Ornithological Study on Sunderban Biosphere Reserve With Special Emphasis To Habitat Conservation

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Abstract- *The Present study revealed some birds in Sunderban Tiger Reserve (STR) with their ecological amplitude. This means that the habitat of birds in the Coastal areas have been discussed with ecological information in the present article. The mangrove and associates would help ornithofauna to choose habitats of ornithofauna even breeding ground and feeding ground of some important plants. As the site is enriched so that special attention should be paid to focus on some other wildlife which is important to interact there. Various components, trophic level and social attitude are also important in each ecosystem. Therefore the research would broadcast the real information to the armature birders and other specialist regarding their study at the versatile habitat which is a world heritage site declared by UNESCO.Littoral and swampy habitats under high tide and low tide makes the land fragile while some shrubby vegetation make the estuarine bank favourable for birds of Indian Sunderban.*

Keywords- Vegetation and Estuarine Ecosystem, Some Ornithofauna, biotic components, wildlife, Conservation.

I. INTRODUCTION

Sunderban is a vast tract of estuarine habitat under high tide and low tide. It is flooded by many halophytes and a large number of halophytic associates. Strata wise vegetation of sunderban isvery interesting and versatile. It is largest deltaic islands, largest mangrove forest and man eaters' dominant forest in the world. Due to high nutrient decomposition the estuary of Sunderban is regarded as most productive ecosystem of versatile diversity which is under study. The land mass is composed of mangrove species and mangrove associates. Land mass and canals submerged due to high and low tide in each 6 hours interval though the schedule is not exact like day hours. High salinity and deficiency of oxygen in soil is the characteristics of the ecosystem though the plants are very much tolerant to the features of the ecosystem. The plants grow near the canals or near the islands show pneumatophores, stilt roots, root buttress etc. to cope the harsh environment. Culture and society mixed with very beautiful folklore that always reflects the light of empowerment governed by the nature in the same area. The famous Royal Bengal Tiger in land (Forest), Crocodile in marshy habitats and in land various venomous snakes make the ecosystem virgin though people of Sunderban always busy with the collection of honey, was, firewood, wood, leaves and to earn money through fishing in estuary. They always face the attack of wild animals particularly wild boar and Royal Bengal Tiger the' Dakhin Roy'. The forest is demarcated as 4 special areas like Sunderban National Park, SajnekhaliAbhyaranya, Lothian Island and Haliday Island. To work independently in the forest there are separate 2 wings namely South 24Pgs Forest Division and Sunderban Tiger Reserve (STR) project wing. Total area of Sunder Tiger Reserve is 2585 sq km while are under Forest Division (24 Pgs S) is 1679.39 sq km. The name of Sunderban derived from the name of a plant namely Sundari (*Heritierafomes*) while in French colonial period the name of the land was Sanderban. Perhaps the name may be a derivative of River 'Sundha' at Borisal in Bangladesh. In dry and marshy mud flat many halophytic associates have been observed namely dhani grass (*Porteresiacoarctata*), harkach (*Acanthus illiciolius*) and gire (*Suaeda maritime*). Other halophytic associates are banlebu (*Atalantia* sp.), banjhau (*Tamarix* sp.), karanja (*Derris* sp.), bhola (*Hibiscus* sp.), pareshpipul (*Thespesia* sp.), manda (*Viscum* sp.), latasundari (*Brownlowia* sp.), hudo (*Acrostichum* sp.), baulelata (*Sarcolobus* sp.), latbegun (*Solanum* sp.), nata (*Caesalpinia* sp.), mandalata (*Hibiscus* sp.), jadupalang (*Sesuvium* sp.), nonahatisur (*Heliotropium* sp.) etc. Some cacti are common in river banks also. Literature revealed that a total 84 mangroves species have been found here. Out of 84 species 34 true mangroves and 50 species are mangrove associates. The land is a treasure of 1692 species of animals. Out of 1692, 482 species are vertebrate and rest species are other kinds. Invertebrates found here is 1104 and the number of protozoa species is 106.The land is full of varieties of bird species indigenous and foreign kinds, but not fixed number round the year. Literature revealed that a total 230 species of birds found in Sunderban. They are small minivet, black-hooded oriole, mangrove whistler, cinnamon bittern, swamp francolin, grey headed fishing eagle, brown fish owl, osprey etc.As the land is the Venice of Nature so the diversity is too rich but under virgin gallery. Therefore it is important to explore the land for avifauna study which is important one. The present article is therefore a basic study on birds of Sunderban of Indian scenario.

