Biological Diversity Status of Fish Genetic Resources at Tanguar Haor Wetland in Bangladesh

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Abstract

Tanguar haor has been declared as an Ecologically Critical Area and a Ramsar site - wetland of international importance by the Government of Bangladesh due to recent gradual alteration of haor ecosystem habitat and over exploitation of natural resources including fish genetic resources. Present winter season study was conducted to assess the effect of dry season on the overall fisheries resources and biological diversity of existing fish species in the wetland ecosystem of the haor. In this study, Focused Group Discussion (FGD) and questionnaire surveys of different stakeholders such as Key Informant Interview (KII); Personal Interview (PI); Household Survey (HS) and spot visit to fish landing centers/ local fish markets were carried out within Tanguar haor area covering two Upazilas viz. Tahirpur and Dharmapasha of Sunamganj district, Sylhet. The existing fisheries resources and status of fish biological diversity of the wetland based on such consultations, discussion and intervention have been assessed. From this study, it has been revealed that there are only 58 fish species were captured among 141 species (as reported earlier) by the local fishermen during that winter season, among those numbers 16 fish (28%) were identified as Commonly Available Species (CAS), 18 fish (31.08%) were as Moderately Available Species (MAS), 12 fish (20.68%) were as Less Available Species (LAS) and 12 fish (20.68%) were as Rarely Available Species (RAS). Both LAS and RAS can be categorized as vulnerable species; those are on the line to be endangered within a few years of time. According to report of the fisher groups a total of 8 fish species were not recently available at all in their catch. The overall assessment result of the study was extremely alarming for fish biological diversity of the wetland. Therefore, it is strongly recommended by all the consulted stakeholders that the integrated Best Wetland Management Practices (BWMPs) should be continued, enhanced and re-adopted as useful solution by the GoB and concerned departments and ministries by coordinated way to restore the threatened natural ecosystem services and vales and conserve the fish biological diversity at Tanguar haor wetland.

Keywords: Tanguar haor wetland, Fish Genetic Resources, Biological Diversity; BWMPs

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Introduction

Tanguar haor is a unique wetland ecosystem in Bangladesh having national and international importance for its rich aquatic and terrestrial resources. The haor lies in the Tahirpur and Dharmapasha Upazilas of Sunamganj District, Sylhet. There are 200 beels (ie. natural depressions) of various sizes and 46 villages within the haor wetland. The total haor area is about 114 km^2 of which 2802.36 ha is wetland. A total of 60,000 people lives around and inside the haor for their livelihoods. Unlike other natural resources, the haor wetland was rich for fisheries resources, where nearly about 141 freshwater fish species were available. Due to gradual alteration of haor ecosystem habitat and over exploitation of natural resources, the Government of Bangladesh declared Tanguar haor as an Ecologically Critical Area in 1999. In 2000, the hoar basin was declared a Ramsar site – wetland of international importance. Simultaneously, the ownership of Tanguar haor was also transferred from the Ministry of Land (MoL) to the Ministry of Environment and Forests (MoEF). Meanwhile, GoB was looking for donor agency(s) to support the government initiative of replacing the "traditional leasing" system with a community-based management system adhering to the Ramsar Site principles. The Swiss Agency for Development and Cooperation (SDC) found the government initiative very innovative and in line with their Country Strategy and signed a contract with GoB to provide necessary financial support for a project to study and suggest alternative system to protect all natural resources of Tanguar Haor ecosystem. Accordingly, MoEF nominated IUCN Bangladesh to implement the project on behalf of the government (SDC CBSMTHP Phase II-Draft Final Report, 2011). Finally, the project titled "Community Based Sustainable Management of Tanguar Haor Project (CBSMTHP)" came to the light by SDC funding support since 2006. The first project was implemented as a brief Preparatory Phase for 18 months. Secondly a three-year (2009 – 2012) Development Phase was completed to establish a co-management system that would ensure both the preservation of key ecosystem functions and values as well as provide substantial livelihood improvements for rural communities. Then a third phase was completed as the Consolidation Phase (2013-2015). The goal of the CBSMTHP was to introduce and institutionalize a co-management system for the Tanguar Haor Ramsar Site that will conserve ecosystem values and services and provide a basis for the improvement of livelihoods for rural communities (SDC CBSMTHP Phase III- Mid Term Review, Final Report, 2014). The CBSMTHP co-management governance has a foundation at the grassroots resource user's level that links up to the GoB's highest policymaking level (Chowdhury, 2010). After the completion of SDC funded Community Based Sustainable Management of Tanguar Haor Project, since 2016 onwards, the Co-Management system was running under the direction of Deputy Commissioner (DC), Sunamganj district by the GoB support. There were no follow up reports that how the designed co-management practices undertaken by the previous projects are running perfectly or not to protect ecosystem services and values.

