1. INTRODUCTION

We have a rich heritage of wildlife. The vast diversity of climate and physiography of India offers suitable living conditions for a wonderfully rich varieties of bird life. Some 2100 species and subspecies have been recorded, including winter visitors from northern Asia. From the ancient time close relation of man and animals have been depicted in our mythology. Thus we have a tremendous opportunity as well as responsibility to enjoy, utilize, protect and pass on this vast treasure to posterity in the face of growing demands from about 850million people and 550 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. Actually only 2.3% of India's geographical area (75,763 sq. km.) is under the reserve forest category (Saharia, 1982). 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 enviornmental hazzards. 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 luner year. In his "Fifth Pillar Edict" we find first laws to protect fish, game and forests. But at present even such glorious social heritage have also proved to be insufficient to save our forests and wildlife. The reasons for the phenomenal decline of wildlife are many: but three main ones can be identified - living space, greed and indifference. The era of exploitation, however, had dawned and continued till recent times with increasing intensity with the population explosion. 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, Moharaja of Rewa killed 616 tigers in his lifetime and Moharaja 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).

After independence the leaders of the country framed stratigies 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 sametime due to improved medical facilities, health and sanitary conditions human population experienced an unprecedented explosive growth rate. Naturally more and more natural habitats were destroyed affecting the wildlife adversely. 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 species has been declared as endangered (Negi Bahuguna, 1983). The story of other groups of animals is similar or even more pathetic.

All this present a grim picture. Fortunately, it is not the whole story. Slowly but strongly, a section of people emerged who voiced the necessity of judicious management of our wildlife heritage and its habitat. The only absolute guarantee against misuse or abuse of high quality wildlife habitat is an informed public - not an easy thing to accomplish in a country like India where a major portion of people are illiterate and live

below poverty line. The Bombay Natural History Society, founded in 1883, has been successful to organise and continue such a movement from the very begining. The Indian Forest Protection Act was installed in 1927 for the firsttime realising the necessity of enforcing conservation measures against ruthless hunting. However, the most important legislation was passed with 'The Indian Wildlife (Protection) Act, 1972' which provides for the legal protection of wildlife and endangered species in particular with the establishment of 19 national parks (area = 6471. 22 sq. km). Besides, several sites were selected to serve as biosphere reserves (insulated from all forms or 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. Another important legislative step was the 42nd Amendment in the Constitution of India by which the Central Government has the power to ensure wildlife protection and to acquire forests of national importance.

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 rational 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.

Even if we leave the recreational and aesthetic benefits of wildlife to the last, there are so many other convincing reasons to comprehend that the natural world is essential to man's survival. From scientific point of view wildlife by its direct and indirect action maintain the ecological balance in otherwards, the functioning of the ecosystem, vital for the support of not only human beings but also other living organisms. The story of human use of plant and animal species shows what valuable - indeed, indispensable - assets they are. Plant and animal products are essential for the manufacture of modern drugs and medicines. They also provide ideas for chemical compounds that can be built up in the laboratory. Animal based products ramged from cod and halibut liver oils as rich sources of vitamins A and D and healing catalysts, to a possible derivative from a hormone from the North American black beer which might offer a new way to treat kidney disease. Cobra (Naja naja) venom is used for the treatment of some kind of cancer. 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 been used as a study material for malaria, the chimpanzee for the pituitary and other hormonal interactions, the armadillo for the study of leprosy and many others in this line. They are immensely important in providing clothing and a host of other economically useful products. Other, more worth-while, uses have

been inspired by observations of animal behaviour - the making of cold weather clothing from the discovery of how polar bears' hairs keep them warm, the improved design of helicopters from studies of humming birds, and the making of a safelight for use in mines from observations of how fireflies make their light. The list of animals known to serve human interest could 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.

