Sanctuary	Mukherjee(1982)
	9. Maharashtra	Dhokna-Kolkas National Park
Nagzari Wildlife Sanctuary		Mukherjee(1982)
Radhanegari Wildlife Sanctuary		Mukherjee(1982)
Taroba National Park		Krishnan (1972)
10. Mizoram	Dampa Wildlife Sanctuary	Mukherjee(1982)
11. Nagaland	Intengki Wildlife Sanctuary	Mukherjee(1982)

Province	Forest Reserve	Authority
12. Orissa	Debrigarh Wildlife Sanctuary	Mulherjee(1982)
	Kapilash Wildlife Sanctuary	Mulherjee(1982)
	Karlapet Wildlife Sanctuary	Mulherjee(1982)
	Khalasuni Wildlife Sanctuary	Mulherjee(1982)
	Kuldiha Wildlife Sanctuary	Mulherjee(1982)
	Saptasajya Wildlife Sanctuary	Mulherjee(1982)
	Simlipal National Park	Mulherjee(1982)
13. Tamil Nadu	Annaimalai Wildlife Sanctuary	H. Saratchandra & Gadgil (1975)
		Mulherjee(1982)
	Madhumalai Wildlife Sanctuary	Krishnan (1972) Mulherjee(1982)
14. West Bengal	Chapramari Wildlife Sanctuary	Mulherjee(1982) Present author
	Garumara Wildlife Sanctuary	Present Author
	Jaldapara Wildlife Sanctuary	Spillett(1967) Present author
		Mulherjee(1982)
	Mahanadi Wildlife Sanctuary	Present author.

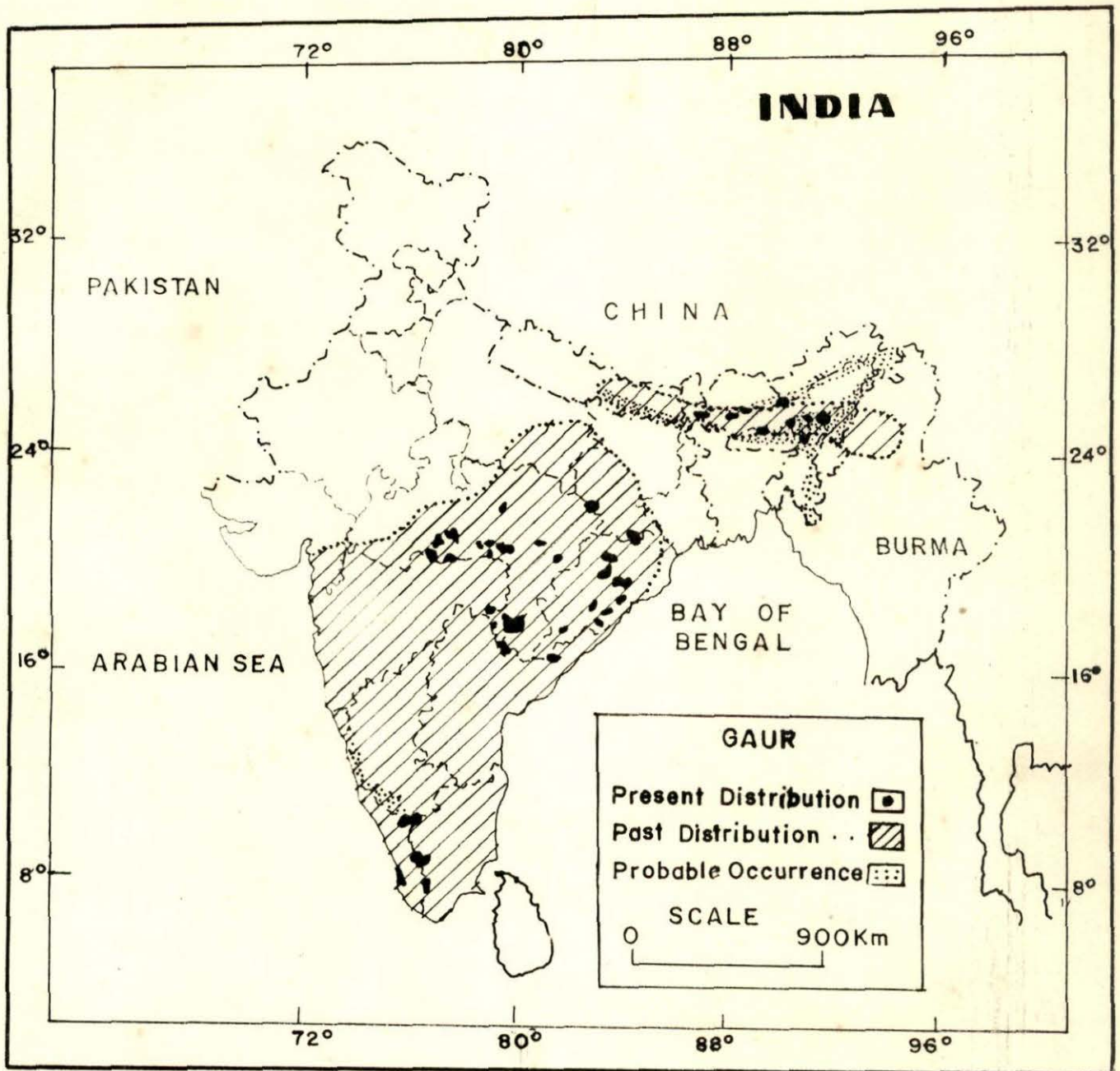


Figure 1.1 : Distribution of gaur in India.