CHAPTER-I: GENERAL INTRODUCTION

1.1. Introduction

Birds, the charismatic group of fauna is ideal bio-indicators and useful models for studying a variety of environmental problems (Newton, 1995). It is very much essential to understand the physical and biotic factors affecting the ecology of birds. The aquatic avifauna of Assam are found, nest gregariously in a colonial manner in all districts. The Charismatic species like storks and ibises are found abundantly in numbers of wetland areas of Assam. Storks and ibises are overwhelmingly carnivorous species and each species eating varieties of fish, amphibians, molluscs, crustaceans and insects etc. that are available in the wetland ecosystem. But, during the recent years the wetland were severely threatened by alteration of its use pattern, encroachment for residential campuses, excessive fishing and dumping of garbage. Maltby (1988) suggest that, wetland alteration and destruction can be attributed to the promotion and acceptance of the “wetland as wastelands” concept, the association of wetlands with diseases, and lack of Government interest for wetland conservation. Conversion of natural vegetation to human inhabited area can negatively affect the adjacent wetlands and their associated waterbird. Research on aquatic avifauna habitat use in urban and countryside wetlands has been considerably less than the process wetland conversion. But, loss of wetland and human modification of wetlands world-wide underscores the importance of efficient management. Wetlands are essential for the free ecosystem
services to the mankind and avian community and as well as other living organisms. The most obvious are maintenance or improvement of water quality, groundwater storage, recharge, erosion control, soil deposition, food chain productivity, nutrient cycling and biogeochemical processes. Apart from that, wetland also serves as wildlife habitat, and has numerous socioeconomic, socio-cultural importance, aesthetics, tourism and recreation. They are also important because attention has been turned recently to using the wetland systems and the plant species occurring therein as bio-energy sources and also for use in pollution abatement projects to filter sewage, agricultural run-off, and acid mine drainage mitigation (Brooks, 1989; Oliver and Hill, 1998). The wetlands are recognized as the ‘Kidneys of the landscape’ or called as biological supermarkets. They are drained and/or filled for agriculture, human settlement and industries besides being rapidly silted due to large-scale deforestation in surrounding area, and they are also being dried up in many places as rivers are dammed and channelized for the generation of hydroelectricity and other purposes.

Wetlands can be defined with the areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh or brackish, or salt, including marine waters, the depth of which at low tide does not exceed six meters Article 1 (1) of the Ramsar Convention).

Wetlands are not isolated spaces but, on the contrary, dynamic, complex habitats with biotic and abiotic connections all around. All natural processes and
social practices, the wetland should be conserved by what Ramsar calls wise use, the sustainable utilization for the benefit of mankind in a way compatible with the maintenance of the natural properties of the ecosystem (Davis, 1993). Wetland ecosystems are complex resources. They account for about 6% percent of the global land cover area and are among the most threatened of all natural resources. Total global wetland area is about 530 million hectares of which 78% (Scott, 1989; Gole, 1996) are in tropical countries and several of them are wetland forests, e.g., Mangrove forests, swamp forest etc. In recent years, the significance of wetland and their biodiversity has been understood in proper ecological perspective (Niering, 1989; Vijayan, 1991; Cairns, 1992) and classification, object oriented characterization and procedures of management of the wetland have been outlined (Larson, 1988; Kusler and Kentula, 1990; Finlayson and Larsson, 1991). An emphasis has been given to create some wetlands to restore the biodiversity loss with the help of non-environmental factors found to be in natural waterways, responsible for a drastic change in the flow regime. A wetland ecosystem is a variable and complex system in which water, nutrients, and light are abundant but free oxygen is limited. In anoxic situations, toxic by-products of anaerobic respiration are fostered, bacterial decomposition is slowed down and peat is accumulated thus locking up the nutrients needed by roots and microorganisms. The water regime and nutrient levels tend to be highest, when precipitation and surface runoff are at peak which also recharge the underground water. These phenomena are described together by the nutrient/species interaction-advection-dispersion equations and surface water/ground water
hydrodynamic equations (Chen and Smith, 1979). Wetland destruction by human intervention commenced long ago and has accelerated in recent times. As a consequence, wetlands are the most degraded of all ecosystems. The relatively recent acceptance of the socio-economic and ecological importance of wetlands in developed countries has not yet succeeded in reversing this trend. Wetlands are the first major ecosystem to be protected by an international treaty (Amezaga, 2002).

The avian communities present in the wetlands of Brahmaputra valley plays an important role in the maintenance of the ecological balance. So, this is necessary to study the various ecological aspects of avian community including the population status distribution pattern and habitat utilization pattern in the Brahmaputra valley, Assam. The conservation biologist and wildlife managers concerned with the population dynamics of endangered bird species. Dense populations of wild animals occurring at a single location provide unique opportunities for studying vertebrate ecology (Lokemoen, 1984). In breeding and feeding sites where animals are numerous, it is often possible to identify factors that are responsible for high densities and to examine the adaptive behaviour of animals to in groups.

