1. INTRODUCTION

Mankind at present is passing through an extremely critical period. The suspicion of the environmentalists two to three decades back about severe environmental degredation is starting to surface now and is going to appear in a much bigger way if proper measures are not implemented right at this moment. The accumulation of Green-house gases due to ever increasing utilization of fossil fuels is threatening to change the face of the earth due to meltdown of polar ice caps and glaciers. The environmental scientists are rather certain that the earth is going to loose large low lying coastal areas along with a significant portion of its biodiversity. The rise of the sea-level and change in oceanic wind and current current patterns including monsoon, southern-wind and equitorial currents is going to severely affect the survival of not only resident organisms but also the migratory ones.

Most animals and plants are affected by changes in environment that influence any facets required for their survival such as habitat, food items for both adults and youngs, nestings spots-trees, predator-parasite pressure and so on. The birds in particular with very high metabolic rates are probably affected most because of their specialized requirements for survival.

There are about 8600 bird species and nearly 30000 including subspecies and geographical races of birds in the world (Ali,2002). Of which India alone accounts for more than 2100 species and subspecies (Saharia,1998). Thus we have a rich heritage of bird life which must be conserved in proper shape to be passed down to posterity.

Indian avifauna require critical study to determine how many bird taxa are there which might actually mereit species status but which currently languish in the lower rank of subspecies or even geographical races. Not much has been done on this point after Ali (2002). It may be mentioned that mainly

because of burgeoning human population a large proportion of Indian birds are threatened with extinction. Among the birds regarded to have become extinct are : the Pink-headed duck, the mountain Koel and Jerdon's Courser. The Great Indian Bustard and White-winged Wood-duck have dwindled to precarious numbers. The beautiful Siberian Crane, a winter visitor to Bharatpur Sanctuary,Rajasthan, is reported to have become reduced to several individuals.

In many parts of their distribution in India in the piscivorous water birds including Little Cormorants and Night Herons come into direct conflect with establised fishery organisations who complain on loss of revenue because of these birds. Again the survival and well being of these birds is seriously threatened due to rapid process of industrialization in a massive way undertaken by both Central and State Governments throughout India. The fate of Socotra Cormorant *Phalacrocorax nigrogularis* in a Arabian Gulf following the recent Gulf War has attracted attention of environmentalists and ornithologists World over. Thus, the pollution level of some of the important Indian rivers is such that the life of the fish and fish-eating birds and animals are at a stake. Thus the cause of conservation of Indian birds have never been more urgent than at present.

The recent out break of bird influenza in South-East and South-Asian countries causing mass scale mortality enforcing culling of entire population of poultry chickens is ringing alarm for wild bird populations. However, blood samples examined for avian influenza virus from the Raiganj Wildlife Sanctuary tested negative.

The birds are not only great to watch but also are important to mankind from various accounts such as :

a) In Pest Control

Al of us know t5hat insectivorous birds thrive exclusively on insects and worms, but many others also regularly take certain amount of insects and worms in their diet. Probably because of high neutrient content in their body. The White stork is reputed as a great destroyer of locusts that ruins cultivated fields.

b) As Scavenger

Birds such as vultures, kites and crows are invaluable scavengers. The speed and thoroughness with which a flock of vultures dispose of a carrion is astounding. Vultures, however, are falling victims to their seavenging behaviour because consumption of diclofenac treated cattles causes renal failure and subsequent mortality in them. Diclofenac has been pointed out to be the primary cause of abnormally high mortality in White -backed vultures in indian subcontinent (Oaks, *et al.*, 2003).

c) As Pollination Agent

A large number of birds of diverse families are responsible for cross fertilization of flowers. In fact, many birds of there groups have specialized adaptation in structure and mechanism of their tongue and bill for the purpose of procuring honey from the base of the flower. In trying to reach the nector often the forehead and throat of the birds come in contact with the anthers. The pollen dust adheres to the feathers and it in transported to the mature stigma of the next flower visited which is thus fertilized. Ali (2002) reported that a few species of birds are responsible for pollination of sixty different species of silk-cotton trees that supply the raw materials for the match sticks. Similarly coral trees that provides shade in the tea and coffee plantations in South India are also fertilized by birds.

d) **In seed dispersal**

Birds also play an important role in the dissemination of seed over a large area. The seeds of Lantana Weeds (a plant of Mexican origin) and Laranthus, a tree-parasite belonging to the Mistletoe family are dispersed mainly by Black-headed Oriole and Sun-birds, Flower peckers and some other bird species. Bulbuls and Barbets are largely responsible for dispersal of the seeds of the sandalwood trees.

e) As food for man

Wild birds particularly wildfowls, Quails, Partridges, Egrets and species of many waterbirds are consumed by human in a mass scale particularly in winter season throughout the indian subcontinent. Similarly egges of these species are also consumed. It is suspected that egges of these species are sold in the market along with usual chicken and duck eggs.

f) Miscellaneous Uses

Feathers of certain birds such as white egrets, peacocks etc. are used in ornaments and garments in various parts of the World particularly in certain Asian and African ethnic communities.

