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Study of Fish Biodiversity of Nijhum Dwip, Noakhali, Bangladesh

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Authors' contributions

This work was carried out in collaboration among all authors. Author MIK did the survey, performed the statistical analysis and wrote the first draft of the manuscript. Author MRH designed and made the protocol of the study and supervised the study. Author TS managed the literature searches and finalize the protocol and draft of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The investigation was concerned to assess the diversity status of fish in Nijhum Dwip, Hatiya, Noakhali with its management actions.
Place and Duration of Study: Nijhum dwip declared as marine protected area is blessed with unique ecosystem with holding numerous flora and fauna species diversity. Data and fish sample were collected from February, 2019 to July 2019 for a period of five month.
Methodology: The current research was grounded on visiting fish landing center and fish market, on spot date collection, interview of the fishermen and the fish traders, sample collection and secondary data collection.
Results: In investigation, 39 species in 22 families were witnessed. The maximum numbers of fish species (8) were observed from the family Cyprinidae. From the survey, 4 species were endangered (EN), 5 species were vulnerable (VU), 2 species were near threatened (NT), 22 species were least concern (LC) categories, 6 species were not threatened (NO) which is grounded on IUCN (2015) list of threatened fishes of Bangladesh. The marine fish and freshwater fish alignment in the research region were 33% and 67% in turn.
Conclusions: The species scarcity or decline is demonstrated by the non-availability and less availability of some of the species in the adjacent area as well as in the country. The policy makers,

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researchers as well as local people would be able to aware with their existing biodiversity status and also significance of fish fauna of the study area by appropriate evaluation and proper documentation of fish fauna.

Keywords: Biodiversity; fish diversity; Nijhum dwip.

1. INTRODUCTION

Biodiversity consists of the diversity and capriciousness of entire life forms i.e. the different animals, plants and microorganisms, their genes and the ecosystems of which they are share. Biodiversity and its maintenance are regarded as one of the major concerns aimed at continuing improvement and stable growth [1]. As Bangladesh is a land of river, it's abundant and varied inland water bodies- beels (floodplain depressions and lakes), ponds, rivers, canals, ditches and vast paddy fields are resident for more than 260 freshwater fish species [2]. Bangladesh is confounded with a varied assortment of freshwater and marine biodiversity's. As greatest significant sector of Bangladesh, fisheries covers an essential part in food intake, nutrition, occupation, export and the socio-economic advancement of the country [3]. In 2017-18, this sector contributes 3.57% to the national GDP and more than one-fourth (25.30%) to the agricultural GDP [4]. Bangladeshi people's 60% of animal protein requirement is fulfilled by consuming fish and rest 37% is fulfilled by consuming poultry and livestock [3].The magnitude of the aquatic biodiversity of Bangladesh is recognize through its extraordinary production and capability to provision of an exceedingly human-populated country alike Bangladesh. The freshwater resources of Bangladesh are currently facing a dramatic decline in fish biodiversity and as a result, a considerable portion of fresh water fishes have been categorized as threatened. These threatened vulnerable (VU), endangered (EN) and critically endangered (CR) etc. category was declared by IUCN [5]. In the midst of 260 freshwater fish species of Bangladesh, 54 species are threatened of which 12 are critically endangered, 28 are endangered and 14 are vulnerable [6]. Bangladesh is recognized as a big delta. The major sediment load carried by the Ganges and the Brahmaputra as combined river drain to Bay of Bengal. It consists of many islands. Nijhum dwip is one of them. Nijhum Dwip is encircled with the Bay of Bengal and Meghna Channel. Nijhum dwip is a small but important water body in the southern part of Bangladesh since it plays an important role in the fisheries sector of in this region.

There are very limited information on diversity at the species level in most of our freshwater and marine water. Distribution and abundance of species baseline records are available for very few cases. Currently no up-to-date or inclusive assessment of the threatened fishes in Bangladesh is presented. There are significant lack of information and nomenclature differences, which creates coordination of documents a test. Findings from this wild fish diversity study will increase our level of knowledge and understanding of the present wild and farmed fish diversity status in Nijhum Dwip, Hatiya, Noakhali district. Finally, the outputs from this study can be applied in the development of national biodiversity strategies, conservation planning and in the integration of biodiversity information within the development and environmental planning process.

2. MATERIALS AND METHODS

2.1 Study Area

The research was carried out in a marine protected area, Nihum Dwip Island in Hatiya Upazilla under Noakhali district. The area located between longitude 21°35′0″ North and latitude 92°01′0″ east respectively.

