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Study On Breeding and Nursery Grounds of Fishes in Netravathi - Gurupura Estuary

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ABSTRACT

The breeding and nursery grounds of fishes in any estuary are highly crucial as most aquatic organisms dependent on these grounds for their breeding and early stages of development. Thus estuarine ecosystems are considered as the eco-sensitive and socio-economically important systems. The present study was conducted based on test harvest or random sampling method to know the status of present breeding sites in comparison to the interaction with local fishermen revealing the breeding locations of the last few decades. The results emphasise that the breeding and nursery grounds of fishes has drastically reduced in number and in few sites there are completely absent attributing to the increased anthropogenic activities and pollution. The outcome calls for frequent monitoring and reduction in anthropogenic disturbances in this area to bring back the ideal and natural breeding and nursery grounds which would improvise the productivity of aquatic food for the future generation.

Keywords: Test Harvest, Fishermen, Anthropogenic, Pollution, Nursery Grounds.

I. INTRODUCTION

The estuarine ecosystem along with its mangrove habitats are recognised as the natural breeding and nursery grounds for many aquatic juveniles, providing refuges for adult and larval stages of fishes, crustaceans, molluscs, etc., both resident and migrant (Potter and Hyndes, 1999; Potter et al., 2001 and Elliott et al., 2007). Habitats such as mangrove, salt marshes, mudflats, sea grass and seaward beds in these estuaries are very much productive to play a role as breeding and nursery grounds for many important aquatic species (Ingole et al, 2002; Hu et al., 2004; Ajithkumar et al., 2006; Prabhu et al., 2008 and Telesh et al., 2010).

The fluctuations of physicochemical parameters in the estuarine region influence the feeding and breeding activities of estuarine fauna (Krishna et al., 2017). Due to anthropogenic activities, industrial and sewage release in this ecosystem, the breeding grounds of these animals are being destroyed. Though mangrove forests provide goods and services that are of economic, ecological and environmental value to man, such loss can impair the ecological functions of wetlands (Bundotich et al., 2009 and Lang'at et al., 2009).

II. MATERIAL AND METHODS

A. Study Area: The present study was carried out during 2014 - 2016 at Netravathi - Gurupura estuarine complex (12° 83' 647" N, 74° 85' 965" E to 12° 90' 507" N, 74° 82' 115" E) along the South-West coast of Mangalore (India), which opens to the Arabian sea. The study area is divided into eight sites with proportionate distance, along the 15 Km stretch of the study area. Netravathi estuary had 3 sites (N1 to N3), Gurupura estuary 3 sites (G1 to G3) and Estuarine

mouth had 2 sites (EM1 and EM2) connecting to Arabian Sea (Figure 1).

