Impact of Pollution on the Ecology of a Wetland in South Western Part of Bangladesh

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Abstract— Water resources provide numerous benefits with minimum care and attention. Katparabaor is a very significant oxbow lake situated in Jhenidah and Chuadanga, South western part of Bangladesh. It is an essential source of natural assets which manifest vital role in aquaculture, fisheries, bio diversity maintenance, water recycling, livelihood of the rural mass, rearing of animal husbandry .The ecology of the wetland is seriously degraded due to the anthropogenic disturbances. Unplanned developments and rapid growth of population, the wetland received large amount of pollutants from agricultural and domestic sources, huge siltation from farm practices adversely affect the water quality as well as the diversity of flora and fauna .Fish is the main source of protein of the rural mass and wetlands provide huge number of fishes to mitigate the demand of protein. But unfortunately the production of native fishes in open water sources is declining day by day. Priority should be given to save the wetland by adopting sustainable management of aquaculture strategies.

Key words: Wetland, Pollution, Biodiversity and Management

I. INTRODUCTION

wetland is an important complex ecosystem interacting with biotic and abiotic factors. Wetland provides fish and other aquatic fauna for the benefit of rural people. It has multifunctional role in fisheries, biodiversity, rearing livestocks, ground water recharging, pollution abatement. Jhenidah and Chuadanga is famous for numerous baors(oxbow lakes), beels(wetland) which were the important source of indigenous fishes. Bangladesh is situated unique geographical location and rich variety of biodiversity. The baors(wetlands) the important aquatic ecosystem having large variety of shell fish and finfishes. But the characteristics of this wetlands ecosystem have been degraded due to anthropogenic disturbances and climate change(Baishya and Bordoloi,2007,Biswas and Panigrahi,2014).some important native fishes and other aquatic fauna locally disappeared due to pollution, overexploitation and unplanned developments. Large agricultural fields beside the wetland received various degree of pollutants such as pesticides, fertilizer and domestic sewage affects the physic-chemical properties of water(Islam etal,2012).Excessive amounts of these created more harm to the physiology of the living aquatic organisms.Changes of rainfall pattern and water abstraction during dry season destroyed the habitat of fishes. In addition to the deposition of heavy siltation, migratory routes are blocked and finally over extraction of water caused the havoc to fish and other aquatic bio diversity(Hossain and Hossain,1999,Chakraborty etal 2013.). During monsoon ,the water body received water from rivers.canals and paddy fields assumes a large water bodies which is helpful for breeding growth and development of local fishes but excessive nutrients(fertilizer) coming from runoff can cause excessive growth of aquatic vegetation which hinders the auto stocking process.(Dheka etal.,Chakraborty and Mirza, 2010).

The degree of pollution in fresh water bodies may be measured for the presence or absence of fishes. fisheries have provided with protein for the rural poor and manifested economic benefits for the livelihood of the country..life of an aquatic ecosystem depens on the basic physicochemical parameters and their stable condition (Jhingran,1965).

kat para baor is a large depression having tremendous role in maintaining biodiversity and livelihood of the rural people. Productivity of an aquatic body offered direct correlation with water quality parameters that can be treated as fisheris resources potential with their tropic status. Attempt were made to identify the the diversity of fishes and pollution load. In recent years, the wetland values are overlooked resulting due to geometric progress of population and unplanned development. . In order to stem the tide of demolition, especially for wetland, suitable guidelines to assess the ecological integrity and effective monitoring programs are required. This includes collecting sufficient information on the various functions, components and attributes of wetlands to reduce the ongoing ecological imbalance. Keeping view of this there is a need to routinely monitor these systems

Ecological renovation and ecosystem managing is an essential part of any habitat conservation. The wetlands management has become important because these environments are still being facing troubles for agricultural practices (Baishya and Bordoloi,2007).

Thus for developing a site exact management plan for the well-being of wetlands .It is urgent to collect baseline information in order to identify with the structure and functions of wetland ecosystems.

Fish production in Bangladesh was 2.7 million tons (DoF,2010)of which open water production estimated as1.12 million tons ,closed water 1.06 million tons(DoF2010).All these wetlands are rich habitat of plants ,arthropods, molluscs and fin fishes. The productivity of wetland ecosystem depends on sustainable developments and successful management.. The aim of the study is to collect basic information which helps to construct the ideas about of pollution related environmental stress and find out ways and means to solve the problems of wetlands for their sustainable management.

II. MATERIALS AND METHODS

A. Study Area:

Four villages near the bank of the weater body were selected for samling sites for the study from January 2013 to

December 2014.. These were of Katpara baor.these were Narayankandi, Katpara and Ramnagar amd Parbotipur.