This paper aims to highlight a part of the studies were conducted under a GoB funded project of Department of Bangladesh Haor and Wetland Development (DBHWD),

Ministry of Water Resources (MoWR), GoB for protecting the haor and other wetland resources implemented by the Institute of Water Modelling (IWM), Bangladesh. The broad objectives of the study related to overview the present Tanguar haor management system and assess the overall fisheries resources and fish biological diversity issues of the haor ecosystem through public consultation and interviews with the targeted stakeholders.

Materials and Methods

The Study Period

The winter season was chosen to conduct field survey and study at Tanguar haor area to assess the effect of dry season on the overall fisheries resources and diversity of available fish species in the wetland ecosystem of the haor. The survey and study were carried out from 01 – 14 December, 2018.

Location of Tanguar Haor Wetland

The Tanguar Haor is located in the North-East part of Bangladesh, between 25°12'10.572" and 25°5'47.969" north latitude and 90°58'49.426" and 91°10'0.018" east longitude. The total area of the haor is approximately 114 km^2 (Fig. 1). The haor wetland is influenced by Dhanu Baulai, Surma and Jadukata Rivers. At the extreme northern side, the Meghalayan Hills of India are standing, from where number of hill streams flows into the haor basin (Chowdhury, 2010).

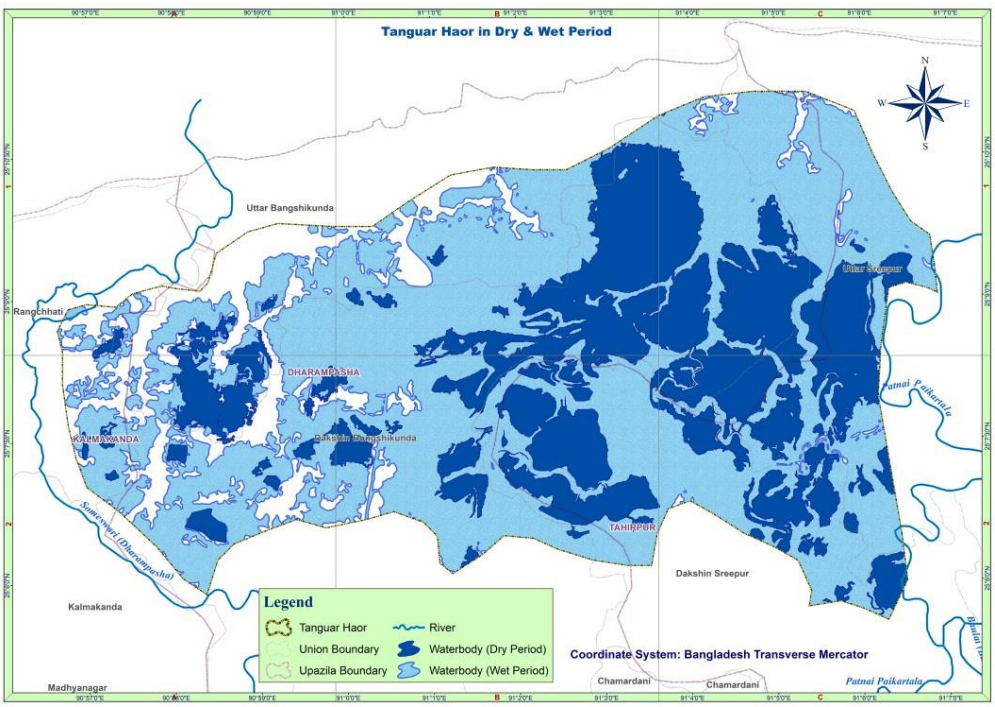

Figure 1. Map of Tanguar Haor in dry and wet season

Sites for Conducting the Study

This study was conducted in two Upazilas viz. Tahirpur and Dharmapasha of Sunamganj district, Sylhet to cover most of the selected spots, villages and fish landing centers adjacent to major beel areas of Tanguar haor. The survey spots covered at the villages like Joypur, Indropur, Benagl Vita, Lama Gaon, Tahirpur Sadar and Soliamanpur Landing Center at Tahirpur Upazila. Subsequently, Dharmapasha Upazila also covered in conducting the survey at the villages viz. Rongchi, Amtorpur and Dharmapasha Sadar. Table 1 shows the list of survey and study sites of winter season.

