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Studies on Diversity of Fin Fish Larvae in Vellar Estuary, Southeast Coast of India

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Abstract: Observation of the finfish juveniles were made from Vellar estuary for a period of nine months from September 2001 to May 2002 during lunar in the present investigation. Totally 45 juveniles lunar belonging to, 34 genera were recorded. Among 45 species, *Elops machnata, Chanos chanos, Lates calcarifer, Epinephalus sp., Sillago sihama, Etroplus suratensis, Mugil cephalus, Liza parasia* and Liza tade were the 9 candidate species. Some commercially important estuarine fishes such as, *Hilsa kelee, Nematalosa nasus, Ilisha melastoma, Stolephorus indicus, Stolephorus commersonii, Thryssa mystax, Megalops cyprinoids, Anguilla bengalensis, Terapon jarpon, Terapon theraps, Lutjanus sp., Etroplus suratensis* and *Cynoglossus arel* were recorded. Ornamental fishes like *Scatophagus argus, Arthron hispidus, Syngnathidae sp* and *Paracaesio xanthurus* were also observed in this study.

Key words: Finfish % Juvenile % Vellar estuary % Euryhaline fishes % Ornamental fishes

INTRODUCTION

Estuaries are highly potential for fishery development in the aquatic environment and are considered as the potential source for feeding, spawning and nursery ground for most of the finfishes and shellfishes. Estuaries are the important seed collection center for most of the coastal aquaculture activities. The fluctuation of physico-chemical characters in esturine environment has a profound influence on the seasonal occurrence of the juveniles and fish stocks. Further, the changes of brackish water environment cause fluctuation on the survival, growth and breeding of fishes. The complete spectrum of the distribution and species composition of juvenile fish in relation to the dynamic changes of hydrographical features of estuaries and fish juveniles are abundantly available in the shallow coastal, esturine and brackish waters as they are safe from predators and their composition change with seasons.

Studies on the early stages of fishes are useful to understand the biology of the species besides determining their spawning seasons. Investigation on the geographical distribution and abundance of the fish eggs and larvae has been in progress almost since the inception of marine research in India. The study is also an essential prerequisite in understanding the spawning biomass of forecasting and trends of production [1].

The study of fish eggs, larvae and juveniles has received considerable attention in recent years. Such studies could help to know the spawning season, breeding grounds and migration aspects related to the fishery investigations of commercially important fishes. Study of the early developmental stages of a particular species helps in estimating the success and factors underlying fluctuation in survival. The present study was concentration on survey availability of finfishes and juveniles, related to season as an attempt to provide baseline information on the juvenile fishes of Vellar estuary.

MATERIALS AND METHODS

Study Area: Present study was carried out in Vellar estuary which is situated on the southeast coast of India in Lat 11°29'N; Long 79° 46'E (Figure 1). It has a year round connection with the open sea. The Vellar estuary has been demarcated into marine, gradient, tidal and freshwater zones [2] based on salinity characteristics. Station 1 is mouth of Vellar estuary and the average depth of the station is about 2m. Station 2 is situated opposite to the biological station and about 1 km from the mouth of Vellar estuary. The average depth of the station is about 2.5m. Station 3 is situated near the Railway Bridge and about 3 km from mouth of Vellar estuary. The average depth of this station is 3m.

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Fig. 1: Map showing study area

Collection of Samples: Samples were collected from three stations in Vellar estuary at lunar days. Plankton organdie nets were used to collect the post larval and early juvenile stages of fish. Velon screen net mesh size (1mm) was used to collect juvenile ichthyofauna. Identification of juveniles have been followed by pervious methods [3-11]. Surface water samples were collected at lunar days. The mean variations in meteorological and physicochemical parameters *viz*, rainfall, air and surface temperature, salinity, pH and dissolved oxygen [12] were recorded for a period of nine months from September 2001 to May 2002 at station I, II and III.

Data Analysis: Different statistical tools were used such simple correlation Co-efficient (r) among different hydrographical parameters. Analysis of variance (ANOVA) has been employed for the statistical interpretation of data obtained from the study and diversity index [13, 14], richness [15] and evenness [16] were following methods.