2.2 Study Period

The work was conducted for a period of five months since February 2019 to July 2019 in Nijhum dwip. Information was also collected from the government fishery office. Based on mostly renowned, a total of 13 aquaculture farms, 23 aqua drug and fish feed center shops were surveyed and information collected.

2.3 Data Collection Methods

Primary data were collected from 35 of both professional and subsistence randomly selected fishermen. Primary data collected by questionnaire interviews (QI) and focus group

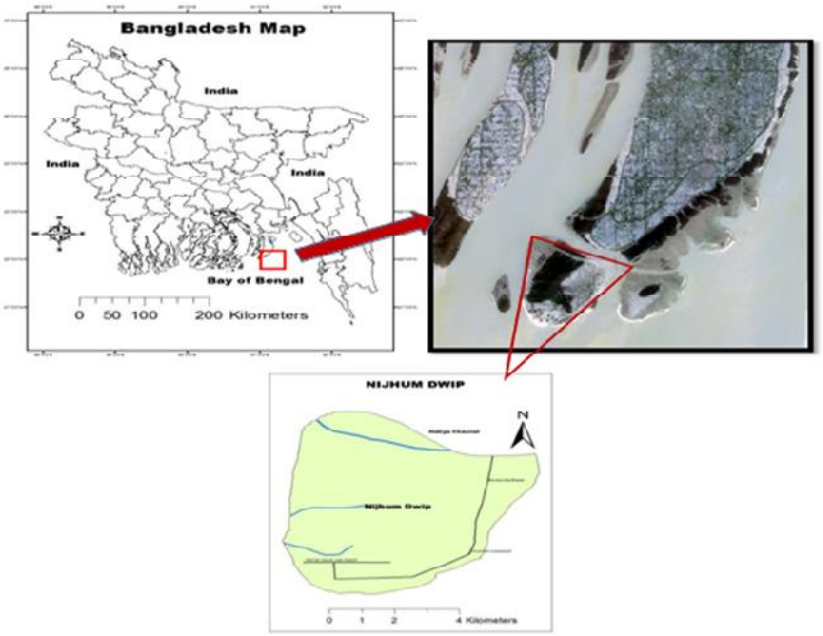


Fig. 1. Location of study area

discussions (FGD) from local people. Related documents such as local name, distribution availability of the species was collected from study sites. The secondary data collected and cross-checked information by key informants interviews (KII) from upazilla fisheries officer (UFO), district fisheries officer (DFO) etc. The fish collected during sampling were identified primarily on the spot. Those, which appeared difficult to identify, were marked properly and preserved in 10% buffered formalin in the plastic jars and then transferred to the Laboratory in the Department of Fisheries, Noakhali Science and Technology University at Noakhali. The collected fish samples were identified by evaluating their morphometric and meristic characteristics as well as the color of the specimens referring the books such as Fish Base etc. The taxonomic guidelines were followed and also fish species classification was done systematically [7,8].

2.4 Data Processing

Collected data were analyzed and arranged accordingly and documented properly. In conclusion collected information arranged tabular form and graphically.

2.5 Data Entry and Analysis

All the collected information was accumulated and analyzed using MS-excel 2010. The investigated data were represented in textual, tabular and graphical arrangement.

3. RESULTS AND DISCUSSION

3.1 Availability of Fish Species

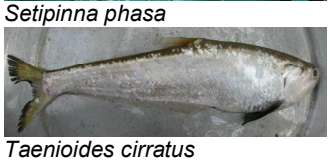
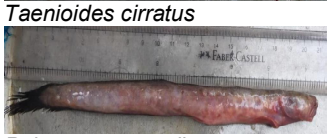
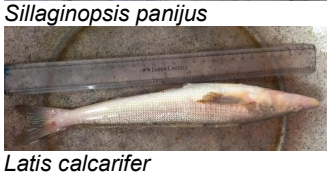
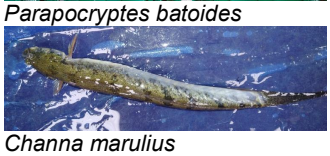
Over-all 39 individuals of fish were recorded and characterized at Nijhum dwip during the study period, which belong to 23 families and seven orders. Perciformes was found as the most dominant order considering species variety and abundance, and Siluriformes and Cypriniformes occupied second and third position in abundance, respectively. During investigation, 18 species from four families named *Cyprinidae, Gobiidae, Bagridae, Channidae.*