Understanding the distribution and abundance of organisms—where they are found, how many individuals occur there, when, and why—is critical for the development of effective conservation plans and comprises the core of ecology as a science (Andrewartha, 1961; Caughley and Sinclair, 1994; Krebs, 1994) The distribution of individuals among habitats is particularly important because:
conservation plans for animal species are usually realized through the management of their habitats (Morrison, et al., 1998). Habitat selection differs from habitat distribution in two ways, such as (1) The distribution of birds among habitats (also called habitat use) must be evaluated within the context of habitat availability to examine selection (Manly, et al., 1993), (2) Secondly, habitat selection refers to the decision-making process (behavioural and evolutionary) by which organisms come to occupy some habitats and others (Cody, 1985). Effective habitat conservation will require forceful demonstration of the benefit to be gained from the integrated use of rivers, floodplains, and riparian habitats as wetlands if we are to prevent their conversion to other uses. Provision of information on the value of these environments and their biota is an essential first step in this process. Moreover, if the continuous increasing endangerment of aquatic biodiversity, especially fishes, is to be halted, then the economic costs of environmental degradation to future generations will need to be included as part of the cost of doing business today. Beyond the general prediction of loss of species and populations because of a decrease in habitat area (Kinzig and Harte, 2000), the effect of this conversion over large areas on communities of native species is relatively unknown, and may be complicated by environmental factors (Allen and Connor, 2000). The loss of overall habitat may be only one aspect of the landscape that can affect species; an increase in the amount of edge habitat, or decrease in habitat diversity and patchiness also may be important (Dale et al., 2000; Kjoss and Litvaitis, 2001).
Attributes of avian communities may serve as indicators of significant environmental changes, such as decreased availability or quality of habitat in the landscape, increased amount or types of agricultural practices, and changes in environment such as global warming (Connel et al., 2000; Peakall, 2000). It is defined that a species can be rare or common either due to abundance or geographical extent. Brown (1984) has demonstrated that the variables of geographic range and abundance are positively correlated. Considerable attention has been drawn towards documenting the patterns of the ‘Distribution-abundance’ relationship and understanding the mechanisms responsible for the pattern. Gaston et al (1997) reviewed the mechanisms of relationship and provided an important conceptual framework for understanding of rarity. Knowledge of population size is not only of intrinsic biological interest but is also fundamental to the application of conservation planning and action. The clumped distribution of many waterbirds during the non-breeding period, and in particular their use of a limited and readily definable site network, means that site designation (for subsequent management and protection) acts as an effective conservation mechanism for many species.

Various anthropogenic activities threaten the biodiversity of rivers and their associated wetlands at global and regional scales in Asian and may well impair or significantly reduce the ecosystem services of rivers and wetland. These threats can be placed in four categories: flow alteration or regulation (including impoundment by dams, water extraction for irrigation, and so on); pollution; drainage-basin alteration (especially deforestation) and overharvesting (mainly of fishes) (Dudgeon,
Population size is also used in conservation priority setting, which is often based on species status, usually as a combination of population size and trends, whilst conservation action plans may set a target of the number of individuals to which a population must be restored, or maintained (or in some cases reduced) as means of measuring its success. In addition, even where extensive monitoring schemes exists, the survey or the means of calculating an index to assess trends in population size may not be representative of the population as a whole, and evaluation of population size on a regular basis provides an alternative measure of change over time Kershaw et al. (2003). Biodiversity loss has increased exponentially in recent years. Currently, 1186 species of birds are threatened with extinction worldwide (Birdlife International, 2000).

1.2. Review of Literature

Wetlands have many functions that are considered to have socioeconomic value. They provide best feeding & breeding ground for many species including fishes, furbearers, both migratory & resident waterfowl. The total biodiversity (flora & fauna) of wetlands is high in comparison with terrestrial ecosystem. Wetlands provide protective cover and maturation areas for a wide range of invertebrates and vertebrates. The best known function of wetlands is a provider of year-round habitats, breading areas, and wintering sites for migratory birds, depending on their location. Wetlands are efficient in trapping pollution and processing waste in human dominated landscapes. Wetlands have been found to be important "sinks" for
pollutants moving from upland areas, preventing their movement into surface water and groundwater. Artificial wetlands are being used to treat wastewater. Declines in these functions due to climate change could have important economic and aesthetic implications particularly in heavily developed areas. Many species of wetland dependant organisms consequently live in multiple local populations sustained through occasional migration that is, in metapopulations. Because the local population is the primary unit of population and community dynamics that maintains genetic and species diversity in wetlands, which alter the abundance and distribution of wetlands and affect the diversity and persistence of the wetlands biota. The most powerful forces currently shaping the matrices of wetland mosaics are the degradation, draining, and filling associated with many other anthropogenic activities. These forces have seriously depleted wetland resources in Assam, totaling 2000 numbers in 1970s, decreased by 50% to 1000 by the year 2002 (Report of ARSAC). These loses affected the wetland biota a disproportionate fraction of species listed as endangered, threatened or vulnerable. Among all the other biota, wetland also sustained a considerable number of avian species. out of 9600 number of world bird species, India itself sustained 1200 species (Ali and Ripley (1983), of which 318 species (26.5%) are wetland birds Vijayan, (1991) Ali & Ripley, (1983), recorded 181 species of wetland birds in Assam, but presently sustained only 122 species that indicate the reduction of 37.56% from the wetland habitat of Assam (Saikia & Bhattacharjee,1993). This reduction of wetland birds has leads to the
species towards extinction (*Rhodonessa cairiophylaceae*), endangered (*Cairina sculunata, Leptoptilos dubius*) vulnerable or threatened status.