Table 1. List of survey and study sites of Tanguar haor wetland

Name of the haor	Upazilas	Spot/village/beel sites
Tanguar Haor	Tahirpur	Joypur
		Indropur
		Bengal Vita
		Lama Ghao
		Solaimanpur
		Tahirpur Sadar
	Dharmapasha	Rongchi,
		Amtorpur
		Dharmapasha Sadar

Data Collection

For collection of data in Tanguar haor areas, the survey was carried out in aforementioned sites through Focus Group Discussion (FGD), direct interviews of different stakeholders viz. Key Informant Interview (KII); Personal Interview (PI); Household Survey (HS) and spot visit of fish landing centers. Public consultation and interviews were made using several sets of pre-structured and pre-tested questionnaires for conducting this study.

Survey Methodology

Focus Group Discussion (FGD)

Focused Group Discussion (FGD) and questionnaire surveys were carried out within Tanguar haor at Tahirpur Upazila area among three categories of stakeholders viz. i) Fisher Group; ii) Alit Group (i.e. local inhabitants) and iii) Fish Trader Groups at lending centers. In this Upazila, 3 Fisher Groups, 1 Alit Group and 1 Fish Trader were met and consulted. In each of such FGD group was composed of 10 – 12 fishermen, a number of local inhabitants and fish traders were participated and interviewed group wise. At Dharmapasha Upazila area a total 2 Fisher Groups and 1 Alit Group were

met, discussed and interviewed. Participation of female members in most of the Fisher Groups and Alit Groups were 20 – 50%. In this Upazila no FGD for Fish Trader Group was consulted. During consultation and group interview using questionnaires for all FGD groups, major crucial points discussed and covered were; i) During the winter season assess and quantity the existing fish resources presently available/not available at harvesting and determine status of fish biodiversity; ii) Find out present fishing practices and type of crafts and gear used during the season; iii) Identify the major reasons of declining catch, fish biodiversity and degradation of aquatic habitat; iv) Assess the impact of catch and biodiversity declining over fish trade and marking as well impact on consumers; v) Suggest mitigating measures for improvement of catch, fish availability at the landing centers and local markets and vi) Suggest mitigating measures for conservation of fish biodiversity and natural breeding grounds and habitat.

Personal Interview (PI)

The Personal Interviews (PIs) were conducted during winter season based on questionnaires in Tanguar haor area (Table 1). PIs were composed of individual fisherman and individual alit person, individual fish trader at landing centers and local markets, individual house wife and individual fish culturists. In Tahirpur and Dharmapasha Upazilas, 7 PI fishermen, 5 PI Alites, 6 PI Traders, 4 PI Household Wives + House Owners and 1 PI Fish Culturist were interviewed.

Key Informant Interview (KII)

Key Informant Interview (KII) were conducted with Upazila Fishery Officer (UFO) of Tahirpur Upazila . In that KII separate questionnaire was used for interviewing UFO. During this time, similar KII also conducted with Upazila Fishery Officer (UFO) of Dharmapasha Upazila. All these interviews covered all physical characteristics of Tanguar Haor; present status of fisheries resources, fish and habitat diversity of the haor; potential causes of fish biodiversity and habitat degradation; Department of Fisheries (DoF) role and involvement in haor management; suggestive mitigating measures from DoF side as well as overall improvement of haor ecosystem diversity and conservation of fish genetic resources in Tanguar haor wetland.

Household Survey (HS)

Household Surveys (HS) were conducted individually using a set questionnaire for them in Tanguar Haor area (both in Tahirour and Dharmapasha Upazilas) with the limited of number of house wives and house owners.