But, truly, no arguement for wildlife preservation can end without reference to its spiritual and aesthetic values. It is true that no analysis of the aesthetic appreciation of the natural world is possible : suffice it to say it exists. Dr. Olaus J. Murie, noted American naturalist, said, 'Nature gives spiritual values no one can do without, although many think they can or haven't the chance to find out. People become different in the wilds - more helpful and happy'. Pandit Jawaharlal Nehru wrote in his forward to E.P. Geis book, The Wild Life of India (1964), '..... life would become very dull and colourless if we did not have these magnificent animals and birds to look at and to play with,'

In this highly materialistic world of today, it is increasingly recognised that man's self consciousness makes things of the spirit of the utmost importance : and among things of the spirit,, contemplation of the natural world occupies a

prime position. Even if one thinks only about the materialistic exchange we should think of our vast natural treasure. And to make proper management and protection of this treasur. We should learn more about the each individual species in natural environment. We should think like Julius Nyerere, speaking of wildlife in Africa, 'The wild creatures, and the wild places they inhabit, are not only important as a source of wonder and inspiration, but are an integral part of our natural resources and of our future livelihood and well-being'.

1.1. EXCELLENCE AND IMPORTANCE OF OPENBILL STORK

Storks are large wading, terrestrial birds found in nearly all the continents except antarctica. Openbill stork, Anastomus oscitans (Boddaert), is the smallest member of this group and is restricted to South east. Asia, particularly in the Indian subcontinent. The remarkable gap between the arching mandibles make them distinct from the other members of the group. They are colonial in habit and frequently nest in mixed-colonies with other wading avian species. Huge breeding assemblages of adults of this species having white and glistening black breeding plumage is a splendour to appreciate.

As a large predator they take the position near the top of the food chain but being a restricted feeder (chiefly on aquatic molluses) their presence or absence is an important index of the general health of an ecosystem. They are also very

selective about the nesting conditions which is directly associated with the water condition and in drought years breeding may even be skipped altogether (Ali & Repley, 1968). So, their presence is not only indicative of the health of the water bodies but also probably predict water condition in immediate future.

In some parts, this storks are hunted for meat. Its eggs are also reported to be stolen from the nests for human consumption.

Although this species was abundant in the entire South East Asia, at present it is restricted in some pockets and the International Council for Bird Preservation/International Waterfowl Research Bureau (ICBP/IWRB) Specialist Group on Storks, Ibises and Spoonbills listed it as a regionally threatened species.

1.2. SYSTEMATIC POSITION

Kahl (1972, and 1987) has classified the Asian openbill as follows :

Class	-	Aves
Subclass	-	Neornithes
Order	-	Ciconiiformes
Family	-	Ciconiidae
Subfamily	-	Ciconiinae
Tribe	-	Mycteriini

Genus - Anastomus

Species - Oscitans

1.2.1. Close Relatives

The genus Anastomus includes only one other species named Anastomus lamelligerus which is also known as openbill stork having the characteristic gap between mandibles but is found only in Africa.

However, the tribe Mycteriini includes four other species which comprise the Mycteria and are commonly known as wood stork. All storks within this tribe feed primarily by tactolocation and exhibit up-down display with extended neck and gaping bill, but lack the ritualised bill clattering behaviour of other storks.

1.3. DISTRIBUTION

Data on past distribution of Asian openbill stork is rather obscure. In the early part of this century it was abundant throughout south-east Asia (Baker, 1929). But at present it has become rare in Bangladesh, Burma and Vietnam (Coulter et al, 1989). However, large populations are still evident from India, Sri Lanka, Indochina and Thailand.

In India it occurs in the plains ranging from terai in the north east to the southern region. However, large breeding colonies are restricted to a few suitable areas. Present breeding grounds of this stork in India as evidenced from various sources

(Bates, 1931; Ali & Ripley, 1968; Mukhopadhyay, 1980; Seshadri, 1986) is shown in Figure 1.1.

1.5. OBJECTIVES OF THE PRESENT STUDY

Although large population of various stork species occur in this subcontinent; only very few longterm studies on them are known. The objectives of this research work was to study the behavioural ecology of feeding and reproduction of openbill storks at Raiganj Wildlife Sanctuary. Species like openbill storks which live on limited food items and have rigid nesting requirements are subjected to threat of extinction at even moderate habitat disturbance or any other constraints and as such warrant precise systematic observations particularly on feeding and reproduction to evaluate their actual status so that effective management strategy may be chalked out when needed. The specific objectives of this study on openbill stork were to determine :

(i) the food habit,

(ii) exploitation of foraging ground and foraging pattern,

(iii) feeding mechanism,

(iv) daily activity pattern,

(v) nesting

(vi) the role of sexes in breeding and rearing of youngs,

(vii) mating behaviour,

(viii) egg characteristics,

(ix) incubation behaviour,

(x) hatching,

(xi) rearing of youngs,

(xii) growth of youngs,

(xIII) aggressive behaviour,

(xiv) predation and nest defense,

(xv) human interference and management.