Aquatic avifauna occupies the different trophic level of the wetland ecosystem. Their diversity and abundance reflect the glory and importance of the particular wetland habitat (Reichhof, 1981). Assam is gifted with many extensive water bodies commonly known as Beel, which are the paradise of the birds of central Asian flyway. Because a number of nationally and internationally potential wetlands in protected and unprotected area are still persist in the lower Assam part of Brahmaputra valley. A total area of 101232ha is covered by 3513 wetlands. This is close to 4% of the total flood plains area and 1.3% of the total area of the state. The lakes/ponds occupy an area of 15494 ha and number 690. There are 861 ox-bow lakes/cut off meanders covering 15461 ha. The waterlogged areas number 1125 and occupy 23432 ha. The swamps and marshes cover an area of 43434 ha and number is 712 only. The resources of these wetlands are important for human nutrition and the economy as they provide a habitat for a number of migratory and residential aquatic avifauna. Fishing is the main economic activity in the wetlands. Rice and vegetables are farmed on the catchments areas in the post monsoon season. Wetlands are very rich in nutrients and have a great production potential. It has been estimated that the production potential of wetlands at 1,80,00,000 kcal of energy/ha/year or 1500kg/ha/year. The productivity of ox-bow lakes can be increased to 2000-4000kg/ha/year by introducing extensive or semi-intensive aquaculture. In other wetlands, productivity can be increased significantly by strictly implementing the
existing fisheries regulation. The value of the environmental functions of the wetlands has not yet been assessed. A complete valuation of the resources, services and attributes of wetlands will help in assessing their full potential and in planning their development.


Some aspects of the avifauna of Assam, particularly on distribution, status and ecology are available in past references (Ali and Ripley, 1983). Saikia and Bhattacharjee (1987, 1989a, 1989b, 1990a, 1990b, 1990c) did several work on the wetland birds of Assam, specially the storks. Saikia and Bhattacharjee (1993) evaluated the status, diversity waterbirds and found their declining trend in Assam. But no study has been carried out on the reduction and disturbance factors associated with Wetlands and water birds of the study area. The present study aimed to investigate the diversity and abundance of water birds in protected and unprotected wetlands of lower Assam part of Brahmaputra valley.
1.3. Justification and Objectives of the study

Under the circumstances - the present study of diversity and abundance of water birds in protected and unprotected wetlands of lower Assam was taken up and this is expected to generate vital information’s for the proper utilization of the highly resourceful sector of the valley.

Wetlands are the main habitat for the water birds, ducks, waders, storks and other avian communities which reside permanently or migrate during winter season. The entire Brahmaputra valley in Assam is networked by the unique Brahmaputra river system that drains such diverse environments as the cold dry plateau in Tibet, the steep rain-drenched slopes of the Himalayas, the land-locked alluvial valley in Assam and fluvio-deltaic plain of Bangladesh in the tropics. Rising in the Chema Yundung glacier in the Kailash range in southwest Tibet (elevation 5300 m), the Brahmaputra traverses a total distance of 2880 km, which comprises an easterly course of 1625 in Tibet, a south and westerly course of 918 km in India and a southerly course of 337 km in Bangladesh. Numerous wetlands present in the entire Brahmaputra valley is also home for many migratory and residential avian species. The wetland like Deepor Beel, Kapla Beel, Jengdia Beel, Puthimari Beel, Kapla Beel, Urpod Beel, Dhir Beel, Wetland inside Manas National Park are important wetland in the lower Assam that harbors a good no of endangered and threatened avian diversity. But there was no study and data related to the avian diversity in the
wetland of lower Assam. The present study was designed with the following objectives:

1. To investigate the aquatic avifauna and analyse the diversity and abundance in the wetlands outside and inside the protected areas of Lower Assam and its seasonal abundance.

2. To study the habitat utilization pattern, habitat type and analyse the habitat selectivity of aquatic avifauna in the study area.

3. To investigate the food item, food and feeding pattern and dietary spectrum of aquatic avifauna in the protected and unprotected area of Lower Assam.

4. To study the threat perspective of aquatic avifauna in the wetlands of study area.

5. To find out the constraints of conservation and conservation threats of aquatic avifauna in the wetland habitat of Lower Assam and its conservation measures.
References:


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