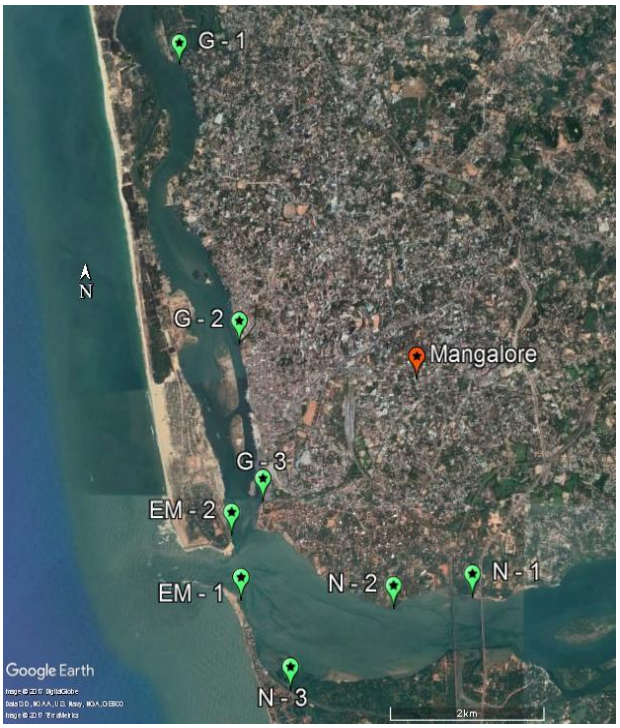

Figure 1. Map showing sampling sites at the Netravathi - Gurupura estuary

B. Sample Collection and Analysis: A continuous survey for the availability of eggs, fries and young fish communities was undertaken by test harvest method or random sampling method during the study using plankton net of mesh size 30µm. Mapping the identified breeding location using GPS was carried out simultaneously. In addition, fishermen were interviewed regarding the known locations where they could spot eggs and school of young fishes during the few last decades and a separate map for the same has been prepared.

III. RESULTS AND DISCUSSION

In the present study, the test harvest method or random sampling method has helped to identify the breeding and nursery grounds to a wide extent. The GPS recording of the identified sites has been mapped well on the Google map. Among the study sites, the breeding and nursery grounds of fishes were found to be high at site G1, followed by sites N3, N1 and G2. Breeding and nursery grounds were not observed at sites N2, G3, EM1and EM2 during the present test harvest or random sampling study (Figure 2).

The results based on the source of interviews with local stakeholder and fishermen revealed that the high number of breeding and nursery grounds were found at site G1 followed by sites N3, G2, N1, N2, G3, EM2 and the only site where no breeding was reported by fishermen is at site EM1(Figure 3). A maximum number of breeding and nursery grounds are found in Gurupura estuary than Netravathi estuary (Figure 2-3 and Table 1) which could be due to slow flowing water and shallow depth facilitating the increased amount of dissolved oxygen and good light penetration.

Estuaries are highly productive environments and are essential fish habitats for their role as breeding and nursery grounds, especially to those associated with the continental shelf (Beck et al., 2001 and Peterson, 2003). Apart from fishes, several shrimp species use estuaries as feeding grounds (Kannappan and Karthikeyan, 2013). Most of these are not permanent residents but seasonal migrants from marine areas, during their early stages of life. The many organisms' life cycles has a indispensable dependence on ecosystem (Jhingran, 1982; Muelbert and Weiss, 1991 and Vieira and Castello, 1997).

Most adult fishes move into river mouth or sea for gonadal maturity, whereas larvae, fry and fingerlings move into the estuary for development and feeding (James and Marchamy, 1987 and Mathew, 2009). Breeding and nursery habitat depends on various factors like water quality, substrate type, food type, spawning period and water flow (Barko et al., 1986; Arunachalam, 2000 and Pirhalla, 2004) which is being deteriorated in the study area. Food availability and oxygen are considered to be most important

factors responsible for breeding and nursery distribution (Lee et al., 1977 and Coull and Bell, 1979) which is high in Gurupura estuary than in the other study areas. It is also known that the macrofauna in the aquatic environment are influenced by nature of substratum in which they establish breeding and nursery grounds (Parsons et al., 1977).

As estuaries are among the highest productive rich ecosystems, these are most impacted directly or indirectly by anthropogenic activities. Direct impacts are overharvesting of resources, mangroves clearances, housing and agriculture reclamation, dredging and constructions for ports, sand and shell mining etc. Indirect impacts are the upstream execution of dams altering water flow, deforestation in catchment areas, pollution and dumping of wastes etc. Several fishes are known to use the estuaries as nurseries for breeding and feeding purpose, ecological degradation of such areas will directly or indirectly have adverse consequences on the fishery as well as on overall ecosystem. To understand the relations between the type of fish communities and nursery grounds, Costa and Bruxelas (1989) carried out a study in Tagus estuary, Portugal state. Miu et al., (1990) studied larvae and Juveniles entering the Tamshui river estuary for feeding and retreat to deeper water away from the mouth for spawning.

