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# OBSERVATIONS ON PELAGIC FISH EGGS AND LARVAE IN THE COASTAL WATERS OF TUTICORIN

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## ABSTRACT

Quantitative estimation of pelagic fish eggs and larvae which occurred in the plankton collections of Tuticorin coast during 1976-85 indicated their abundance in space and time. A trimodal cycle in the distribution of fish eggs and larvae with peaks in February-March, June-July and September-October was observed, indicating the spawning seasons. A maximum occurrence of 7,584 eggs contributing to 80.6% in the composition of total zooplankton was recorded in October, 1978 coinciding the monsoon season. Hydrological and meteorological features of the area in relation to the distribution of fish eggs and larvae are briefly discussed. A variety of types of eggs and larvae sorted in the collections indicated the area as an important resourceful ground in the fishery map of Southeast coast of India.

## INTRODUCTION

The most important factors that influence the fishery of a region is the magnitude of spawning intensity, egg production and availability of plankton which forms diet of the early developmental stages. It is essential to follow the cycle of events in these aspects so as to give valid predictions regarding the natural fluctuations in the abundance of fish stock. In comparison with the considerable amount of knowledge available on the Ichthyoplankton of Indian coastal waters, practically little is known on this aspect off Tuticorin in Gulf of Mannar. Chacko (1950) has described the eggs and larvae of sixteen species of fishes from Krusadai Island. Nair and Bhimachar (1950) have described eggs of eel from Gulf of Mannar. Bapat (1955) studied the occurrence, distribution and development of fish eggs and larvae of the Gulf of Mannar and Palk Bay. Based on the occurrence of fish eggs Marichamy and Pon. Siraimetan (1984) observed the maximum spawning period as March-July and existence of an inverse relationship between the larval population and other major zooplanktonic organisms. The present paper deals with the gross quantitative variations of fish eggs and larvae in plankton of the inshore waters with reference to environmental conditions and general inter-relationship of zooplanktonic organisms. The work was carried out during 1976-85, covering a stretch of 30 km along the Tuticorin coast in 6-20 m depth

## MATERIAL AND METHODS

Regular weekly or fortnightly samples of zooplankton were collected from fixed stations between 06.30-08.30 hours as surface tows for 10 minutes using a half metre ring net made of nylon of 0.4 mm mesh size. The estimates were made as number per 10 minutes haul. Data on hydrological factors were also collected. The samples were preserved in 5% formalin. Fish eggs and larvae were counted numerically in the whole samples. The percentage composition of fish eggs and fish larvae were calculated in relation to other major zooplanktonic organisms, monthwise, to make the results comparable and for determination of peak spawning period.

## RESULTS

### *Influence of hydrological factors*

Observations on the environmental characteristics were made to see their influence on the distribution pattern of fish eggs and larvae and the spawning season of commercially important fishes. The monthly average values of rainfall, surface temperature, salinity and volume of plankton in relation to the occurrence of fish eggs and larvae are depicted in Fig. 1. It may be seen that there was a maximum rainfall in November (169 mm) with a secondary peak in April (34 mm). Bimodal oscillation of surface temperature and salinity was noticed with two