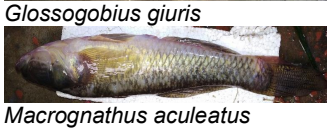
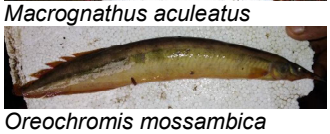
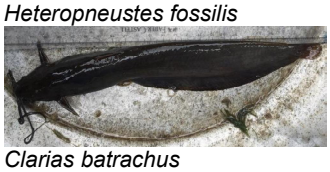
Among the fish species, 15 were as of marine and brackish water source and others are from freshwater source. Maximum number of the fresh water species were presented in rivers, streams, canals and ponds. Several studies were shown alike key dominant species of the study area [9,10].

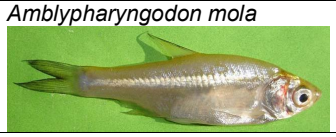
The following species contributed more than 80% of the total composition: *Tenualosa ilisha, Channa amarulius, Channa punctatus, Cirrhinus cirrhosis, Ctenopharyngodon Idella, Cyprinus carpio, Labeo rohita, Puntius ticto, Puntius sarana, Mystus tengra, Pangasius Pangasius,*

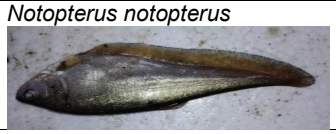
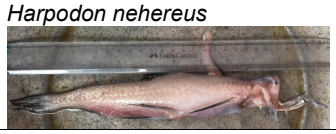
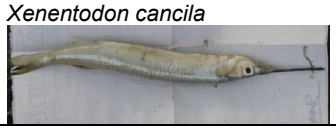
Clarias gariepinus, Harpodon nehereus, Decapterus russelli, and Lates calcarifer. It was identified 265 freshwater fish species in Bangladesh [10]. Present study reported that the study areas represent 10% of the country's total fish species.

Table 1. List of fish species recorded in the present study according to order

Order	Family	Species	English name	Local name	Conservation status
Clupeiformes	Clupeidae	*Tenualosa ilisha* 	Hilsha	Ilish	LC
	Clupeidae	*Gudusia chapra* 	Indian river shad	Chapila	VU
	Engraulidae	*Setipinna phasa* 	Gangetic hairfin anchovy	Phasa	LC
	Gobiidae	*Taenioides cirratus* 	Bearded worm goby	Chewa	LC
	Polynemidae	*Polynemus paradiseus* 	Paradise threadfin	Taposhi	NO
	Sillaginidae	*Sillaginopsis panijus* 	Gangetic sillago	Tular dandi	LC
	Centropomidae	*Latis calcarifer* 	Sea bass	Koral	NO
	Centropomidae	*Jhonius coalter* 	Coiter crocker	Poa	LC
	Gobiidae	*Parapocryptes batoides* 	Goby	Chiring	LC
	Channidae	*Channa marulius* 	Giant snakehead	Gajar	EN
	Anabantidae	*Anabas testudineus*	Climbing perch	Koi	LC
	Channidae	*Channa punctatus*	Spotted snakehead	Taki	LC

Order	Family	Species	English name	Local name	Conservation status
Perciformes	Mugilidae	 *Rhinomugil corsula*	Corsula mullet	Bata	LC
	Channidae	 *Channa striata*	Striped snakehead	Shol	LC
	Gobiidae	 *Glossogobius giuris*	Tank goby	Bailla	LC
	Mastacembelidae	 *Macrognathus aculeatus*	Spiny eel	Baim	NT
	Cichlidae	 *Oreochromis mossambica*	Mozambique tilapia	Tilapia	NO
	Bagridae	 *Batasio batasio*	Tista batasio	Batasi	NT
	Schilbeidae	 *Clupisoma garua*	Garua bachcha	Gaura	EN
	Schilbeidae	 *Ailia coila*	Gangetic ailia	Kajuli	LC
Siluriformes	Heteropneustidae	*Heteropneustes fossilis*	Stingimg catfish	Shing	LC
	Clariidae	 *Clarias batrachus*	Walking catfish	Magur	LC
	Clariidae	 *Wallago attu*	Boal	Boal	VU
	Bagridae	 *Sperata aor*	Long-whiskered catfish	Ayer	VU
	Bagridae	 *Mystus tengara*	Stripped dwarf catfish	Bajari tengra	LC