II. STUDY AREA

A vast tract of Sunderban has its two parts i.e. Bangladesh and Indian. So, people are reluctant to say Sunderbans. Now Bangladesh Sunderban part is 62% while 38% is under India (Fig. 1). But in the country, we are meaning to say Indian Sunderban. It is a lower part of Ganges and Brahmaputra River where they met with Bay of Bengal. The coordinator is 21^0 13' to $22^0$40' N and 88^0 5' to 89^0 6' E.The ranges include Namkhana and Basirhat. Presently the area is 4726 sq km but only the 55% land mass is under forest. Here salinity of soil recorded by many earlier workers in which highest salinity recorded in the month of April (40%) and lowest in the month of December (Fig. 2). Ordinarily the climatic condition of the zone is interesting. Here, temperature ranged between 20 degree to 34 degree and the rainfall is extremely high. So the weather is almost always moist and with the humid air from Bay of Bengal blowing constantly carrying 80% humidity[27]. During December the temperature comes down at 10-12 degree centigrade. It is important for its forest where famous is Royal Bengal Tiger. Forest dominated part of Sunderban includes 13 blocks namely Caning-I, II, Basanti, Gosaba, Joynagar-I, II, Kultali, Mathurapur-I, II, Kakdwip, Namkhana, Patharpratima and Sagardwip. The area is flooded by river like Raymangal, Adiganga, Harinbhanga, Gosaba, Matla, Bidyadhari, Jhila, Karatal, Thakuran, Saptamukhi, Muriganga, Gabtala, Mridangabhanga, Jagaddal, Ajmalmari, Dhulibhasani, Chulkati, Beledena, Peili, Herobhanga, Moni, Benifeli and Hooghly. Deltaic islands recorded here are 102 in which 48 islands recorded as Wildlife habitats (Das and Nayek, 2016). Study have been made in the site which includes Caning, Gadkhali, Sudhanyakhali, Sajnekhali canal, Pakhirala, SajnekhaliCamp,Sudhanyakhali Camp, Banabibi Bharani Canal, Sunderkhali Canal, Choragazi Canal, Dobanki, Jharkhali, Gosaba etc.

III. MATERIALS AND METHODS

Frequent field visit were done with the help of some knowledgeable persons available in Gosaba. Discussion about the bird and bird behaviour was conducted in the village premises with some persons headed by some elderly people available in villages. Small canals, rivers, protected areas and estuaries were studied with the help of motor boat. Vegetation structure, availability of resource like water and water bodies (fresh water), small herbs and shrubs including nesting sites have been studied. Temperature, salinity, humidity and rainfall parameters were recorded. Round the year, migratory bird behaviour and availability of species in 1km radius was recorded along the line. Binocular, DSLR cameras, sound recorder, temperature meter, lux meter, GPS and necessary items were taken for study. Seminar and training workshop have been conducted at Lalgarh Govt. College, Lalgarh, Jhargram and in Seva Bharati Mahavidyalaya, Kapgari, Jhargram to popularize birds and birding in Sunderbanswhich is an important IBA. Indigenous and winter visitors including migratory special kind have been recorded in note book and data sheet was prepared accordingly as per IBCN format. Photographs were taken and picture was developed by pencil sketch where not possible to capture by cameras. Literatures studied for the entire work are mentioned in references [1-28].

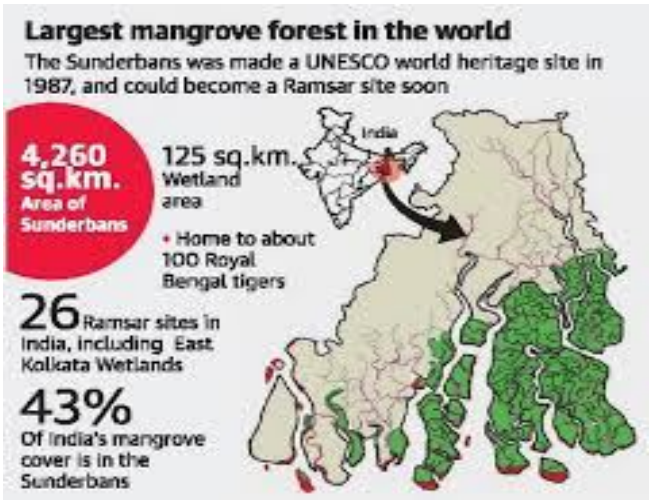

Fig.1 Indian Sunderban-a littoral and swampy forest in West Bengal (Source: www)