Visit to Fish Landing Centers and local fish markets

During winter season a total of 4 fish landing centers/local fish markets were visited among those two were belong to Solaimanpur and Lamagaon, Tahirpur Upazila and other two were located to Rongchi and Dharmapasha Sadar, Dharmapasha Unpazila., where the traders were interviewed and consulted.

Results and Discussion

Assessment of Existing Fish Genetic Resources and Status of Fish Biological Diversity

During this study, major intention was to address with all set queries among all the stakeholders involved in all FGDs, PIs, KIIs, household surveys and fish landing center/local market visits of Tanguar haor area for assessing winter season quantity and type of existing fish generic resources were presently available/not available at harvesting and determine the status of fish biological diversity. The existing fisheries resources and status of fish biodiversity based on such consultation and intervention are presented in Table 2. From this table, we could easily assess the present scenario of degraded fish genetic rescues, where there are only 58 species were being captured by the local fishermen during this winter season, among those numbers 16 fish (28%) were identified as Commonly Available Species (CAS), 18 fish (31.08%) were as Moderately Available Species (MAS), 12 fish (20.68%) were as Less Available Species (LAS) and 12 fish (20.68%) were as Rarely Available Species (RAS). Both LAS and RAS can be categorized as vulnerable species; those are on the line to be endangered within a few years of time. The comparative proportion of these existing fish species availability during winter season at Tanguar haor wetland is shown in Figure 1.

Table 2. List of fish species presently available and not available during winter season at Tanguar haor wetland

Serial number	Commonly Available Species (Local Name)	Moderately Available Species (Local Name)	Less Available Species (Local Name)	Rarely Available Species (Local Name)	Not Available Species (Local Name)
1	*Mystus vittatus* (Tengra)	*Ompok pabda* (Boali Pabda)	*Ompok bimaculatus* (Kani Pabda)	*Eutropiichthys vacha* (Bacha)	*Labeo nandina* (Nanid)
2	*Mystus tengra* (Bujuri Tengra)	*Ompok pabo* (Pabda)	*Chaca chaca* (Chaka)	*Clupisoma garua* Gharua)	*Tor tor* (Mohashaol)
3	*Wallago attu* (Boal)	*Heteropneustes fossilis* (Shing)	*Badis badis* (Napid Koi)	*Ailia coilia* (Kajuli)	*Plotosus caniu* (Gangmagur)
4	*Mystus aor* (Air)	*Clarius batrachus* (Magur)	*Colisa chuna* (Small Kholisha)	*Pseudeutropius atherinoides* (Batashi)	*Notopterus chitala* (Chittal)
5	*Nandus nandus* (Meni)	*Botia dayi* (Maita rani)	*Macrognathus armatus* (Baim)	*Hyporamphus limbatus* (Ekthuta)	*Silonia silondia* (Shilon)
6	*Gaduasia chapra* (Chapila)	*Channa striatus* (Shole)	*Labeo rohita* (Rui)	*Botia dario* (Bou Rani)	*Pangasius pangasius* (Deshi Pangus)

7	*Xenentodon cancila* (Kakila)	*Channa marulius* (Gozar)	*Catla catla* (Katla)	*Channa orientalis* (Chang)	*Bagarius yarrellii* (*Bagarius yarrelli*)
8	*Glossogobius giuris* (Baila)	*Channa punctatus* (Taki)	*Cirrhinus cirrhosis* (Mrigal)	*Colisa lalia* (Lal Khalisha)	*Rita rita* (*Rita rita*)
9	*Parambassis ranga* (Gol chanda)	*Anabas testudineus* (Koi)	*Ctenopharyngo don Idella* (Grass Carp)	*Monopterus cuchia* (Cuchia)	-
10	*Lepidocephalich thys guntea* (Gutum)	*Colisa fasciatus* (Large Kholisha)	*Cyprinus carpio* (Karo)	*Cirrhinus reba* (Lachu)	-
11	*Tetraodon cutcutia* (Potka)	*Colisa chuna* (Small Kholisha)	*Puntius sarana* (Shar punti)	*Osteobrama cotio* (Dhela)	-
12	*Labeo gonius* (Goniya)	*Macrognathus pancalus* (Guchi Baim)	*Macrobrachium rosenbergii* (Golda Chingri)	*Amblypharyngo don mola* (mola)	-
13	*Puntius ticto* (Tit Punti)	*Macrognathus aculeatus* (Tara Baim)	-	-	-
14	*Puntius sophore* (Jati Punti)	*Notopterus notopterus* (Foli)	-	-	-
15	*Macrobrachium malcolmsonii* (Kalo Chingri)	*Labeo bata* (Bata)	-	-	-
16	*Macrobrachium sp.* (Chingri)	*Labeo calbasu* (Kaliboush)	-	-	-
17	-	*Chela phulo* (Chela)	-	-	-
18	-	*Aplocheilus panchax* (Panch Chokha)	-	-	-
Total	16	18	12	12	8