Order	Family	Species	English name	Local name	Conservation status
					
	Pangasiidae	*Pangasius pangasius* 	Pungas catfish	Pungus	EN
Cypriniformes	Cyprinidae	*Amblypharyngodon mola* 	Mola carplet	Mola	LC
	Cyprinidae	*Esomus danricus* 	Flying barb	Darkina	LC
	Cyprinidae	*Puntius ticto* 	Sportfin swamp barb	Tit punti	LC
	Cobitidae	*Lepidocephalichthyes annandalei* 	Annaldale loach	Gutum	VU
	Cyprinidae	*Labeo rohita* 	Rohita	Rui	LC
	Cyprinidae	*Catla catla* 	Catla	Catla	LC
	Cyprinidae	*Hypophthalmichthyes molitrix* 	Silver carp	Silver carp	NO
	Cyprinidae	*Ctenopharyngodon idellus* 	Grass carp	Grass carp	NO
Osteoglossifor	Cyprinidae	*Labeo bata* 	Bata labeo	Chokka bata	LC
	Notopteridae	*Chitala chitala*	Humped featherbac	Chital	EN

Order	Family	Species	English name	Local name	Conservation status
			k		
	Notopteridae	*Notopterus notopterus* 	Grey featherback	Foli	VU
Scopeliformes	Hardontida	*Harpodon nehereus* 	Bombay duck	Loitta	NO
Beloniformes	Belonidae	*Xenentodon cancila* 	Freshwater garfish	Kaikya	LC

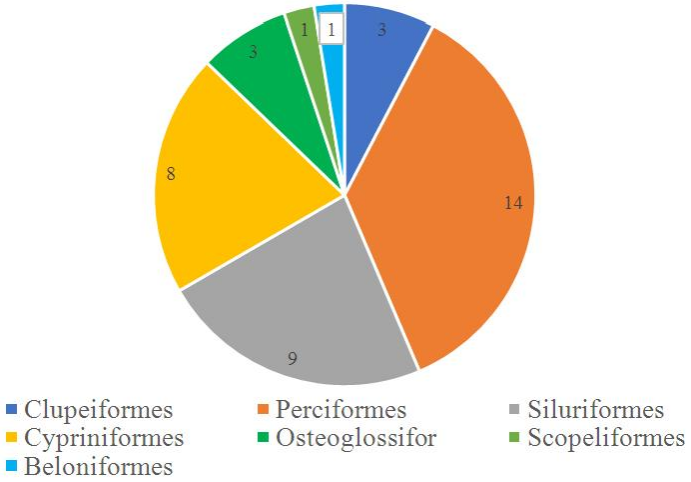


Fig. 2. Present status of fish species in Nijhum Dwip Island

In the study, a total of 12 sampling and observation trips were done and fish trading by 35 whole seller/retailers and Fishermen were observed. A total of 39 natural/wild fish species representing 23 families were listed. The most abundant natural fish in biomass was *Tenualosa ilisha* in the studied market. Other significant species were *Taenioides cirratus, Polynemus paradiseus Parapocryptes batoides* in descending order. The national fish of Bangladesh (Ilish) showed higher abundance during the late summer and monsoon. The fishermen also confirmed that Ilish landing is highest during rainy season. Bearded Worm Goby (Chewa) showed higher abundance during the winter. Poor presence of *Pangasius pangasius, Hypophthalmichthyes molitrix, Notopterus notopterus, Xenentodon cancila, Ctenopharyngodon idellus, Sperata aor, Clupisoma garua,* and *Channa marulius* in the market and landing center indicated their declining trend throughout the season as reported by the fishermen and people engaged in fish trading.

Among overall species found during the study, 4 species were endangered (EN), 5 species were vulnerable (VU), 2 species were near threatened (NT), 22 species were least concern (LC) categories. 6 species were not threatened (NO), established on IUCN (2015) list of threatened fishes of Bangladesh (Fig 4).

