

ON ICHTHYOPLANKTON OF THE COCHIN BACKWATER DURING SPRING TIDES

K. RENGARAJAN AND I. DAVID RAJ

Central Marine Fisheries Research Institute, Cochin-682018

ABSTRACT

It is known that the seed of several cultivable fishes occur in abundance in backwater areas. In order to understand the availability and distribution pattern of the ichthyoplankton of the Cochin Backwater, samples were collected regularly from a fixed station (09°58'N, 76°15'E) in Mattancherry Channel in the Cochin Backwater by operating a half a metre diameter nylon net (0.33 mm mesh size) for half an hour duration against the spring tide on full and new moon days from surface and bottom waters from June 1974 to December 1976. The ichthyoplankton at the station composed of gobids, clupeids, *Ambassis* sp., *Cynoglossus* sp., *Chanos chanos*, *Solea elongata*, *Solea* sp., *Pseudorhombus* sp., *Samaris* sp., *Elops* sp., *Trypauchen vagina*, *Pterois* sp., *Stolephorus* sp., *Haplocheilus* sp., *Sphyræna* sp., *Siganus* sp., *Syngnathus* sp., *Scatophagus* sp., *Lelognathus* sp., *Chirocentrus* sp., Balistidae, Sciaenidae and Tetrodontidae. The seasonal fluctuation of the fish larvae and other associated plankters in relation to the environmental parameters such as salinity, temperature and rainfall in the region are discussed.

INTRODUCTION

COCHIN BACKWATER is one of the major backwater systems on the southwest coast of India. Because of its importance as a nursery ground and the role it plays in the general ecology as well as economy of the area, this ecosystem has been the object of intensive studies by several workers. In recent years, the area is attracting greater attention as the vast stretches of the shallow water regimes are brought under intensive culture of fishes, crustaceans and molluscs. In order to facilitate the development of these culture fisheries, investigations are being carried out to find out and understand the availability of seed resources of cultivable organisms. In this context, the present report on the composition of fish eggs and larvae, their quantitative abundance and seasonal fluctuations in relation to certain environmental factors in the Cochin Backwater, would endeavour to add information in proper understanding of seed resources and their exploitation.

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MATERIAL AND METHODS

Zooplankton and water samples from the surface and near bottom were collected from a fixed station (09°58'N, 76°15'E) at Thoppumpady in the Mattancherry Channel of the Cochin Backwater. The period of investigation was between June 1974 and December 1976. Sampling was done during the highest high tide (Spring tide) on full and new moon days on the basis of the assumption that relatively greater intensity of zooplankton is brought into the backwater by this tide.

Two conical zooplankton nets having a mouth diameter of 0.5 m and mesh size of 0.33 mm were tied at the two ends of a stake and fixed with the help of a bamboo pole at 5 m depth, so that the upper net was at the subsurface level and the lower one near the bottom. The nets

were operated against the tide for half an hour, generally at midnight. Water samples both from the surface and bottom were analysed for salinity determination. The temperature was recorded in the field itself by an immersion thermometer.

The zooplankton samples were preserved immediately after visual observation, in 5% neutral formalin for detailed studies in the laboratory. Plankton biomass was estimated by 'Plankton Volume Estimating Apparatus' designed by the Central Marine Fisheries Research Institute. Fish eggs and larvae were completely sorted out from the total sample, identified and counted numerically for each group/species wherever possible. Length of larvae was also measured from snout to the tail for size composition. The different groups of zooplankton were enumerated by a counting tray from a 25% aliquot and the total numbers were calculated for their quantitative abundance.

Rainfall data were collected from 'Daily Weather Reports' for the relevant period.

TEMPERATURE, SALINITY AND RAINFALL

Temperature

During the period of investigation, temperature was fluctuated between 24.5°C and 31.3°C at the surface, and between 24.2°C and 31.5°C at the bottom (Fig. 1). The minimum and maximum temperature were recorded for the bottom water on full moon days of July 1974 and May 1973 respectively. On the full moon days, 24.5°C for the surface water in January 1975 and 31.4°C for the bottom water in April 1975 were the minimum and maximum temperature. In general, March–May period was warmer during the period of observation.

Salinity

The general trend of the salinity distribution is depicted in Fig. 1. In August 1975, the salinity values 0.09‰ and 0.4‰ respectively were the minimum at the surface as well as at the bottom (Fig. 1). The maximum salinity for both the surface and bottom waters was however at 35.3‰ in May 1976. While the lower salinity value was generally noted on full moon day, higher value was recorded on new moon day.

As described by several earlier workers (Ramamirtham and Jayaraman, 1963; George and Kartha, 1963; Cherian, 1963, 1967; Nair, 1964; Qasim and Reddy, 1967; Qasim and Gopinathan, 1969; Mohamed and Rao, 1971; Pillai, 1971; Pillai and Pillai, 1973; Nair and Tranter, 1971; Menon *et al.*, 1971; Nair, 1971; Rengarajan, 1974) the general hydrological features of the Cochin Backwater show wide variations in salinity. This is mainly due to the freshwater influx into the estuary from the various rivers flowing into it and influence of more saline waters brought in by the regular tidal actions, having a maximum amplitude of about 1.2 m at Mattancherry Channel.