Note: Commonly Available Species = CAS**;** Moderately Available Species = MAS; Less Available Species = LAS; Rarely Available Species RAS; Not Available Species = NAS

On the other hand, it is also observed from Table 2, according to report of the fisher groups a total of 8 fish species were not recently available at all in their catch. More or less similar opinion and experience have been expressed by all other stakeholders interviewed in this survey. Among this list, one or two species have already been extinct and other species could be categorized either endangered or critically endangered.

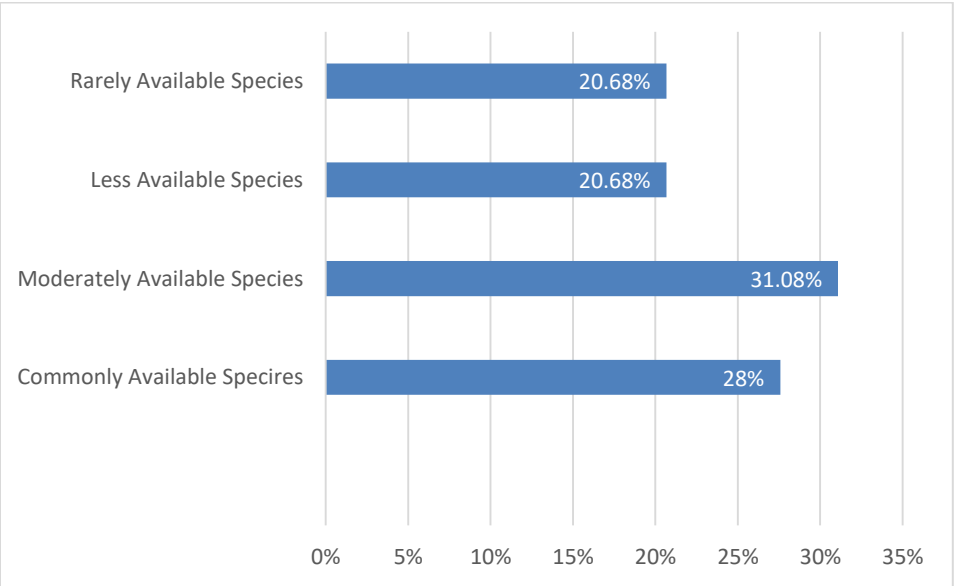

Figure 1. Comparative proportion (shown as Bar Chart) of fish species availability during winter season at Tanguar haor wetland

The Tanguar Haor is one of the large wetland ecosystems in the country, which was once very rich in terms of fisheries resources and fish species biodiversity. On the other hand, overall fisheries of the haor had significant importance to support natural fish production, national economy and livelihood of surrounding people. In terms of fish species diversity, the haor having one of "Mother Fish Stocks" of a total six of the country ((Alam et al. 2015). According to Doz (1997); Nuruzzaman (1997) and Khan (1997) the number of fish species belongs to Tanguar Haor is about 141 species, which represents nearly half of total 260 freshwater fish species of Bangladesh. This diversity of fish fauna in Tanguar Haor also supported by it, and reported as well that a large number of nationally declared threatened fish species, among 55 threatened fish taxa, 23 were found endangered fish species, 17 were found only in Tanguar Haor (Alam et al. 2015). In fact, the present situation is completely different in regard to fisheries resources and species diversity due to haor aquatic ecosystem resource depletion, havoc degradation of wetland habitat, degradation of natural fish breeding grounds and illegal massive harvest of fish by undesirable fishing practices using various banned fishing nets and gears. These had probably contributed to disappearance of a large number of

fish in the natural system, which would have led to genetic erosion and had been a threat to indigenous fish species (GOB, 2004).