Water samples were collected for monthly period using clean BoD bottle for the analysis of water quality variables. From selected station of the lake. .ph, temperature and Do were measured on the spot. Rest of the parameters were measured in the laboratory following the standard methods of APHA 1995

Fish samples were collected from the water bodies by using traditionalfishing methods. Using crafts and gears.Most common fishes were identified on the spot with help of the fishermen and consult with the age old people.. Those fishes which were difficult to identify brought to the laboratory, preserved in 5% formali and identification was done with the help of different keys and books. (Rahman2005, Talwar and Jhingran, 1991, Nelson,1994)

III. Result and Discussion

There is a direct relationship between the producers and consumers which are two physiologically different groups of organisms in all aquatic ecosystems.. The producers produce energy by traping sunlight in order to built up organic matter and release oxygen during photosynthesis, The consumers (bacteria and fungi, animals)used these energy as food .Organisms in an aquatic environment include phytoplankton, zooplankton, macrophytes, macro invertebrates and vertebrates. The results of water quality variables offered distinct variations among different seasons due to the different degree of environmental stress.

parameters	Pre monsoon	monsoon	post monsoon
temperature	33±3.12	28±1.98	19±2.97
ph	7.9±0.73	6.7±0.49	7.4±0.71
Do	5.1±0.51	5.6±0.69	7.2±0.78
Hardness	176±4.72	158±3.46	142±3.60
Alkalinity	184±3.36	163±3.52	149±5.47
TDS	205±2.28	187±5.37	168±3.29
Nitrate	3.54±0.41	2.30±0.25	3.14±0.21
phosphatre	2.32±0.29	1.32±0.33	2.26±0.23

Table 1: Water quality parameters among different seasons

The measured water quality parameters are presented in table 1.The present investigation shows highest temperature33.15 in premonsoon due to summer and lowest in postmonsoon due to cold weather.The ranges of temperature of the wetland was found appropriate for aquatic species in comparison to national standard of 20-30^{o} c(Bhaumik etal,2010 and Sabbir etal, 2010) The ranges of measured pH was 6.7 to 7.9. The minimum value was observed in the monsoon indicates acidic in nature (below7) because of rainfall. Rest of the months of the year(postmonsoon, Oct-January and premonsoon, Feb-May) the wetland water was alkaline(above7) due to low free co^{2} ,high temperature, high alkalinity, and high dumping rate at different Points. Lower levels of DO was recorded in premonsoon because the river is almost dry up and huge industrial wastes discharged agricultural waste, runoff nutrients. This finding was similar to Rahman etal 2012.No animal can survive in the less concentration of DO. Sufficient DO is essential for the growth and reproduction of aquatic organisms(Dara etal2002, Islam etal 2010andRahman etal2012). The Highest value of Hardness was 170mg/l and lowest value 142mg/l obviously exceeds the standard limit 123mg/l (Islam etal 2012).The reason for increasing in total Hardness is due to increase photosynthetic activity , free co_2 is utilized and bicarbonates are transformed to carbonates (Reid and Wood,1976). The Hardness value of 50mg/l is good for fish harvesting (Swingle,1967). High value of Alkalinity 184 mg/l and lowest149 mg/l in winter, the main reason for the presence of high value is due to high rate of degradation of waste material. Rich concentration of Nitrate was recorded maximum 3.54mg/l and lowest in May2.30mg/l. The main cause for rich content of No_3-N is due to heavy agricultural practices around and inside the water body. Fertilizer like phosphate and nitrates enters into water body by runoff resulting high algal bloom lowers the concentration of DO.The standard value of nitrate is below0.25mg/l and the obtained results exceed the standard value as a result water is highly toxic aquatic animals (Hoq 2008). Highest organic carbon was in may54mg/l and lowest in march16.4 mg/lThe presence of high value of TDS is due to the excessive rate of erosion of the soillowers the level of DO.

Scientific namre	Local name	Common name	abundance
Ompok pabo	Pabda	Pabo catfish	++
Ompok pabda	Modhu pabda	Pabdha cat fish	++
. Xenentodon cancila	. Kakila	. Fresh water garfish	+
Monopterus cuchia	. Kuicha Gangeticmudeel	. Kuicha Gangeticmudeel	+
Pseudambasis ranga	. Ranga chanda	Indian glassy fish	++
Machrobrachium villosimanus	Gkatalia chingri	Dima river prawn	+
. Puntius chola	. Chola punti	. Chola barb	+
. Lepidocephalus gontea	. Gutum	. Guntea loach	+++
Macrognathus aral	. Tara baim	. One-stripe Spinyeel	++
Pseudambasis bacuculis	Kata chanda	Himalayan glassy perchlet	++
Macrognathus pancalus	. Guchi baim	. Striped spinyeel	++
Corica soborna	. Kachki	River-sprat	++
Mystus tengra	Bujuri Tengra	mystus	+++
Mystus cavasius	Gulsa	Gangetic mystus	++
Puntius gonionotus	Thai sarpunti	Silver barb	++
Lamellidens marginalis	Lamellidens marginalis	Lamellidens marginalis	++
Colisa lalia	. Lal khailsha	Dwarf gourami	++
Colisa fasciata	Khalisha	Stripled gourami	+++