Salim Ali reported that the Chineese consume the nest of swiftlets (*Collocalia*) made of saliva. They consider it is as a delicacy. The swiftlets live in islands off the coast of Southern Myanmer.

The excrement of the sea birds such as gannets, cormorants and pelicans are extremely rich in nitrogen and phosphorus, popularly called guanos serve as excellent fertilizer. The Government of Peru earn a handsome amount of foreign exchange by exporting guanos from the island of the coast of Peru in the paciific. In fact the guanos that accumulate in the sanctuaries inhabitet by piscivorous water birds such as Cormorants and Night Herons in India have fair potential to be used as manure in agriculture.

1.1 EXCELLENCE AND IMPORTANCE OF LITTLE CORMORANT AND NIGHT HERON

Little Cormorants are black duck-like water birds found in the South and South-East Asian countries such as :- India, Bangladesh, Pakistan, Srilanka, Thailand, Ceylon, Myanmer, Malay Peninsula to Indonesian islands. Little Cormorant, *Phalacrocorax niger* (Vieillot) has a long stiff tail, and slender compressed bill, black in colour with bill sharply hooked at the tip. It is shorter and its horny bill is less slender than Indian Shag. It is found in all types of water bodies : sea, brakish lagoons and tidal creeks. It nests in mixed colonies comprising of Night Herons,egrets, storks etc., mostly close to water bodies. Its gular skin and orbital skin is black in the non-breeding season, but purple in the breeding season ; legs and webbed feet is blackish, tinged with purple flesh-colour during breeding season.

Little Cormorants live exclusively on fish which it chases and captures mostly under water, being an expert driver and efficient swimmer.At some parts of the earth it is considered as a pest particularly at extensive fishing centers.

Night Herons on the other hand are wading, semi-terrestrial birds found in South and Central Europe ; Northern Africa and the greater part of Southern and Central Asia. It is found wherever there is suffieient water. Night Herons, *Nycticorax nycticorax* (Linnaeus) lack the characteristic necks and legs so conspicuous in other herons. During flight their necks are not s-folded like those of others but appear short and drawn in, somewhat crow-like. At rest they present a rather short, stocky appearance. This species nests in homogeneous colonies, in colonies of other waders, and, rarely, singly. Its plumage is gray and white with a distinctive black cap and two, to four long narrow white plumes that extend from the back of the head. During the breeding season, the black feathers at the head and back emit a bluish-green gloss and the legs become red or pink.

The normal call is a " Qua", " Quak". or "Quark". These calls are most often emitted in flight or from a perch.

The fish hatchery-men complained that the birds were consuming rather large amount of fish and should be declared as pests. when they nest near human settlements, they are considered as pests (Davis, 1993). So, their presence or absence is an important index of the productivity of aquatic ecosystems.

Night Herons are hunted for food. Its eggs are also reported to be stolen from the nests for human consumption.

1.2 SYSTEMATIC POSITION OF LITTLE CORMORANT AND NIGHT HERON

Class	-	Aves
Subclass	-	Neornithes
Order	-	Pelecaniformes
Family	-	Phalacrocoracidae
Sub-Family	-	Phalacrocoracinae
Genus	-	Phalacrocorax
Species	-	niger

Class	-	Aves
Subclass	-	Neornithes
Order	-	Ciconiiformes
Family	-	Ardeidae
Genus	-	*Nycticorax*
Species	-	*nycticorax*

1.2.1 Close Relatives

The genus *Phalacrocorax* includes several other common species such as : *Phalacrocorax carbo sinensis* popularly know as large cormorant having the characteristic throat and front half of face white ;*Phalacrocorax pygmaeus* (Pallas) also known as Pygmy Cormorant, found only Baluchistan ; *Phalacrocorax auritus* also called Double-crested Cormorant, and it is found in Florida ; *Phalacrocorax fuscicollis* or the Indian Shag have characteristically larger but slimmer bill.