RESULTS

Rainfall: The total rainfall recorded from the study area was 620.4 mm. There was no rainfall during March and April. The maximum rainfall 220 mm was recorded in February 2002. The monthly mean rainfall for the study period was 68.5 mm (Figure 2).

Atmospheric Temperature: The atmospheric temperature was 26.1°C - 34.1°C at station-I during September 2001 to May 2002. The maximum (34.1°C) temperature was recorded in May 2002 and minimum (26.1°C) in December 2001. At station-II the temperature varied from 26.4°C-34.2°C during the study period. The maximum temperature (34.2°C during May) and minimum (26.4°C during December) were observed. At station-III maximum atmospheric temperature ranged from 26.9°C - 33.6°C. The maximum (33.6°C during May) and minimum (26.9°C during December) were recorded during the study period (Figure 3).

Surface Water Temperature: At station-I the surface water temperature varied from 25°C - 34.1°C the maximum was recorded during May and minimum during December. At station-II, the minimum temperature 25.3°C (December) and maximum 34.4°C (May) were recorded. At station-III surface water temperature range between 26.6°C and 33.6°C during study period (Figure 4).

Salinity: At station-I the salinity was ranged between 15 - 34.1‰ during the present study period. At station-II, the minimum salinity was 14.5 (December, 2001) and 32.5‰ (February, 2002). At station-III, it varied from 12.2 to 31.7 ‰ during the study period (Figure 5).

pH: At station-I, the pH varied from 7.0 (February) - 7.5 (April) during the study period. At station-II, the pH varied from 7.4 (October, March, April and May) - 7.0 (December). At station-III, it varied from 6.9 to 7.4 during the study period (Figure 6).

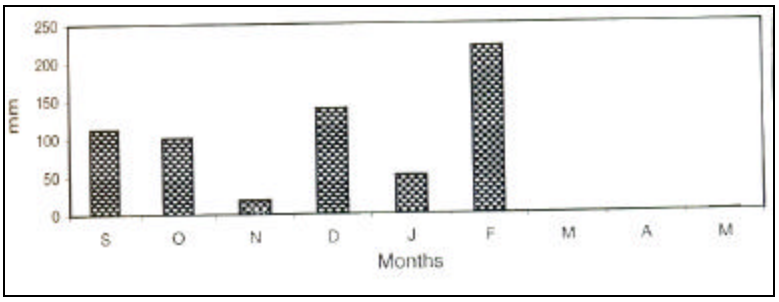

Fig. 2: Monthly variations of rainfall recorded during 2001-2002

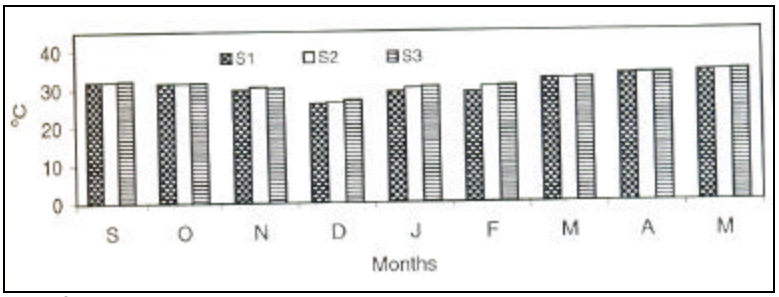

Fig. 3: Monthly variations of Atmospheric temperature during 2001-2002

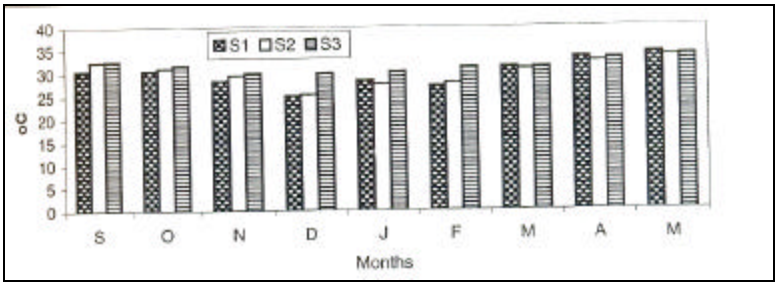

Fig. 4: Monthly variations of surface water temperature recorded during 2001-2002