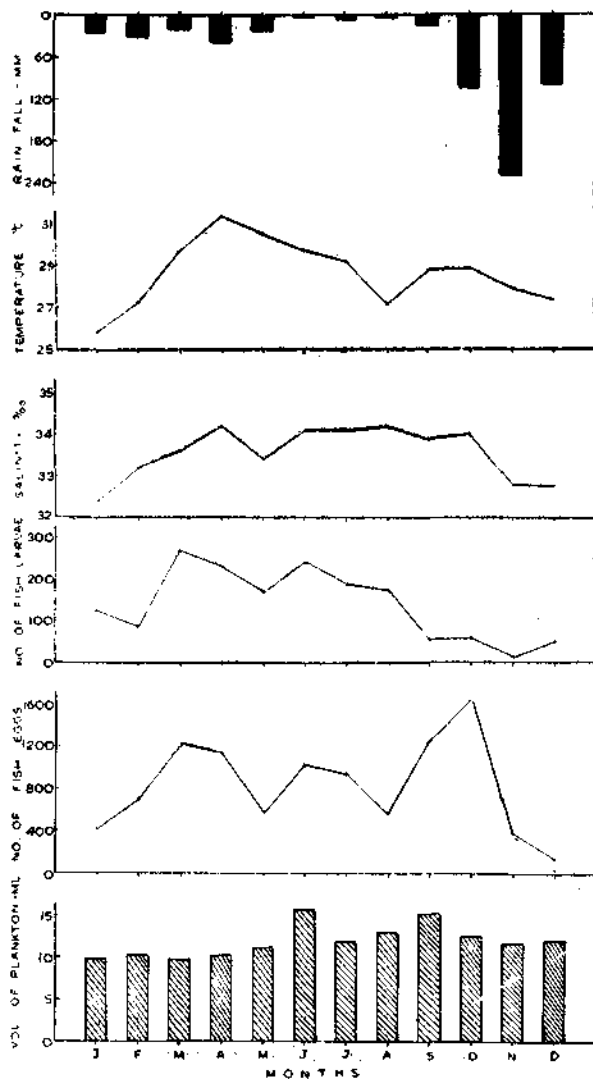


Fig. 1

peaks in April and October. It is significant to note that a maximum number of fish eggs and larvae were collected during March and October

indicating the spawning season during this premonsoon period. A third prominent season for the occurrence of fish eggs and larvae during June was also noticed although the rainfall was poor. Fish eggs and larvae of one kind or other were present almost throughout the year. Generally, an increased volume of zooplankton was recorded during February (10.3 ml), June (15.9 ml) and September (15.3 ml) coinciding more or less the peak season of the occurrence of fish eggs and larvae and spawning of other organisms.

#### Seasonal variations in the abundance of fish eggs

The percentage composition of fish eggs in zooplankton collections made during 1976-85 are presented in Table 1. It may be seen that the general trend of distribution was more or less identical during the period of observation of ten years. Certain types of eggs were collected round the year with definite peaks in particular months, indicating a protracted spawning season. An increased composition of fish eggs with certain exceptions was recorded in three seasons in a year i. e. February-March, June-July and again during October-November. In the rest of the months, the fish eggs were accounted either in low or negligible percentages. Fish eggs constituted a maximum of 80.5 percentage in the plankton composition during October, 1978 whereas in the corresponding month of 1985 no eggs were present in the collection. The occurrence of fish eggs was comparatively high varying from 1,098-2,390 during 1976-1980. The percentage composition

TABLE 1.  
The Percentage composition of fish eggs in plankton

Year	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	22.2	17.1	17.5	1.9	6.0	1.7	4.9	13.7	5.1	11.6	9.6
1977	21.6	28.8	3.5	5.8	22.8	1.1	14.7	28.5	16.6	9.0	1.1	0.2
1978	8.7	4.2	30.2	18.0	8.5	13.5	24.8	7.5	14.5	80.5	—	1.6
1979	3.5	23.5	16.6	5.3	4.3	—	6.7	0.5	—	0.2	25.5	2.7
1980	14.2	25.6	8.6	6.2	8.7	9.9	—	0.1	2.3	41.8	9.5	0.6
1981	—	14.7	3.2	0.8	1.9	—	1.1	0.5	0.3	—	2.4	3.0
1982	20.0	10.8	19.0	30.8	9.8	17.7	34.9	4.9	2.7	1.9	0	8.2
1983	0.4	0.1	3.5	7.8	0.2	0.4	3.4	—	0.3	0.2	0.6	2.3
1984	1.9	4.0	20.8	0.2	2.1	0.5	3.6	0.6	1.2	0.7	0.3	0.8
1985	1.3	1.2	1.4	1.0	19.1	0.2	0.1	5.0	0	0	1.7	0.2

of fish eggs was generally poor during the years 1981, 1983 and 1985. During these years the rainfall was also considerably low (260 mm-520 mm).

From the characteristics features of the fish eggs as described by Delsman (1926, 1929, 1931), Chacko (1950), Nair (1952) Bapat (1955) and Venkataramanujam and Ramamoorthi (1976) the presence of clupeid eggs, eggs of *Stolephorus*, Carangid and eel were noticed in most of the months. Eggs of *Stolephorus* were found with oil globules and embryo of advanced stages with two peak seasons, February-March and June-August and measured at 1.0-2.1 mm size They were more common in the collections made at Punnakayal trench.

