Chapter 01: Introduction

1. INTRODUCTION:

Ichthyofauna refers to any fish life of a particular region and ichthyodiversity means variety and variability of finfish species. Recent views on inland fisheries are ambiguous. Despite decline of aquatic resources due to wrong or inexistent fishery management, water abstractions, land drainage, dam construction, pollution, eutrophication, climatic variability reported fish yield is an increase of 3% per year in global scenario (Welcomme 1976). That is not in satisfactory levels as demand needed.

The valid record of inland fisheries catchment is unrecorded and generally underestimated due to small scale and subsistence fisheries sources and indefinable fish landing points. Most of the harvested fishes go directly to the human for eating purposes. The wild fish species captured from rice fields are generally not considered as mentioned intention. Researchers showed the production of fishes from rice fields are higher and is significant mode as far the total fish production is considered (Coates 2002). Higher rate of fish production has also reported in several countries like, Bangladesh and Combodia. Workers also reviewed the statistics of marine and inland fish yield of Thailand and mark out an underestimation of inland waters (Hortle, Troeung et al. 2008). Recently, most of the projects estimated that the inland fishery catches were about 14 million tonnes in global scale. The resources from wild inland waters are unmanaged and underestimated and this resource needs sharp attention in most of these wild zones which conversely reflects the actual health of the environment. India consist with vast freshwater resources along their promising living resources of rivers & canals (1,95,210 kilometers), reservoirs (2.9 m. hectares), ponds and lakes (2.4 million hectares) and others wetland (0.8 million hectares) (Coates 2002).

Currently the capture fisheries of freshwater and marine water at India stayed along with rapid growth of intensive and semi intensive mode of fish farming. Therefore, India stands second position among the total countries of the world involved in fish producing. Fish production and availability leads India to fight malnutrition and help food security concerned with the economic development (Bartley and Jorgensen 2010). Ichthyofaunal resources are very rich all over India in respect to other neighboring countries. Coastal, marine as well as inland fisheries stocks led India one of the major fishery resources country in the rest part of world. Different states of India are also having marine and inland resources and utilizing it in to meet the protein consuming

demand of the people. So, practically this resource has ecological, economical, medicinal as well as aesthetic values.

Concrete knowledge on sustainable fishing, fish production and their exports will definitely improve the status of Indian fishermen. The aquatic ecosystem is highly dependent on water quality and biological diversity. Hydrological parameter of water affects the fish biology and physiology system (Zacharia, Gopalakrishnan et al. 2016). Lakes and reservoirs have the high potentiality of contributing fishery resources as far as size and production is concerned. Fishes are ecologically and economically very important as it acts as a crucial biological indicator of aquatic ecosystem and on the other hand it boosts the socioeconomic status of the farmers and the peoples of fishery dependent nations. Fish is proven to be very rich content of protein, vitamins and minerals. Freshwater fishes contribute more than 6% protein of total animal protein produced and normally used for human being. It is accounted as 50% in Bangladesh, Indonesia and Philippines and 40% in Thailand and Vietnam. Henceforth, the fishes are the major and only economical source of animal protein intake for economically poor families (Béné, Arthur et al. 2016).

The freshwater finfish diversity of West Bengal has been gradually decreasing due to the rapid degradation of inland water areas. Paschim Medinipur districts having many extensive water bodies commonly known as beels, ponds, bundhs that are the key sources of fishes for the poor people in the surrounding villages. However, major portions remain unproductive due to excessive siltation and growth of weeds and fisheries potentiality stands to 33 % only. The aquatic ecosystem and its biodiversity is decreasing in scale of global concern (Dhawan and Kaur 2002), especially for the river landscapes (Briones, Dey et al. 2004). Freshwater finfishes are most threatened after the amphibians among vertebrates and the fish extinction rate is very high than other higher vertebrates in global scenario (Georges and Cottingham 2002). The conservation measures to lessen the disastrous impacts are slow and inadequate mode. Consequently, many valuable aquatic species are decreasing alarmingly. The main reasons behind the loss of freshwater biodiversity are habitat degradation and fragmentation, invasive species, water diversions, pollution, and global climate change impacts (Dunn 2004).

To manage the freshwater biodiversity efficiently, a valid data on fish species lost and endangered with probable reasons have to be recognised. The study on fish biodiversity in entire Paschim Medinipur in particular is not reported so far and therefore, it is an attempt to assess

current status of fish biodiversity, distribution, threats and other management issues in the district Paschim Medinipur, which may serve as the baseline information.

In comparison to terrestrial and marine, the decline rate of freshwater biodiversity is very high during past thirty years (Bruton 1995). Flowing rate of river water and its stagnancy is the prime cause of loss of the aquatic species (Gibbs 2000). The additional factors increasing the loss of fish diversity are higher temperature, low precipitation and overdraw of water to use in agriculture or other domestic purpose (Jenkins 2003). Inland and freshwater biodiversity is valuable natural resource having education, cultural, economic, aesthetic, scientific aspects. The management of these resources is vital for benefit of the human as well as to the nations and world. The anthropogenic activities enhancing the environmental hazards to the biodiversity of freshwater (Plafkin, Barbour et al. 1989) and degrades the stream and river ecosystem (Alcamo, Döll et al. 2003) which finally alters the stream biota (Young, Townsend et al. 2004) .