From the data collected from winter season study on fish genetic resources and fish biodiversity, it could easily be estimated that during that season a total of 41% fish (only 58 species) were available among 141 species (as reported earlier) in the depleted natural ecosystem of Tanguar haor wetland and other 59% fish (83 species) either lost or disappeared forever from this water body, which is extremely alarming for this Ramsar Site – wetland of international importance.

Present Fishing Practices and Use of Fishing Crafts and Gears

During that winter season survey, while interviewing all the concerned stakeholders specifically FGD Fisher groups, FGD Fish Trader Groups at the landing centers and KII of Upazila Fishery Officers of Tahirpur and Dharmashala Upazilas, present fishing practice and gear used was given due importance to know their effect on existing fisheries resources and biodiversity. It was reported in particularly from the Fisher Groups regarding the use of different types of fishing crafts as well for harvesting fish from different beels of the haor wetland such as manually driven small wooden boats (20 feet long); Mechanized boats (30 feet long). For catching fish from Tanguar haor during winter season, the fishermen used 6 different types of fishing nets; 2 types of fishing traps; 3 types of hook and lines and 1 type of metal/stainless harpoon.

During this study, it was revealed that although fishing of gravid fish during breeding season and under sized young wild fish catch was already banned, but a large number of fishermen used different types of fishing gears illegally all over the Tanguar haor wetland in all the seasons. A number of the banned fishing gears viz. Seine net , mono-filament net, hook and line fishing etc. were being used for fishing in such type of waterbodies all over the country. In particularly, the fishing gears such as bamboo traps are extremely harmful for gravid indigenous species available at the haor wetland areas. Alam et al. (2015) also reported the impact and threat of such fishing gears to entire fish biodiversity at Tanguar haor. It was critically observed during that winter season, while the survey team crossing over a number of beels of the haor from early morning to sunset, every part of wetland of the haor, fishermen were heavily engaged to harvest many varieties of indigenous fishes mostly small and medium sized fish species (Figure 2 and Figure 3) using the aforementioned banned fishing nets and lethal gears. Moreover, at night time, the fishermen became also busy to set gill nets in most of the canals and open places of the haor wetland including they also used lethal metal harpoons and light fishing, which were extremely dangerous and detrimental for wounding and killing the medium and large sized gravid fish.

Figure 2. Banned hooks and line fishing were being used to harvest the gravid indigenous small and medium sized fish species including needlefish species from Tanguar haor wetland.

Figure 3. Banned hooks and line fishing as well as mono-filament nets were being used to harvest the gravid indigenous small and medium sized fish species including leaf fish species from Tanguar haor wetland.

Potential Causes of Fish Biological Diversity and Habitat Degradation

During all those consultation and discussion meetings with concerned stakeholders specifically FGD Fisher groups, FGD Fish Trader Groups at the landing centers and KII of Upazila Fishery Officers of Tahirpur and Dharmashala Upazilas, one of the important quarries were asked regarding potential causes of fish biological diversity and habitat degradation of Tanguar haor wetland. In reply, each group members were telling in detail the reasons behind those facts and majority of their opinion were more or less similar. The listed major causes are as follows; i) Over fishing by banned and illegal nets, gears etc, which damaged the breeding, feeding and nursery grounds of the indigenous fish species of the wetland ecosystem; ii) Indiscriminate catching of fry/fingerlings, juveniles and gravid fish by the local fishermen; iii) Increasing pressure of illegal fishing day by day at the haor wetland area; iv) Fishing by dewatering or complete drying the beel ditches, the most devastating practice for harvesting all sizes of fish such as fry, juveniles and adults; v) Setting of higher rate of brush fishing in many areas of haor wetland causing depletion of juvenile and gravid fish population; vi) Fishing by bamboo fencing or nets with fixed fishing gears across sluice gates, canals, rivers or other water ways; vii) Unplanned construction of dams, embankments, roads and bridges that separate the shallow water portion from deeper portion of wetland adjacent rivers to block the migratory path ways of fish and hinder in normal water flows; viii) Indiscriminate use of harmful and toxic pesticides in the wetland adjacent agricultural lands, which caused severe pollution in the wetland waters; ix) Decreasing overall depth of the wetland and the beels due to heavy siltation day by day; x) Continuous deforestation is a common practice by the residing population for fishing, navigational and fuel collection purposes, which had negative impacts as a whole on wetland ecosystem.