*Seasonal variations in the occurrence of fish larvae*

The occurrence of fish larvae in plankton was observed round the year with three distinct peaks in a year during February-March, June-July and September-October. During September-October normally an increased trend in the surface temperature and salinity was noticed prior to the onset of northeast monsoon (Fig. 1). The observations revealed that some fishes spawn during this season. Similarly, there was peak occurrence of fish larvae during late February and March coinciding low temperature and salinity. This is indication of another spawning season.

The percentage composition of fish larvae in plankton are given in Table 2. The data indicate differences in the abundance of fish larvae in the plankton collections showing spawning seasons. In 1978 a maximum percentage of fish larvae was seen in the plankton in January than in the rest of the year including the usual spawning months. Likewise another unusual trend in the occurrence of fish larvae was noticed in August as seen in 1981 and 1982. In 1984, the fish larvae were found in negligible percentages in February-March and in the rest of the months they were completely absent.

Identification of fish larvae was possible for more common fishes with available published information. The size of the larvae, peak period of occurrence and the ground of predominant collection as well as its percentage composition in total fish larvae are tabulated and given in Table 3. Of all the groups the occurrence of larvae of *Stolephorus* spp. was high (31.5%) during February-March and again during August-October in the size range of 2.3-8.5 mm. They were more common in the collections made at Punnakayal trench and off Spic coast. The larvae of *Sardinella* spp occupied the second rank and the peaks were noticed in summer, March-May and October-December. The percentage composition was accounted to 15.5. They were measured mostly in the size 3.1-6.3 mm.

TABLE 2  
*Percentage composition of fish larvae in plankton*

Year	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	0.4	3.0	0.9	0.4	0.2	0.1	0.2	0.7	0.1	0.2	0.9
1977	3.7	5.4	0.1	0.2	0.1	0.3	0.1	0.1	0.5	0.1	0	0.1
1978	2.6	0.4	0.2	0.8	1.4	0.3	0.2	0.1	0.1	0.1	—	0.5
1979	0.4	1.0	0.7	0.1	2.1	—	1.3	0.4	—	0.4	0.8	0
1980	1.0	4.7	0.4	0.3	0.5	0.5	—	0	0.4	0.4	0.6	1.4
1981	—	0.5	0.3	0.4	0.3	—	0.8	1.6	0.1	—	0.4	1.6
1982	1.7	1.7	1.4	0.8	1.1	2.2	0.8	2.3	—	0.1	0.2	0.1
1983	0	0.1	2.8	0	0.1	0.1	0.1	—	0.2	—	—	0.2
1984	0	0.1	0.2	0	0	0	0	0	0	0	0	0
1985	0	0.2	0.3	0.1	0.4	0.1	0.1	2.1	0.1	0.1	0.1	0.1

TABLE 3.  
Distribution of identified fish eggs and larvae in the plankton of Tuticorin coast.

No	Name of fish	Size range length-mm	Percentage composition	Peak season	Ground
I	Fish eggs <i>Stolephorus</i> spp.	1.0-2.1	21.0	February-March and June-August	Punnakayal trench and Off Valinokkam
II	Fish larvae :				
1.	<i>Stolephorus</i> spp.	2.3-8.5	31.5	February-March and August-October	Punnakayal trench and Off Spic coast.
2.	<i>Sardinella</i> spp.	3.1-6.3	15.5	March-May and October-December	Punnakayal trench and Off Spic coast
3.	<i>Euthynnus affinis</i>	2.7-3.8	0.1	August	Off Manapad
4.	<i>Istiophorus platypterus</i>	2.9-4.9	0.2	February-March	Off Manapad
5.	<i>Rastrelliger Kanakurta</i>	3.7-3.8	0.2	July-August	Off Manapad
6.	<i>Caranx</i> spp	3.6-9.4	0.2	November-December	Punnakayal trench and Off Manapad
7.	<i>Hipdocampus</i>	9.2-19.5	0.2	November	Off Spic coast.
8.	<i>Balone</i> spp.	4.6-5.2	0.1	May	Punnakayal trench
9.	<i>Hemirhamphus obtusus</i>	19.0-25.0	0.1	January-February	Punnakayal trench
10.	<i>Leiognathus</i> spp	2.3-3.0	0.6	May	Punnakayal trench
11.	<i>Exocoetus</i> spp.	6.1-7.4	0.1	February	Off Valinokkam
12.	<i>Balistes</i> spp	3.8-4.6	0.1	February	Thalayiram paar
13.	<i>Gobius</i> sp.	5.9-8.7	0.2	December	Off Spic coast
14.	<i>Sphyræna</i> spp.	10.6-11.0	1.0	February	Off Manapad
15.	<i>Syngnathus</i> spp.	51.0-60.0	0.1	March	Off Spice coast