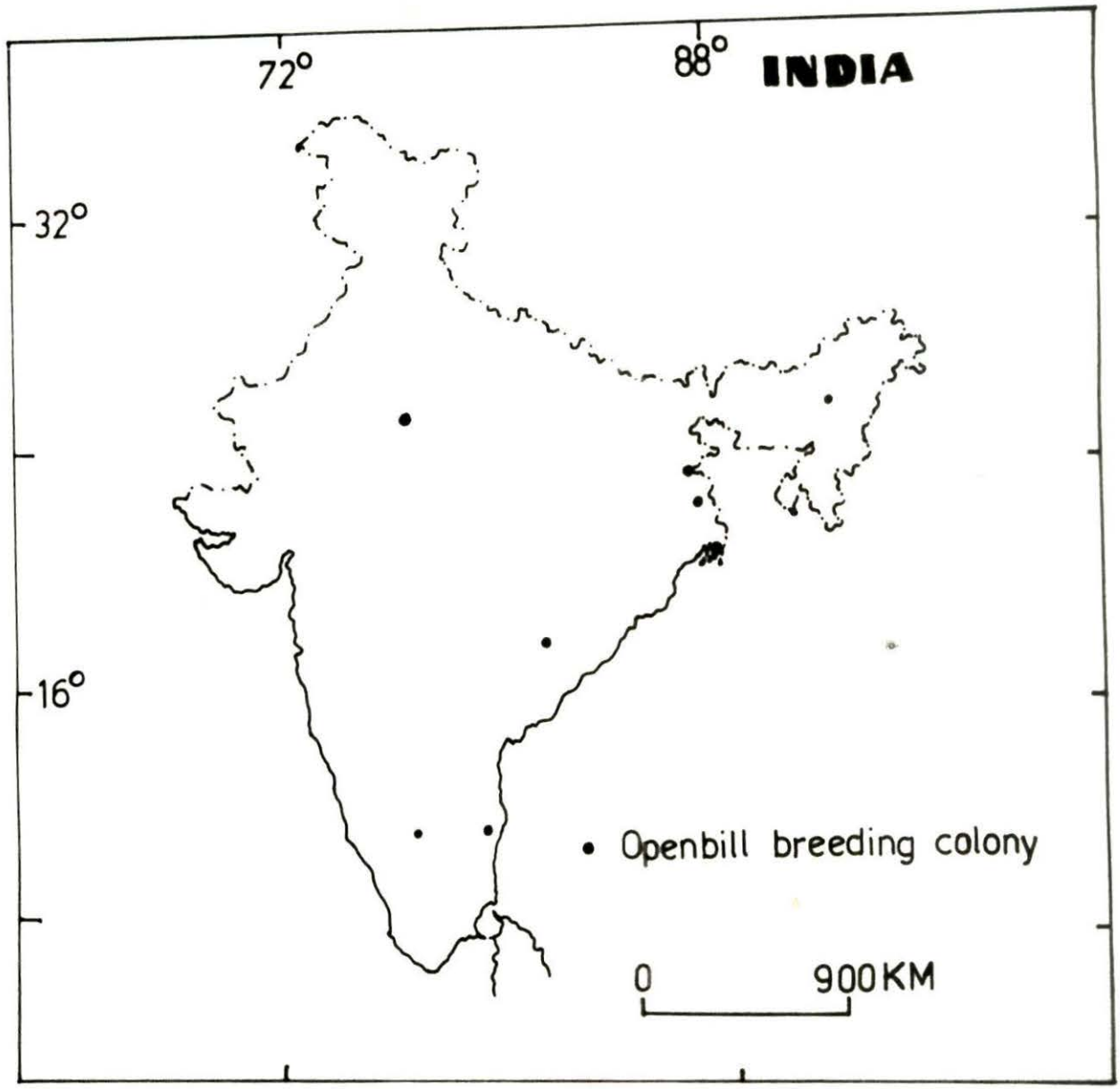

Fig. 1.1 : Openbill storks breeding colony in India