Estuaries being the transitional zone between river catchments and marine environment, it becomes very much susceptible to anthropogenic activities resulting in loss of diversity. Accelerated loss of biodiversity and breeding grounds of many aquatic faunae over the last few decades has been of great concern conferring to anthropogenic activities, sewage release and pollution levels in these environments. This is been well documented in the present study that showed a reduced number of breeding and nursery grounds in comparison to the data collected by interaction with local stakeholders (Figure 4). The data revealed that the breeding and nursery grounds in certain areas were completely absent where it was reported to be present in the past by local stakeholders.

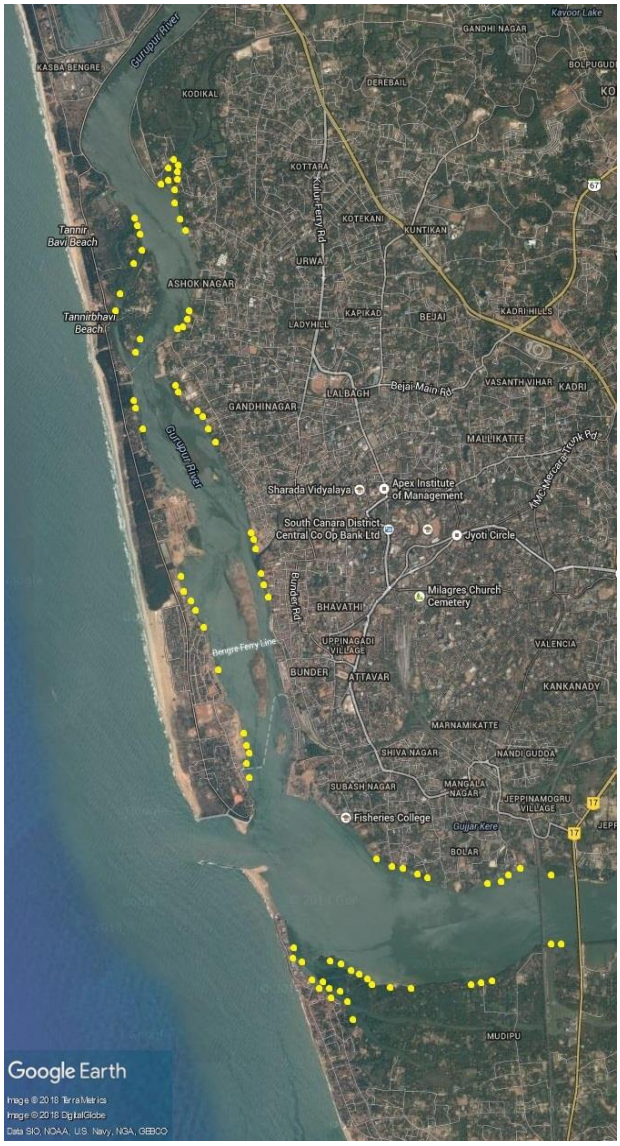

Figure 2. Past nursery and breeding grounds (localities interview) in Netravathi - Gurupura estuary.

Table 1. Number of breeding and nursery grounds of euryhaline fishes (past and present).

Method / Site	N 1	N 2	N 3	G 1	G 2	G 3	EM 1	EM 2
Interview (Past)	10	5	20	27	15	5	0	5
Test harvest (Present)	4	0	11	13	3	0	0	0