Larvae of *Euthynnus affinis* in the range of 2.7-3.8 mm were observed in August, in the collections made off Manapad. It is significant to note that the tuna fishery has a peak season during this same period and most of the specimens were found to have fully advanced stage of eggs. This observation further confirmed the spawning season of the species in this ground. The larvae of *Istiophorus platypterus* were collected during February-March in this same ground. The characteristic features of the larvae are the sharp, pointed snout and smaller eyes as described by Jones and Kumaran (1964). The larvae of *Leiognathus* spp were noticed in May from Punnakayal ground. The juveniles and larvae of *Caranx* spp were recorded in the size 3.6-15 mm during November-December.

*Sphyræna* spp. constitute an important fishery in this region. The larvae of this group was noticed in the size 10.6-11.0 during February.

#### Inter-relationship with other zooplankters.

Definite peak seasons were recorded for the occurrence of larvae of other organisms such as bivalves, gastropods, decapods and the dicyclic pattern of dominance of these organisms closely followed or coinciding with the abundance of fish eggs and larvae. *Appendicularians* were also seen in high numbers during this corresponding season of February-March, June and in September-October. An inverse relationship was exhibited between the occurrence of fish eggs and larvae and other major zooplankters like Lucifer.

## DISCUSSION

The surface temperature and salinity exhibited a bimodal cycle of oscillation in the course of the year while the occurrence of fish eggs and larvae registered three peaks in the year, during February-March, June and September-October. Two maxima were observed in the records of rainfall, during April and November, and the peak distribution of fish eggs and larvae noticed in the preceding months March and October indicated the premonsoon spawning season of some pelagic fishes. However, the peak occurrence of fish eggs and larvae observed in June do not show any significance to the hydrological or rainfall variations, except the coincidence of the high volume of plankton in this month. Bapat (1955) recorded a bimodal occurrence of fish eggs during March and September-October, corresponding to the low surface temperature and salinity period in Mandapam area. Marichamy and Pon. Siraimeetan (1964) observed two peaks in the distribution of fish larvae, the primary one in January-February and the secondary one in June-July during 1973-74 associated with the low temperature and salinity in Tuticorin area. The present observations reveal the similarities as well as distinct differences in the spawning behaviour of fishes in Gulf of Mannar, when compared with the earlier works. As observed by Bapat (1955), the presence of majority of the types of the eggs in varying numbers during a greater part of the year indicate the protracted breeding season in many species in this region. Also Panikkar and Aiyar (1939) observed active spawning of many species during the monsoon season and attributed it to the outbreak of rains as influencing factors even in continuous breeders. The occurrence of eggs and larvae of *Stolephorus* spp during February-March and again in August-October indicated the biannual spawning season of the fish in this region. Prasad (1954) opined that the water in Gulf of Mannar are subject to considerable influences from the adjacent seas and maintenance of a planktonic population depends upon a balance of dynamic factors, such as drift of the water and its interaction with its environment as well as upon the rate of reproduction and mortality of the population. Abrupt changes in the percentage composition of fish eggs and

larvae noticed during June-August may also be due to the influence of surface currents as they may bring or carry away the plankters in the areas of investigation.

Unlike Mandapam area where two peaks in the abundance of fish eggs and larvae had been reported, in the present study three peak periods of occurrence had been recorded in the Gulf of Mannar off Tuticorin coast.

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