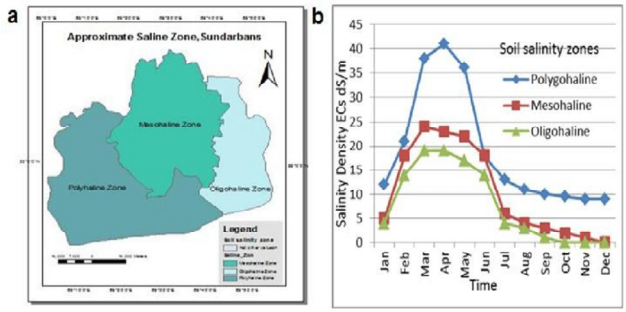

Fig. 2 Salinity condition of Sunderban Biosphere Reserve (Source : www.)

IV. RESULT AND DISCUSSION

Sunder ban in Indian context is a landmass surrounded by a large number of river and rivulets by the confluence of Ganges, Brahmaputra and Meghna rivers in the Bay of Bengal. It is demarcated as a territory from the Hooghly River in the north to the BaleswarRiver in Bangladesh in South east. The site is under littoral and swampy forest with huge vegetation cover by a large number of plant species namely *Heritiera, Ceriops, Excoiceria*(Fig. 12), *Avicennia, Rhizophora, Sonneratia, Xylocarpus, Bruguiera, Aegiceros, Aegialitis, Lumnitzera, Kandleia,*

Phoenix, Nypa, Aglaia and a special grass i.e. *Proteresiacoarcctata*. Vivipary i.e. germination of fruits (Seeds) in plant as the land is not permitting to germinate is a common phenomenon of halophytes (Fig. 11). It is an abode of many animals like spotted deer, jungle cat, Royal Bengal tiger, fishing cat, wild boar (Fig. 9), jackal, monkey and mongoose. In the water body we see a large number of animals like jellyfish, sea-anemone, star-fish, giant sea perch, pomfret, hilsha, prawns etc. Various crabs including fiddler crabs (Fig. 13) are also available though other species like horse shoe crabs and ghost crabs are the attraction of the area. Besides these species other species found here are bats, vulture (endangered sp.), fox, civet, osprey, tokay, goliath, batagur, smooth Indian otter, ruddy kingfisher, yellow monitor lizard, mangrove kingfisher, pied kingfisher, black capped kingfisher etc. estuarine crocodile (Fig. 10) is common in the estuary. Other species like various venomous snakes and non venomous snakes are found here. These are common crait, king cobra, monocle cobra, common water snake, bronze back snake, ornamental snake, worm snake, stripped keel back, vine snake, wolf snake, rat snake etc. Green sea turtle and Ridley sea turtle are also found here. UNESCO has declared the site as World Heritage site in the year 1987. The site is highly productive and a site of attraction of many exotic birds including some local migratory birds. The versatile biodiversity and good interaction make the land mass as Biosphere reserve by MAB in 29th March, 1987. Regarding the entire episode the present paper is going to highlight ornithofaunal study in Sunderban biosphere reserve though it is very little informative. In the beginning of the information we are going to discuss on bird migration and global scenario of fly over to locate the ecological niche under which birds migrate. Therefore Bird migration is an interesting phenomenon which needs critical study for migratory birds and study of the habitats. In the later we will discuss habitats and conservation that can protect bird species from various threats.