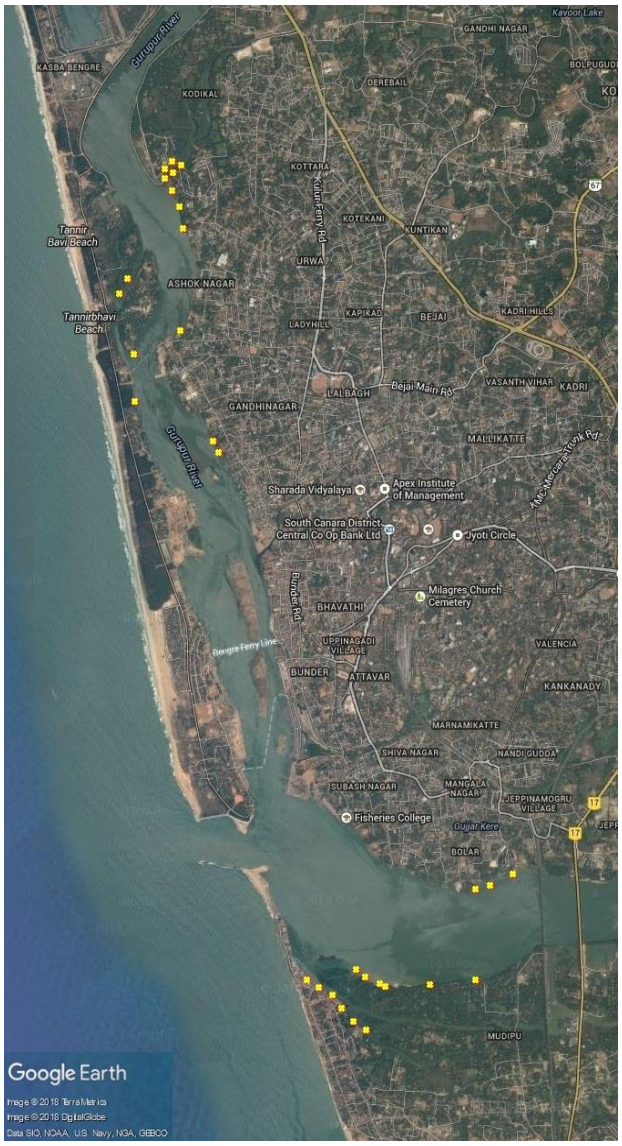

Figure 3. Present nursery and breeding grounds (Test harvest) in Netravathi - Gurupura estuary.

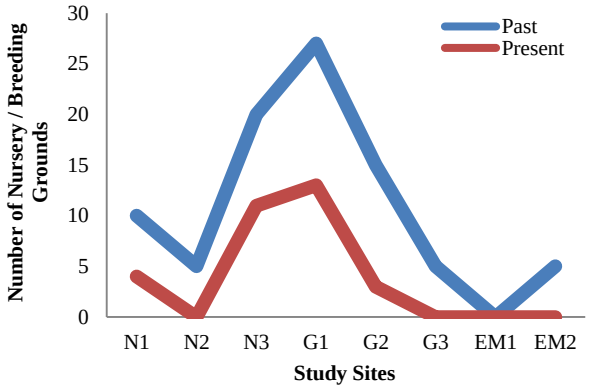

Figure 4. Nursery and breeding grounds of fishes at different study sites.

The decreased breeding and nursery grounds in the present study is majorly ascribed to tidal variation, sewage sludge, industrial effluents discharge, urban and agricultural runoff, pesticides, algaecides, fungicides, molluscicides, detrital materials with decomposition of large quantity of dead organic matter, dumping of wastes containing bio-persistent heavy metal pollutants, increased use of mechanised boats and the removal of top layer sediment by sand mining. These observations are in accordance with opinions of Woke (1954), Breeland (1960), Davies (1967) and Dahanukar et al., (2004). Bapurao et al., (2011) states that the knowledge of breeding and nursery grounds of the fish fauna is essential for designing and implementing conservation strategies. Thus the study conducted in Netravathi - Gurupura estuary illustrates the alarming changes of the breeding and nursery grounds due to anthropogenic activities and calls for an integrated approach towards conservation of the waterscape and landscape elements, associated with this estuary.

IV. CONCLUSION

The eco-sensitive estuarine ecosystems have an important socio-economic function in local aquaculture and harbour a wide range of fishes that are commonly consumed. This study on the breeding and nursery grounds of the fishes inferred reduction in comparison to the data collected by interview with local fisherman and stakeholders. This confirmed that breeding and nursery grounds in certain areas were completely absent where it was reported to be present in the past. The decrease has been ascribed to the increased pollution levels in recent years due to various anthropogenic activities and industrial discharges leading to a loss of diversity.

V. ACKNOWLEDGMENT

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