Colisa sota	Chuna khalisha	Sunset gourami	+++
Labeo gonius	Ghonia	Kuria labeo	+
Labeo calbasu	Calbaus	Black rohu	+
Labeo rohita	Rui	ruhu	++
Labeo bata	bata	Labeo bata	+++
Catla catla	catla	catla	++
Cirrhinus mrigala	Mrigal	Mrigal	++
Cirrhinus reba	Bhagna	Bhagna Labeo	++
. Ailia coila	. Kajuli	. Jamuna ailia	+
Mystus vitttus	Tengra	Striped dwarf	++
. Heteropneustes fossilis	. Singi	. Stinging catfish	+++
Channa orientalis			++
. Lepidocephalus gontea	. . Gutum	Guntea loach	+++
. Channa punctatus	. Taki	. snake head	+++
Ompok bimaculatus E	. Kani papda	. Indian butter cat fish	++
.Wallago attu	Boal	Fresh water shark	++
Anabas testudineus	Koi	Climbing perch	+
Machrobrachium birmanicum	. Gura chingri	. Birma river prawn	++
Hypophthalmicichthys molitrix	Silver carp	Silver carp	+++
. Glossogobus giuris	. Bele	. Baila Tank goby	+
Channa striatus	Shol	Striped snake headed	++
Channa marulius	gajar	Giant snake head	
Channa punctatus			
Chanda nama	. Nama chanda Elongate	-perchlet	+++
	. Kata chanda Himalayan		
Machrobrachium rosenbergii	. Galda	. Giant fresh water prawn	++
. Notopterus chitala	. Chitol	.Humped featherback	+
Salmostoma phulo	Fulchela	Razzer belly minnow	+
Puntius chola	Chola punti	Chola barb	+
Puntius sophore	Jat punti	Spotfin swamp barb	+++
Puntius ticto	Tit puti	Ticto barb	+++
Puntius sarana	sarputi	Olive barb	+
Machrobrachium malcolmsnii	Chotka chingri	Monsoon river prawn	++
Esomus danricus	Darkina	Flying barb	++
Cyprinus carpio	Common carp	Scale carp	+++
Clarius batrachus	Magur	Magur	+
Tetrodon cutcutia	. Potka	. Ocellated pufferfish	+
Botia Dario	Rani/botia	Necktie loach	++
Channa gachua	cheng	Snake head	++
Gadusia chapra	Chapila	Indian river shad	++
Notopterus notopterus	Foli	Grey featherback	+++
Amblypharyngodon mola	. Mola	Mola carplet	++
Nundas nandus	Meni	i Mottled nandas	+
Cotio Rohtee cotio	Dhela	Cotio Rohtee	++
Corica soborna	Kachki	Ganga river-sprat	++

Table2: List of identified fishes

+++ - abundance,++ Less abundance,+- few.

Wetlands were the main source of indigenous fishes which contain vitamin, mineralsctc which helps to eradicate mal nutrition(Thilsted etal 1997.). Some of these species were Channa marulius ,Chanda nema ,Colisa lalia, Colisa fasciatus , Gudusia chapra ,Macrognathus pancalus, Ompok pabda , Channa striatus, Xenotodon cancilla, Sperata aor and Labeo bata..According to IUCN(2000) some threatened species were detected which includes Channa orientalis, Rasbora rasbora, Labeo boga, Puntius sarena, Bagarius bagarius, Eutropichthys vacha, Macrognathus eculeatus, Botia Dario, Mystus cavasius, Clupisoma garua, Chela lauboca.and Notopterus chitala

Fish is the good indicator of pollution and the presence and absence of fish mortality indicates the pollution status of water body. The potential causes of reduction of biodiversity were different kinds of human developmental activities, agricultural practices, explosion of human population and excessive utilization of resources. Aquatic organisms face many adverse conditions which negatively affect the reproduction of fishes(Islam and Hossain,1983). Theb presence of Pesticides,fertilizer and heavy metals cause the mortality of fish and other aquatic organisms.

Various gears, crafts and nets were used for catching fish and other organisms . During dry season, due to shortage of water, over harvesting caused the massive

killing of brood fishes.In addition to these, some chemicals were used to capture fishes. Mass mortality of fishes and other animals is responsible for the depletion of biodiversity(Biswas and Panigrahi,2014).

wetlands has tremendous role in socioeconomic, agriculture, biodiversity preservation, food security, maintaining surface water quality etc (Boyd,1982). Unplanned urbanization and extensive agriculture, industrial developments and transportation, building roads, bridges made the water bodies polluted. Biota faced environmental stress which affects the productivity of an ecosystem and livelihood of the adjacent people. More than two million people directly depend on inland open water resources.

IV. MANAGEMENT AND CONSERVATION OF WETLAND

Restoration of habitat and management of ecosystem is an essential component of a wetland. Site specific management plan is needed to collect information on the baseline in order to realize the proper functioning of the ecosystem. Fishery management techniques should applied with slight implementation of fishery managements practices.

Over increasing population growth, made wide gap between supply and demand so there is a need to increase production of resources as well as increasing the distribution system (ICLARM,1991).

V. CONCLUSION

Select protected zone for single species conservation, national policy and institutional frame work should involve management practices. closer monitoring of the ecosystem, the utmost responsibility, participation, accountability and utilization of local knowledge based skills.

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