The migration pathway that birds take during their North to South and return migration are known as flyways. There are nine fly ways under which Central Asian flyway is one of them. Central Asian flyway (CAF) is a fly way of birds that covers a large continental area of Eurasia between the Arctic Ocean and the Indian Ocean and the associated island chains. The CAF comprises several important migratory routes of migratory water birds, most of which extends from the northernmost breeding ground from the Siberia to the Southernmost Non breeding wintering ground in the West Asia, India, Maldives, and the British Indian Ocean territory. In our India several migratory birds comes from different regions of the world but mainly from Central Asian flyway. Migration is necessary for bird life because they need food, shelter, and water from the environment to stay live, breed and rearing broods. The food and shelter is important criteria for birds. So regarding the conservation of such vivid articles required for bird's attraction we need the conservation of habitats. The utmost goal of the wildlife conservation that obviously shelters the ornitho-fauna particularly the migratory found shortly in such areas. Sunderban is a unique land comprised of a large number of eco-habitats from estuarine face to the fond of Bay of Bengal. In the estuary a large number of halophytes and halophytic associates boost luxuriantly that protect soil mass and enriching the water body as well as land mass fertile and nutrient rich for many animals. Small animals are the centre of attraction of many water and semiaquatic bird species. Similarly in land area big to medium sized tree nurture a good number of woodland birds including birds of prey. Winter visitors and other migratory bird species also visit the land mass in which we see a flock of lesser whistling duck (Fig. 4). Their behaviour and ecological niche impress over the other species too. In this area migratory birds settle for temporary period and are being protected by the protection authority of our country. In West Bengal it also known as protected bird areas or important Bird area (IBA). Sometimes it is a small land and it is so called bird Sanctuary like Sajnekhali.

In Sunder ban Tiger Reserve; the main attraction is tourists resulting in human disturbance to the migratory and resident birds. This is a serious problem for birds and environment which need serious thinking and therefore need to develop eco-tourism rather than tourism. Several times due to human intervention birds species leave the place and nests at different stages of breeding resulting in possible decline of birds population even population of flora and fauna of a particular place. Heronries, the source of breeding population of herons, egrets, ibises, cormorants, night herons and other associate aquatic bird species play very important role in conservation of water birds in general and threatened species in particular. Successful conservation and recovery of water bird species depends on an improved understanding of ecological requirements, pre settings of rules, protection corner from outsiders for aquatic birds but in contrary local support and knowledge transfer is essential tools to control it.

Knowledge of the arrival dates and breeding dates of bird is important for studying long term trends of changes in timing of breeding in the ongoing climate changes. It also includes the threat by exotic alien species both plants and animals also. Present research is therefore is elementary knowledge based and in the paper which stated the, "Sunderban Tiger Reserve under Sunderban Biosphere Reserve" on the basis of ecological constraints and economical retracts. The study site is a semi aquatic and

aquatic with high tide and low tide region and imposed on some near threatened species of birds like black-headed ibis, Lesser Adjutant Stork and darter and other least concerned species nested in colony during the entire cycle round the year. They were categorized as the early comers like Black-crowned night heron, Little egret, Cattle Egret, Darter and Grey Heron; late comers are species like Intermediate egret, Indian pond heron, Great egret, Black-headed ibis, Purple heron and Asian Open bill Stork and very late comers like Eurasian Spoonbill, little Cormorant and Indian cormorant. Mixed colonial breeding of aquatic birds were also found in the study site.
The bird activity like pre egg laying (nest making, courtship), egg laying and chick rearing was confined between late April and early September. There was no sign of such activity in the heronry from mid September to early April with conformity of species richness though the site is now vulnerable due to heavy load of threat by tourism rather than eco-tourism too.

This heronry remained very active between May and August as the heronry birds, mostly the wading birds. Early nesters started aggregating by the end of April and the late nesters dispersed by the end of second week of September. This coincided with the pre-monsoon and monsoon period or major rainfall period in the region which provided adequate moisture to feeding ground. So, there is a good role of climatic conditions in avian breeding with high capacity of food and available nutrients in the same ecological trophic level.
Indirectly it is evident that during drought period breeding activities get almost ceased except a few woodland birds. Climatic condition could be the possible reason for variation in breeding phenology of egrets and herons.

Nests occupancy was very high in Cattle egret, Black-crowned night heron and Intermediate Egret in contrast to very low occupancy in Eurasian Spoonbill, Purple Heron and Asian Openbill. This was probably related to colonization timing of the heronry by these birds and competition among themselves. Here, former group of birds was early colonizers, while latter group was the late colonizer. Early colonizers had less competition for space and resources from other birds using same area with same trophic structure; therefore, they might have occupied the nests in higher number. Some authors have opined that the positioning of nests may be the function of nest initiation timing, nest density and intra-specific competition. This could be the interactions of bird populations in conformity with space and nutrient load of the ecosystem in connection with microclimate of the zone. As a whole we recorded many birds from the study sites which are given below in the last year.