Night Herons are also present. These are :-

a) Yellow-crowned Night Heron (*Nyctanassa violacea*).

b) White-backed Night Heron (*Gorsachius leuconotus*).

c) Malay Night Heron (*Gorsachius melanolophus)*

1.3 DISTRIBUTION OF LITTLE CORMORANT AND NIGHT HERON

Little Cormorants are found in south and southeast Asian countries i.e., India, south East Pakistan, Bangladesh, Terai region of Nepal, Srilanka, Myanmer, Malaysia and Indonesian islands.

It is absent in the Himalayas and northern Pakistan (Ali & Ripley, 1968,). However, large breeding grounds are restricted to a few suitable areas. Present breeding grounds of little Cormorants in India as evidenced from various sources (Baker,1935; Ali,1953, Ramakrishna,1990, Naik *et al.*, 1991) are summerised in Table 1.1

Unlike Little Cormorants Night Herons enjoy much larger distribution. It is found in Central and Southern Europe, North East Africa, the middle East Pakistan, India, Bangladesh, Nepal, Srilanka, Myanmer, South East Asia, China, Japan and North America.

In India it is found in different states and Andaman and Nicobar islands. It is also found in Kashmir Valley (Height 1900m.). However, large breeding grounds are restricted to a few suitable areas. Present breeding

grounds of Night Herons in India as evidenced from various sources (Ali, 1953; Neginhal,1983; Naik & Parasharya, 1987; Sankhala, 1990 ; Naik *et al.*,1991; Raghunatha, 1993) are presented in Table 1.2. Breeding colonies of Little Cormorant and Night Heron in India is shown in Fig 1.1.

1.4 OBJECTIVES OF THE PRESENT STUDY

Although Large populations of various Cormorant and Night Heron species occur in this subcontinent ; only very few longterm studies on them are known. The objectives of the present work is to study the ecology and behaviour of Little Cormorant and Night Heron at the Raiganj Wildlife Sanctuary. These two species live on limited food items and have rigid nesting requirements. These species are greatly affected by habitat destruction and similar other constraints thus warranting precise systematic observations on the ecology and behaviour to evaluate their actual status.

The specific objectives of the present work on Little Cormorant and Night Herons are :-

1. To ascertain the food composition and food preference
2. To study the nesting and reproductive behaviour
3. To study the parental behaviour and nestling success
4. To study the human interference at the sanctury, cyclonic storms and management.

Table 1.1 : Known breeding / nesting sites of Little Cormorant in India

Name of the site	State	District	Source
Neelapattu	Andhra Pradesh	Nellore	Nagulu and Rao (1983)
Ethirapattu	Andhra Pradesh	Nellore	Ramakrishna (1990)
Southern Gulf Kutch Heronries	Gujarat	Jamanagar	Naik *et al* (1991)
Ranganathittu Bird Sanctuary	Karnataka	Mysore	Ali (1943); Sharatchandra (1990)
Gudvi Bird Sanctuary	Karnataka	Shimoga	Ragunatha (1993)
Keoladeo National Park	Rajasthan	Bharatpur	Ali (1952); Sankhala (1990)
Vedanthangal	Tamilnadu	Chengai-Anna	Baker (1935); Santharam & Menon (1991)
Chitrangudi Heronry	Tamilnadu	Ramanathapuram	Ragunatha (1993)
Vettangudi Patti	Tamilnadu	Ramanathapuram	Ragunatha (1993)
Raiganj Wild life Sanctuary	West Bengal	Uttar Dinajpur	Present study
Lakhimpur Swamp	Assam	Lakhimpur	Baker (1935)
Luna Village	Gujarat	Kuchchh	Thiwari (1993)
Pabitora Wildlife Sanctuary	Assam	Morigoan	Lahkar (1999)
Kolkata Zoological Garden	West Bengal	Kolkata	Baker (1929)
Adina Forest	West Bengal	Malda	Personal observation

Table : 1.2 : Known breeding / nesting sites of Night Heron in India

Name of the site	State	District	Source
Ranganathittu Bird Sanctuary	Karnataka	Mysore	Ali (1943) Neghinhal (1983)
Keoladeo National Park	Rajasthan	Bharatpur	Baker (1935) Ali (1953) Soni (1992)
Southern Gulf of Kutch Heron	Gujarat	Jamanagar	Naik *et al.* (1991)
Ghoga Town	Gujarat	Bhavnagar	Naik & Parasharya, (1987)
Gudvi Bird Sanctuary	Karnataka	Shimoga	Raghunatha (1993)
Bhitarkannika Wildlife Sanctuary	Orissa	Cuttack	Subramanya (1996)
Raiganj Wildlife Sanctuary	West Bengal	Uttar Dinajpur	Present study
Kolkata Zoological Garden	West Bengal	Kolkata	Baker (1929)
Adina Forest	West Bengal	Malda	Personal observation