The above factors have been identified as the major causes of hindering fish and habitat diversity of natural ecosystem of the wetland. Similar reasons were also reported by Alam et al (2015), where many of such potential causes are discussed as major challenges to conserve fish biodiversity in Tanguar haor wetland. They also suggested the locally appropriate adaptive measures are required to address these social, environmental and climate challenges of these fishery resources. In view of sustaining ecosystem diversity and conservation of this important fish biological diversity, effective synchronization among the government relevant agencies, development actors and stakeholders were essentially important (Alam et al. 2015).

Recommendations for Conserving of Fish Genetic Resources and Biological Diversity

During this study, at the time of consultation and discussion necessary measures and recommendations were sought from all the stakeholders such as FGD Fisher groups, FGD Fish Trader Groups at the lending centers and KIIs. Their combined recommendations were as follows:

- Illegal fishing nets, viz. seine net and mono filament nets, and harmful gears etc. should protected and banned.
- Dredging is extremely required of depleted rivers, canals and beel areas for increasing water flow and depth for proper migration and better survival of gravid and juvenile stocks.
- Sanctuary must be established at the haor basin to conserve the brood and juvenile fishes
- Fish harvest banning period should be followed during peak breeding season April to July.
- Alternative income source needs to be implemented for the fishermen need to implement in breeding season like gravid and juvenile hilsa harvest banning system by the Govdernment.
- Need especial task forces for controlling haor and high-speed vehicle and equipment involving Upazilla Fisheries officers.
- Tree plantations in haor dyke areas like hijol and koros trees are extremely essential.
- The co-management systems should be continued, enhanced and re-adopted as the integrated Best Wetland Management Practices (BWMPs) by the GoB and concerned departments and ministries by coordinated way to restore the threatened natural ecosystem services and vales and conserve the fish biological diversity at Tanguar haor wetland.

Conclusion

In view of protecting natural resources and biological diversities, the GoB already declared some of the important wetlands including Tanguar haor wetland as the Ecologically Critical Areas and Ramsar Sites respectively in 1999 and 2000. After that the GoB and concerned ministry (MoE) initiated and adopted wetland co-management systems involving IUCN through implementing a number of short, medium and long-term projects funded by Swiss Agency for Development and Cooperation (SDC) at Tanguar Haor during 2006 - 2015. At the same time, under those projects well designed co-management systems were implemented by involving all village level communities and fisher groups living behind and inside the wetland areas. From the present study, in assessing all the stakeholder's consultations and discussion it was clear that Best Wetland Management Practices (BWMPs) and improved Management Framework were formulated and implemented for a number of important mentioned wetlands by the GoB in Bangladesh. After completion of donor funded project periods, there were some laps and gaps observed. Afterwards, although the overall co-management efforts guided and supervised by local administration in each region. In many cases, severe lacking of implementation of Govt. fishing rules and regulation and use of illegal and banned fishing nets, viz. seine net and mono filament nets, and harmful gears etc., which continuously depleted and declined the indigenous fish species population in

most of that wetland. Therefore, it is strongly recommended that the integrated Best Wetland Management Practices (BWMPs) should be continued, enhanced and re-adopted by the GoB and concerned departments and ministries by coordinated way to restore the threatened natural ecosystem habitat and conserve fish biological diversity in the wetland. From this study it is revealed that BWMPs are the only solution to protect the wetland ecosystem services and values from measurable destruction and declining of biological diversity related to valuable fisheries and other aquatic resources at Tanguar haor.

Acknowledgement
This study was conducted under the GOB funded project entitled "Study on Interaction between Haor and River Ecosystem including Development of Wetland Inventory and Sustainable Wetland Management Framework" of Department of Bangladesh Haor and Wetland Development (DBHWD), Ministry of Water Resources (MoWR), which was implemented by the Institute of Water Modelling (IWM) during 2018 - 2020. The author would like express his gratitude and special thanks to Dr. Ali Muhammad Omar Farouque, Deputy Secretary as well as Project Director of DBHWD, MoWR, GoB for his constructive guidelines and suggestions. Thanks also goes to Mr. Gautam Chandra Mridha, Project Leader, IWM for his immense collaboration.

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