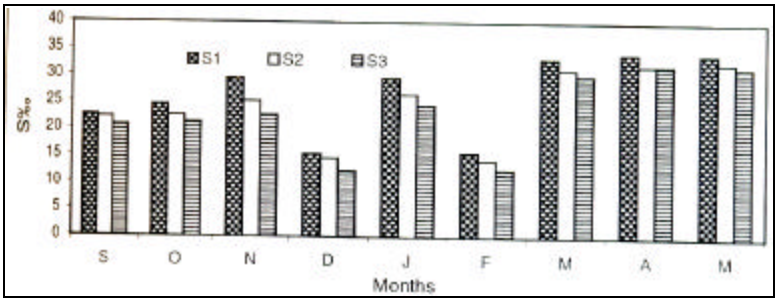

Fig. 5: Monthly variation of salinity during 2001-2002

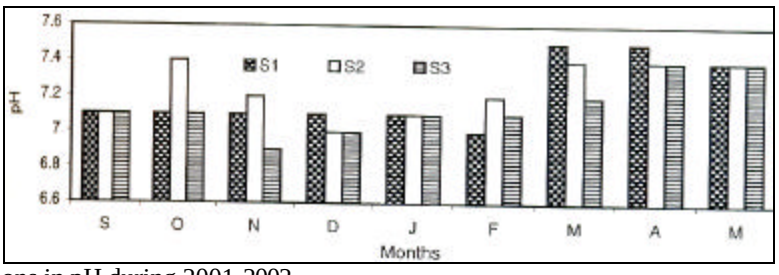

Fig. 6: Monthly variations in pH during 2001-2002

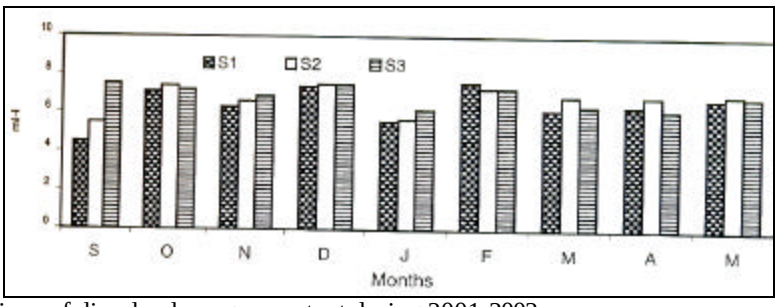

Fig. 7: Monthly variations of dissolved oxygen content during 2001-2002

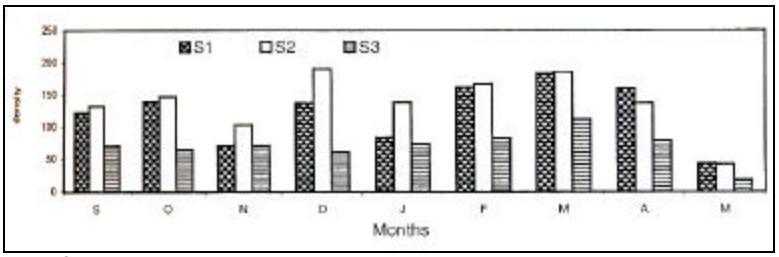

Fig. 8: Monthly variations of juvenile density during 2001-2002

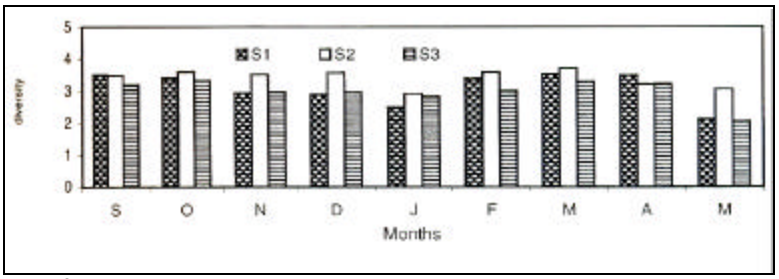

Fig. 9: Monthly variations of juvenile diversity during 2001-2002

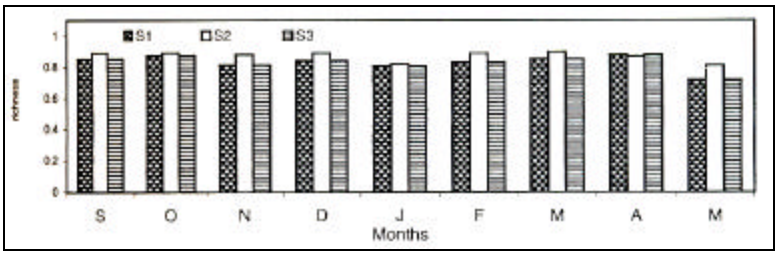

Fig. 10: Monthly variations of juvenile richness during 2001-2002

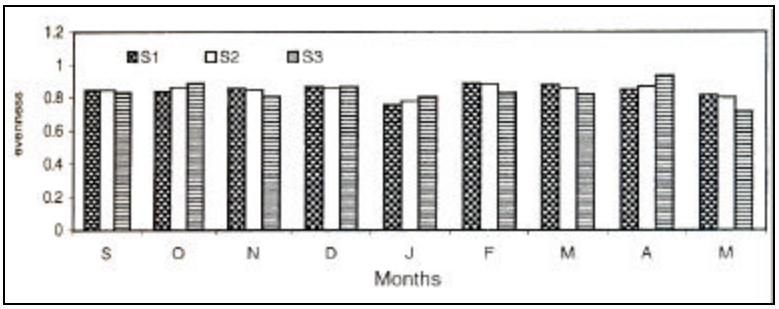

Fig. 11: Monthly variations of juvenile evenness during 2001-2002

Dissolved Oxygen: The dissolved oxygen content varied from 4.5ml/1 (September)-7.6ml/1 (February) during the period of study. At station-II, it varied from 5.5ml/1 (September) - 7.5ml/1 (December). At station-II, it varied from 7.5ml/1 (December) - 6.2ml/1 (January) (Figure 7).

Juvenile Density: At station-I, the Juvenile Density varied from 43 (May) - 162.5 (February) during the present study period. At station-II, it varied from 42.5 (May) - 190 (December). At station-III, the mean juvenile species density varied from 18.5 (May) to 112 (March) during the study period (Figure 9).

Species Diversity: At station-I, the Juvenile species varied from 2.45bits/ind (May) - 3.45bits/ind (November). At station-II, it varied from 2.1bits/ind (May) - 3.46bits/ind (February). At station-III, varied from 2.0 bits/ind (May) to 3.36 bits/ind (October) during the present study (Figure 10).

Species Richness: At station-I, the Juvenile species richness varied from 0.76 (May) - 0.91 (March). At station-II, it varied from 0.81 (May 2001) - 0.89 (September 2001). At station-III, it varied from 0.71 (May) to 0.87 (October) during the study period (Figure 11).