India occupies ninth position among the nations of world so far freshwater megabiodiversity is concern (Raghavan, Prasad et al. 2008). It is one among 12 known mega biodiversity hot spots that harbours 60-70% of the world's biological resources. India contains 11.72% fish diversity in the global scenario (Stoddard, Larsen et al. 2006).

This puzzling ichthyodiversity attracts many ichthyologists not only from India but also from the abroad. Among vertebrates, most diverse group are fishes with 34,000 species (Mittermeier 1997). There is a total of 27,977 numbers of valid fish species (Nelson 2006). In India, total 2,500 fish species recorded. Among them freshwater fishes are 930 which come under 20 orders and 99 families (Froese and Pauly 2018). Information regarding fish fauna in tropical Asia was not complete due to lack of survey (Nelson 2006). In India, the National Bureau of Fish Genetic Resources (NBFGR) developed strong database on fish genetic resources of country. Based on IUCN status, the CAMP Workshop identified freshwater fishes with threatened/endangered status (Molur and Walker 1998). West Bengal is in leading position in fish production states of India for seven consecutive years from 2004-05 to 2012-13.

Extensive studies performed on the Indian freshwater fishes. But they are concerned mostly with taxonomy, biology and aquaculture. Ichthyodiversity and fish conservation in lentic water environment have not been done in spite of having significance so far the productivity and fish diversity is concerned. Due to illogical fishing practices, decreasing water volumes, increased sedimentation, undesired pollution, water abstraction over the past years the fish diversity is

declining. We have already loosened some freshwater species in India and some are endangered and threatened. The freshwaters of India have considered in perspective of economic production. They act as irrigation source, urban-industrial water source, hydro electric power source, receives waste from sewage and industries and also produce edible fish (Levêque, Oberdorff et al. 2007).

The increasing population on the world has threatened mankind in several ways amongst which the most important one is the food problem. Threats to biodiversity are degradation and fragmentation of habitat, invasive species, overexploitation of natural resources & climate change. Human must conserve biodiversity for its own existence. The valuable services like cultural, recreational, and spiritual is very much essential to maintain personal as well as social life.

Ecological restoration measures are being taken to reduce anthropogenic environmental degradation. However, this process has not been measured systematically so far effectiveness in restoration is concerned.

Ecological enhancement means the improvement of ecological condition of the target site after the development work is over. Ecological enhancement measures are applied to neutralise the developmental impacts on wildlife. Developments providing ecological enhancements must be taken care by local planning authority. The law and policies of Central and State Government, local planning authorities, now engaged in enhancement of biodiversity as part of the development process. In order to enhance the biodiversity, an alternate approach is to help financially the conservation interest zone or by creating new fresh habitats on land with low ecological value.

The term biodiversity is very frequently used and discussed in present days worldwide due to its loss in global level and in alarming rate. The biodiversity declining rate to human population increase is inversely proportional. We all are aware about ecosystem functioning and the services it provides in terms of agriculture, pisciculture, public health etc. but we neglect the rules of exploitation of nature. Therefore it will affect our future wellbeing and economy.

The biodiversity loss in global scale is significant with the human existence and cannot stopped population increase globally (Molur and Walker 1998). Clear evidence is that biodiversity loss can affect the wellbeing of society and have negative economic impacts (Bhakta and Bandyopadhyay 2008). To preserve the global biodiversity, the priority of conservation strategy

and plan is to include local as well as global communities, their ecosystems and culture. (Jenkins, Green et al. 2003). The identification of exotic fish species using barcode and subsequently their removal is very much necessary to recover ecological niches of the native fish species. In field survey related task the use of Geoinformatics is an indispensable technique that deals with the spatial characters and their capture, classification, storage, processing, portrayal and dissemination (Balmford, Bruner et al. 2002). Many fields have been benefitted from Geoinformatics including land use and land cover, in-car navigation, public health, environmental modeling, military, transport network planning and management etc.

Key steps in natural resource management are to know the exact location. Geospatial mapping is an effective tool to the fisheries scientists and resource managers in order to frame and plan the development and conservation of this valuable natural resource of this country. A study performed in this context to generate a fisheries profile in West Bengal using GIS tool. This study integrated data from all the districts of West Bengal.

Serious threat to the wild fisheries is the exploitation threshold level (Gascon, Collins et al. 2007). Fishing is a traditional as well as cultural customs to utilize the common global resorce (Raju 2003). The existing fish gives us information about the past climate and proved themselves as living witness. The most threatened among the taxonomic groups are freshwater fish (Delgado 2003) and are highly susceptible to the changes in quality as well as quantity of aquatic habitat (Clausen and York 2008).

Maintenance of Hydrological connectivity is essential for the viability and recruitment of native biota (Darwall and Vié 2005) and any alteration may lead to local extinction. Longitudinal and lateral connectivity among river channels and floodplains leads to characteristic high biodiversity. Presently there are 34000 fish species recorded as per fish base 2018. There is a report of 267 freshwater fish species (primary freshwater species is 186 in number and secondary freshwater species is 81 in number), distributed in 12 orders and 40 families in West Bengal. Thirteen exotic finfish species already entered into the state freshwater bodies. Out of the 267 freshwater fishes, 17.97% are under threatened and near threatened categories (Kang, He et al. 2009).

The target of this research study is to thoroughly review the past and examine current status of freshwater fish biodiversity, threats to fish diversity and make suitable recommendations for conservation and management aspects of fish biodiversity. It also discusses about implementation of the proper strategies for fish diversity conservation in Paschim Medinipur through habitat and fish stock conservation.