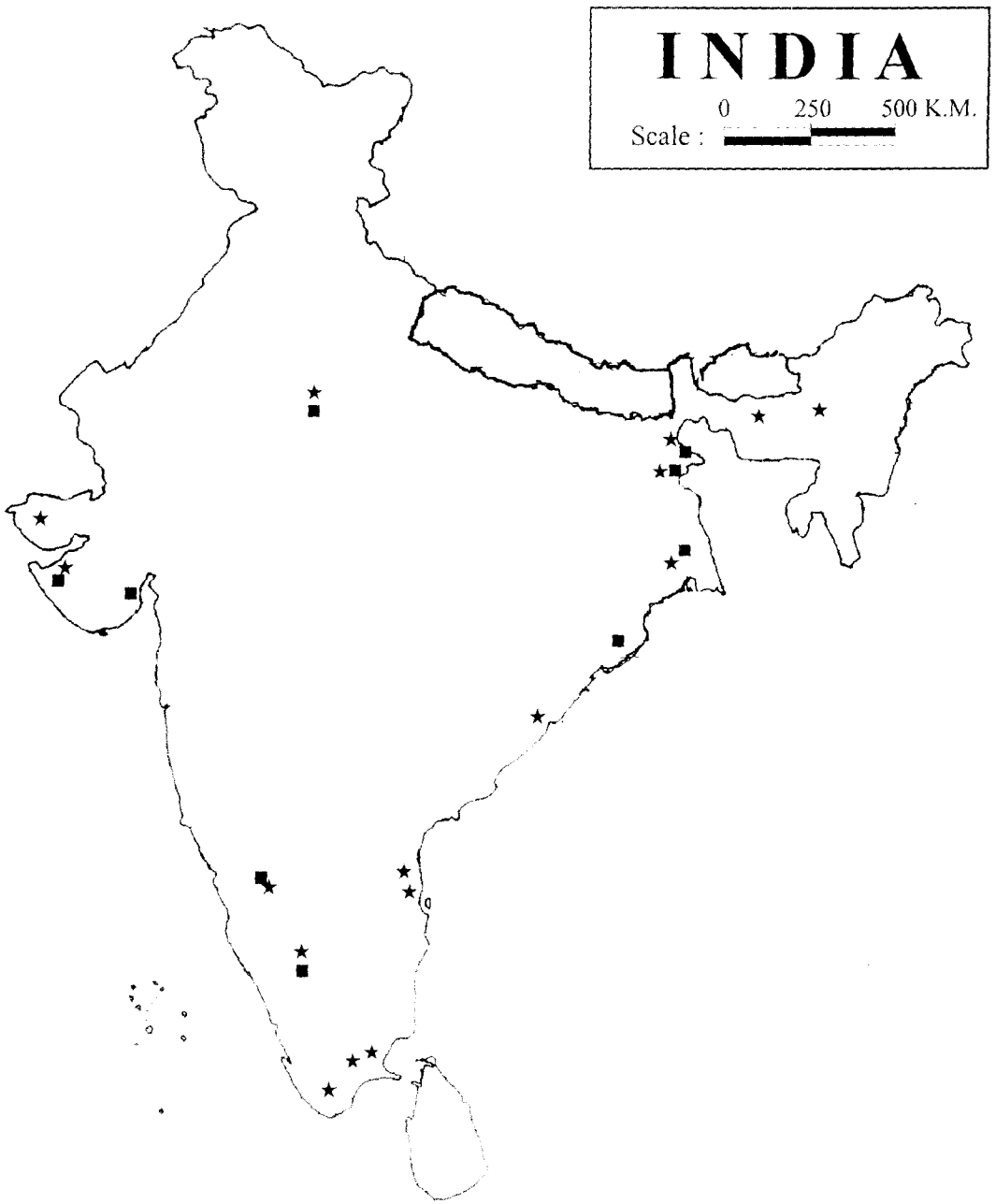

Fig. 1.1 Breeding colonies of Little Cormorant (★) and Night Heron (■) in India.