Abstract

In India, the large populations are mostly dependent on the agricultural economy, and we are blessed with significant natural resources of land, water both inland and marine, forest and desert ecologies. In fresh water zone a complex network of rivers, streams, ponds, tanks, lakes and reservoirs constitute significant resources. Purba Medinipur district of West Bengal is blessed with the serene beauty of major water resources in the form of large number of river systems, ponds, floodplains and wetlands. These water bodies contain rich and varied aquatic biodiversity including diversified fish fauna.

Remote Sensing and GIS application in fisheries resource management changed the way of traditional fisheries management technique since decades. There were a number of applications of remote sensing for the fishery resource management. In this study remote sensing data has been used for the water body extraction and GIS for displaying the spatial distribution of water bodies, fish yields, species richness and conservation priority areas etc. The various steps involved in mapping of wetlands starting from selection of satellite data, spatial resolution, geo-referencing, base map development, image processing to tabulation. The high-resolution satellite data Sentinal-2B and Google earth imagery for three four years interval data i.e. 2010, 2014 and 2018 has been used to study the distribution pattern, measurement and classification of impounded water bodies (IWB) of Purba Medinipur district. The IWBs are classified into three major classes i.e. small (< 0.5 ha.), medium (0.5-1 ha.) and large water bodies (>1 ha.). The growth rate (GR) pattern, density measurement and entropy analysis method have been applied to estimate characterization of temporal and spatial distribution. Kernel density (KD) method has been used to estimate the density of water body and the high density of waterbody area is observed in four blocks i.e.Moyna, Bhagwanpur-II, Contai-II and Ramnagar-II of the district. Absolute Shannon's entropy of Moyna block shows that it is decreasing gradually, indicating high concentrate distributions of water body. The compact growth pattern has also been observed in Ramnagar-II block, conversely the dispersed distribution pattern has also been observed at Bhagwanpur-II, Contai-II blocks. Water conservation policy and the rapid development of water body for the past few years will be a useful key tool for conservation, measurement, decision making and further analysis in rapidly growing aquaculture.

The detailed survey was carried out during the breeding and post breeding season to know the actual status of fish diversity in this region. The fish data was surveyed and collected from fish seller, fishing folk communities, local peoples of the region, Govt. fishery extension officers, fishery field assistants and different fish market of each block in Purba Medinipur district. Taxonomically classified details of available surveyed fish specimens are identified and categorized followed by Talwar and Jhingran literature and 'Fish base'. The total number of 46 native fish species of 18 families of 6 orders has been identified and recorded. The locally endangered fish species were also identified among the total fish fauna. Question & Answer survey data was collected from local fishmongers and the local people in the area revealed that there has been a high decline in productivity in the last 10 years. The low abundance of some species in daily local market as well as discussing with local fishermen and other experienced people to ensure the listing of low abundance or declining in productivity of those species. The geospatial technology has also been used for showing the block wise distribution of threatened category fish species. Nine (9) fish species were identified as endangered locally during the preliminary survey of the total fish status of the district. The market based survey of those fish species showed that there was a sharp drop in productivity in last few years. Over fishing, unregulated uses of pesticides in agricultural field, irrational fish harvesting along with different anthropogenic activities are the innermost cause for aquatic diversity loss. Sustainable developmental thoughts like restrictions of harvesting fish population size, breeding technique developing with proper supervision may save from harm those fish species from the door of extinction.

A stepwise screening process has been applied for different criteria to identify potential fish farming as well as conservation area. Soil quality, water quality, land use types, rainfall, density and proximity of water resources and other economical influences related to aquaculture has been applied in GIS analysis to monitor and quantify suitable fish habitat area. In this study most suitable sites were analyzed and model based two analytical frame work has been used i.e. Site Suitability for Fish Farming (SSFF) and Site Suitability for Commercial Fish Farming (SSCFF).The weightage based overlay analysis in SSFF model were developed and various numbers of parameters related to suitable fish living or survival environment like waterbody density (WD), proximity to river (km), precipitations, water availability (WA), water pH, Dissolved oxygen (DO)

(mg/l), Temperature (˚C), Total Dissolved Solids **(**TDS), slope of the land, soil character (pH, texture), Land use and proximity to industries were used to find out the proper site for aquaculture. The SSCFF model has also developed and different economically significant parameters like population density (km^2), road and railway density (km^2), road proximity (in km.), proximity to market (in km.), population of fish farmer and proximity to Sub Divisions (SD) capitals (in km.) were integrated to access the location of sites which are economically and commercially suitable. The SSFF model shows that the largest part of Moyna and Bhagawanpur-I and a few parts of Nandigram-III, Bhagawanpur-II, western part of Tamluk, Nandakumar blocks are come under the most suitable zone. Adversely Nandigram-I, Haldia, Sutahata, Panskura and some parts of Nandakumar, Nandigram-III and Sahid Matangini blocks are observed as unsuitable zone for aquaculture. The economy based SSCFF model shows the focus on the feasible sites for the commercially benefited fish farm, where most of the part of Panskura block comes into suitable zone and quite a few portion of Moyna, Sahid Matangini, Tamluk, Nandakumar-III and Bhagawanpur-I blocks are measured as suitable areas, additionally blocks of Khejuri-II, Nandakumar-I, Nandakumar-II and Egra-I etc, are observed in inappropriate areas planning for development of commercial fish farm. The transport capacity, market demand due to rising demand of population density in an area and accessibility of high-quality fish survival environment are accountable for this kind of distributional pattern. Sufficient availability of water and environmental qualities for fish growth can be a good influence on small-scale fish farms in this region. The observations confirm that the existing situations in the study area support promising opportunities for establishing and developing aquaculture as well as fish farming. To sustain this diversified fish production, a regular fisheries management policy and implementation of management has to be adopted.