Species Evenness: At station-I, the Juvenile species evenness varied from 0.75 (January) - 0.88 (February). At station-II, it varied from 0.77 (January) - 0.88 (February). At station-III, it varied from 0.71 (May) to 0.93 (April) during the study period (Figure 12).

DISCUSSION

The physico-chemical features of the estuarine environment were subjected to wide temporal variations. Analyzing the seasonal variations in the meteorological and physico-chemical parameters, indicating that the amount of rainfall was nil during summer (April and May). The peak value of rainfall was recorded in December. The tropical estuaries are affected by monsoon rainfall, which brings about drastic changes in their hydrography due to floods and running waters [17]. Similar type of observation was also made in the present study.

In the esturine ecosystem, the temperature influences the distribution and abundance of flora and fauna. During the summer season, the air temperature was high due to clean sky with more solar radiation. The annual cycle of surface water temperature showed irregular mode of distribution. The surface water temperature was high during summer months (April-May) and it was low during monsoon season. Similar to that of air temperature, the temporal variation in surface water discernable was due to intensity of solar radiation, evaporation and influences the entry of fresh water. Further the statistical analysis showed a positive correlation ($r = 0.9861$ and $r = 0.9783$ at station 1, $r = 0.9706$ and $r = 0.8991$ at station 2 and $r = 0.9590$ and $r = 0.9582$) between air and surface water temperature from all the three station in full moon and new moon days.