Birds recorded instudy area by authors on 27.12.2018:

Little Egret, White Breasted King fisher, Little Cormorant, White Collared Kingfisher/Mangrove kingfisher, Black Capped Kingfisher, Brown Shrike, Lesser Adjutant Stork, Common Kingfisher, Pond Heron, Common Sandpiper, Lesser Golden back, Green Bee-eater, Spotted Dove, Eurasian Collared Dove, House Crow, Sparrow, White Throated Fantail, Jungle Babbler, Red Vented Bulbul, Red Whiskered Bulbul, Asian Koel (M & F), Black Crowned Night Heron (Juvenile), Jungle Myna, Common Myna, Purple Sunbird, Black Drongo, Intermediate Egret, Black Kite, Great Egret, Great Tit, Rose Ringed Parakeet, Oriental Magpie Robin, Bronze Winged Jacana.

Birds recorded in study area by authors on 28.12.2018:

White breasted water hen, Common sandpiper, Jungle crow, White Collared Kingfisher, Purple rumped sunbird (Fig. 7), Intermediate Egret, Little Ringed plover, Black capped Kingfisher, Indian Pond Heron, Oriental Magpie Robin, Little Cormorant, Common Kingfisher, Pied Kingfisher, Green Bee-eater, Spotted Dove, Red Jungle Fowl (Fig. 2), Lesser Whistling Duck (In fresh water pond at Dobanki), Brhminy Kite, Common Iora, Rose Ringed Parakeet, Rufous Treepie, Asian Paradise Flycatcher, Jungle Myna, Common Myna, Red Vented Bulbul, Red Whiskered, Bronzed Drongo, Jungle Babbler, Eagle, Rock pigeon, Eurasian Collared Dove, Brown Shrike, black headed Gull.

The study site received high speed cyclonic storm several times during the season which was detrimental to the nest damage and consequently egg loss and chick mortality. The sanctuary was found to be the refuge of large population of crows (two species of *Corvus*sp., Fig. 5, 6), which was observed to be the worst enemy for egg predation in the heronry when parent birds were absent during incubation or chick rearing for collection of food material.

Brahminy kite (*HaliasturIndus;* Fig. 8*)*, was also seen as the predator but frequency was very very low. On two occasions during the data recording a Monitor Lizard (*Varanus bengalensis*Fig. 13), was also found attacking the nestling. Other birds like Shikra (*Accipeter badius*) and Oriental honey buzzard (*Pernusptilorhyncus*) have been found but their occupancy was lesser. It is neither space limited but found frequently in the entire Reserve areas many times. The capacity of the spread is restricted to locate and record because of the problem persist in such eco-fragile zone with high and low tide.

The author observed that when the data recorder approached the heronry from forest side through walking trail the birds showed quicker and higher disturbance sign as

compared to the heronry approach by boat or motor boat from estuary side. Author also observed that migratory birds were more scared by presence of motor boat moving speedily or common fishing boat rowing erect bamboo pole as compared to standing human being in the boat. It was recorded that, disturbance signs were marked by noising (alert call), initial movement by adults as well as chick in the nest, and finally temporary leaving off the nest even sitting nearby during searching food items near the estuary.

So, threat, disturbance behaviour of the birds and disturbance distance are the problems recorded in the paper. Buffer establishment and water bird protection measures are therefore recommended for conservation of the bird population in some sites of the biosphere reserve which is too important as the site is regarded as World heritage site. The phenology data of birds could be used as baseline as indicator tool for other researcher in the forthcoming research. The conservation status exists for all bird species is least concern except lesser adjutant stork i.e. *Leptoptilosjavanicus*; black-headed ibis i.e. *Threskiornismelanocephalus*and darter i.e. *Anhinga melanogaster which* have near threatened status as per report of IUCN.

PHOTO PLATES

Fig. 3 Habitat for Red Jungle fowl in Littoral and Swampy forest at Sunderban
(Photo by Dr. D. Das)

Fig. 4 Habitat filled with *Typha* sp. a freshwater pond at Dobanki with migratory birds

Fig. 4a. Lesser whistling duck in Sunderban Tiger reserve (In Wild) , Photo by A. A Das, 2018

Fig. 5 Large billed crow at Pakhiralay by Courtesy 1st author, 2018

Fig. 6 House Crow at Pakhiralay by 2nd author, 2018

Fig. 7 Purplerumped Sunbird (Photo by Dr. D Das), 2018 at Pakhiralay

Fig. 8 Brahminy kite (photo by Dr. D Das at Dobanki)