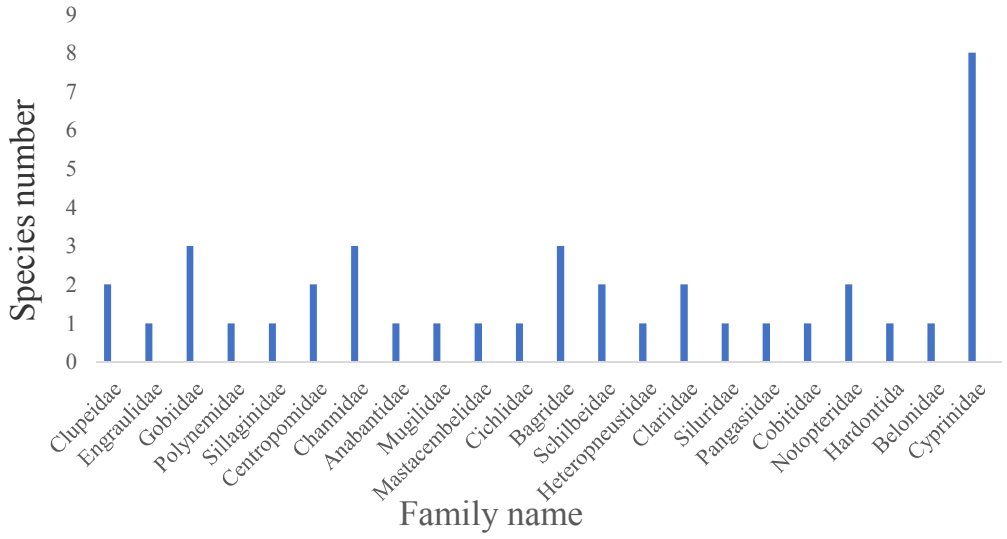


Fig. 3. Present status of fish species based on family in Nijhum Dwip

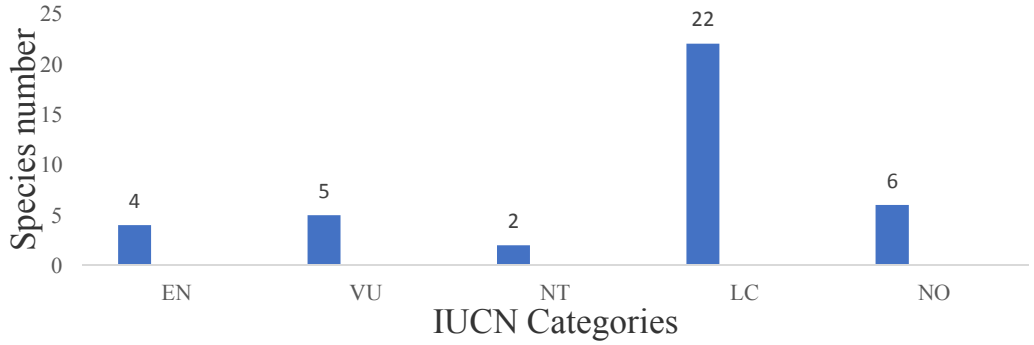


Fig. 4. Conservation status in the Nijhum Dwip (EN-Endangered, VU-Vulnerable, NT-Near threatened, NO-Not threatened; Based on IUCN National categories, 2015)

Nevertheless based on the available data it is specified that species are not existing in every season. Diverse environmental features of the aquatic ecosystem may be the reason of species composition alteration. The quantity of orders, families and species of fish signified in the research area is a rich and varied supply, providing a major impact to the protein requirement as well as national economy. But increase of population is dropping the water body of the study zone. This, on top of increased fishing pressure, is tumbling fisheries variety in the study area. Scientists informed that the amount of freshwater species has been bit by bit decreasing. Fish habitat annihilation by developmental works like roads, embankments, drainage and flood control correlated structures and natural siltation accompanied by overfishing have been frequently mentioned as reasons of the worsening of the nation's assets [11].

4. CONCLUSION AND RECOMMENDATION

As declared as marine protected area Nijhum Dwip Island is blessed with natural enriched biodiversity of flora and fauna. It is located in the migratory route of hilsha therefore considered as the important maintenance point for hilsha conservation. It holds large mangrove forest which is breeding ground for various fishes, shellfishes etc. By conserving and initiating proper management in this area can lead to rich, diversified and enriched fish zone of the Noakhali as well as Bangladesh. As not enough scientific study is conducted in the southern coastal region

of Bangladesh, a massive amount of fish fauna is beyond assessment. So adequate research on species structure, live history and also on reproductive biology should be conducted to protect the biodiversity of that area [12]. Many government and non-government organization are working on the conservation and management of the study area but integrated approach of GO, NGO, researchers and donor can enhance the potentiality and resource utilization of the Nijhum dwip island. GO's and NGO's should focus on providing health care, micro-credit, non-formal education to the fishermen for conservation of island richness and to reduce over exploitation. To preserve natural habitat and biodiversity, no poisonous element or toxins should not be applied where aquatic organisms resides. By declaring fish sanctuary in certain areas of the island can lead to the enrichment of fish species diversity.

CONSENT

As per international standard or university standard, participants' written consent has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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