Salinity is one of the prime factors, which influence the abundance and distribution of the environment which inturn is influenced by freshwater inflow and prevailing air temperature. The higher salinity was observed during summer months (April-May) due to seawater intrusion, low rainfall, lack of freshwater inflow and high surface water evaporation due to solar radiation. Further, salinity showed positive correlation with temperature ($r = 0.7282$, $r = 0.7416$, at station 1, $r = 0.7416$, $r = 0.7559$ at station 2, $r = 0.8190$ and $r = 0.8093$ at station 3) in full moon and new moon days. During December, low salinity was characterized due to monsoon flood water dilute the concentration at seawater evidenced by negative correlation obtained with rainfall ($r = 0.9510$, $r = 0.9545$ at station 1, $r = -0.9374$, $r = 0.923$ at station 2 and $r = -0.9093$ and $r = -0.8778$ at station 3) in full moon and new moon days, because it receives large quantity of freshwater from agricultural discharge and land drainage.

Similar trend in water temperature and salinity values was observed from Vellar estuary [18, 19], Pichavaram mangrove waters [20, 21], Arasalar and Kaveri estuarine complex [22], Palk bay [23], Uppanar estuary [23-25]. pH was higher during post monsoon and summer season and low during monsoon season. The higher pH value was due to uptake of carbondioxide by photosynthesis organisms [27]. The lower pH value during monsoon season was due to large quantity of fresh water influx, dilution of seawater, low temperature and decomposition of organic matter [28]. Similar type of observation was reported from Vellar estuary [19, 29]. Dissolved oxygen concentration was high during monsoon season from all the three stations. Monsoon season for oxygen solubility, low salinity and low water temperature. Similar type of values was recorded from Poonthora estuary [30] and Orissa coastal water [31] and they also observed the migratory behavior of certain fishes from coastal waters to estuarine waters.

Maximum numbers of juveniles were observed during monsoon season followed by post monsoon. However, it was concluded that many species of fishes breed activity during the monsoon [32]. The outbreak of rain and the changes in the environment act as a definite stimulant to spawning even in species, which are continuous breeder. This trend was also seen during the

study and also this finding coincides with studies from west coast of India [33] and Vellar estuary [34]. The higher species diversity was observed with higher number of species density, richness and evenness in all the 3 stations.

Totally 45 species, includinge 34 genera were recorded during the present study, at station 1, *Ambassis commersonii, Terapon jarbua, Mugil cephalus* and *Arothron hispidus* were common during the study period. *Etroplus suratensis, Elops machnata, Stolephorus indicus* were abundant during the monsoon seasons. *Leiognathus equulus, Secutor insidiator* were dominant during before and after rainy season. Distribution and abundance of juvenile fishes are influenced by hydrographical parameters such a temperature, salinity and dissolved oxygen. The juvenile fish were correlated with temperature, salinity, pH, dissolved oxygen by the statistical method. At station 1 full moon and new moon samples not significant correlation between temperature, salinity and dissolved oxygen with juvenile density were observed. At station 2, the atmospheric temperature with surface water temperature, salinity, dissolved oxygen showed negative correlation with juvenile density during the study. In new moon sample positive correlation obtained between juvenile evenness, diversity and richness with juvenile density from all the three station.

At station 2, totally 40 juvenile which include 35 genera were observed during the present investigation and season wise occurrence. *Ambassiscommersonii, Terapon jarbua, Mugil cephalus* and *Glossogobitus sp*. were common in study period. *Mystus gulio* and *Pomadasys maculatum* are dominated during the month of December, January and February. Similarity *Liza tade* also have been recorded. At station 3, totally 27 juveniles which include 27 genera were recorded and season wise occurrence. From the station 3, *Mystus gulio, Ambassis commersonii, Etroplus suratensis, Mugil cephalus, Glossogobitus sp, Oreochromis mossambica* are common in all the stations. *Chanos chanos, Platycephalus indicus, Leiognathus equulus, Secutor insidiator* are abundant during September, October and November and *Hemiramphus far, Terapon jarbua, Terapan puta, Caranx para, Gerres abbreviates* were abundantly recorded during the month of March and April.

In the present should be concluded that a highly significant and seasonal distribution of juveniles could be observed. More number of juvenile were observed during monsoon season *Ambassis commersonii, Mugil cephalus, Leptocephalus* stages of *Elops machnata, Megalops cyprinoides* which may prefare low salinity and low temperature similar type of observation.

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