Fig. 9 Wild boar in Sunderban Tiger Reserve, Photo by A A Das, 2018

Fig. 10 Marsh Crocodile (*Crocodyluspalustris*) photo by A. A Das

Fig. 11. Vivipary-a phenomenon for Halophytic plant in Sunderban, (Photo by D Das, 2018)

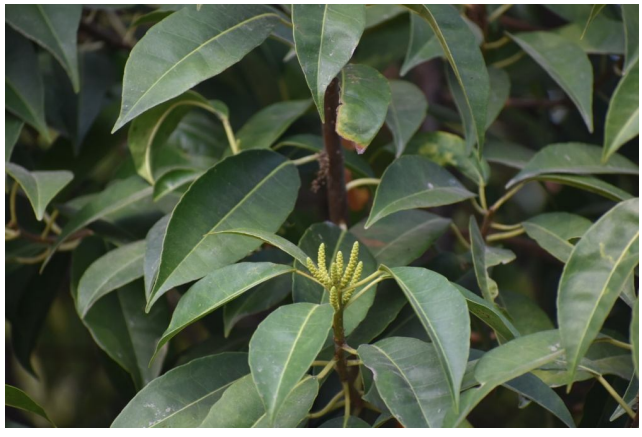

Fig. 12 *Excoicariaagallocha* (Beng. Gaeona) inflorescence in December, Jharkhali (Photo A A Das)

Fig. 13 Monitor Lizard in Sunderban, Photo by A A Das

Fig. 14 Fiddler Crab (Photo by A A Das)

V. CONCLUSION

In the next four decades, Earth's natural areas will be limited to grassland, mountains, ice and arid and semi-arid plains (Sharma, 2014). The fact is that by 2050, biodiversity loss will be unprecedented due to land use change, spread of plantation and climate change. All altered environmental territory will change their microclimate that lead to loss of species and loss of natural resources even limited use of favourable habitats. It is assumed that that time nearly 1.3 million square km of pristine ecosystems will be without any original species due to havoc change. According to GLOBI 3, a global model that assesses human-induced changes in biodiversity, while in 2000 land use like agriculture and plantation triggered the maximum biodiversity loss; in 2050 by climate change will be the key factor (Sharma, 2014). Our assumption is that the change is going so rapid that coastal and estuary ecosystem is under threat which causing loss of species gradually but slowly which disrupt the chain of ecosystem leading to loss of overall threatened species very soon. By virtue our diverse biosphere reserve is going to face a serious problem due to change of land and habitat alteration and havoc load of human population in the environment. The main cause is human population rise and indiscriminate use of resources over the land. Income generation and accumulation of resource rapidly causing great loss of species which need management to cope the chance of habitat loss. Government will take proper steps to manage it immediately for sustenance of ecosystem and public should aware regarding the fact. We need more educated people in our country not need more environmental scientists to solve the problem. This means proper education, policy making can check the conservation proper not preservation by virtue.

VI. ACKNOWLEDGEMENTS

First author acknowledges her father who introduced her to the community of Bird studies in India. Thanks go to Dr.Pampi Ghosh, Assistant Professor of Botany, Seva Bharati Mahavidyalaya, Kapgari, Jhargram, West Bengal who encourages us every time to make such type of work. First author acknowledges to Mrinal KantiSatpathi, a retired officer of BDO office since her child hood about birds and birding. All her friends of BCO course (2017-2018) of CEC, BNHS, Mumbai are well acknowledged for their rigorous identification and help as and when required. We, specially thank to our IBA programme manager Dr. Raju Kasambe, IBCN, Mumbai, India, for their help to study birds. We also acknowledge to Sir AsishBabre, Sir Jat Mohmmad, Sankara Narayanan, HetaKaria, Ravi Naidu, Sri N. K. Dudhe, Sri Omkar Joshi, BhagyashreeGrampurohit, Priyadarshini Supekar for their inspiration about research on avifauna study in India even to run Common Bird Monitoring Programe (CBMP) in India. We convey our thanks to the Forest Official, Gosaba, 24 Pgs (S) for their permission to visit the places. Last but not least thanks to all BCO members for their co-operation during entire programme in India. IJIRD society members are also thankful for their co-operation.

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How to write reference:

Das, A. A and Das, D. 2019. Ornithological study on Sunderban Biosphere Reserve with special emphasis to habitat conservation, *IJSART*, 5(1):