Rainfall

The highest rainfall (649 mm) was reported in July 1974. 611 mm and 388 mm were the maximum rainfall for 1975 and 1976 monsoon periods respectively (Fig. 2). There was no rain in December 1974, March 1975, January and February 1976. In all the years of study, the southwest monsoon was active from May to September. However, in 1974 and 1976 the monsoon was seen extending upto the middle of November and in 1973 upto December.

ZOOPLANKTON BIOMASS AND COMPOSITION

The minimum zooplankton biomass (0.3 cc) at the surface water was recorded on a new

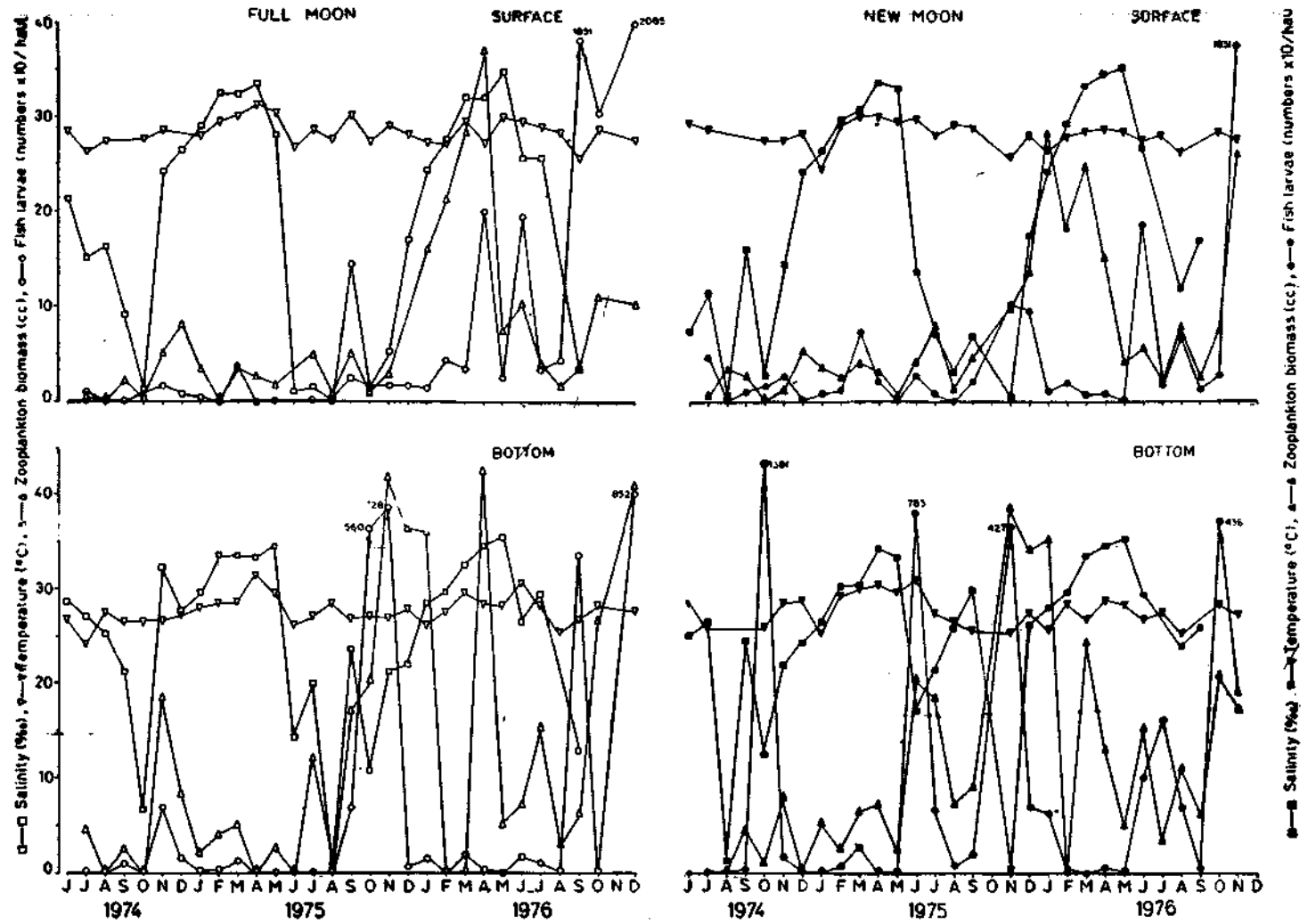


Fig. 1. Distribution of salinity, temperature, zooplankton biomass and fish eggs and larvae at Thoppumpady station during full moon and new moon days at the surface and bottom.

moon day in July 1974 and the maximum (42.8 cc on a full moon day in April 1976 at the bottom (Fig. 1). The maximum zooplankton biomass at the surface water was 37.2 cc. The full moon days during pre and post-monsoon months were generally very productive.

the period of observation. The minor groups consisted of medusae, ctenophores, gastropods, mysids, polychaetes, cladocerans, lamellibranchs, ostracods, siphonophores, stomatopods, appendicularians, doliolids, isopods, cumaceans, heteropods, cirripedes

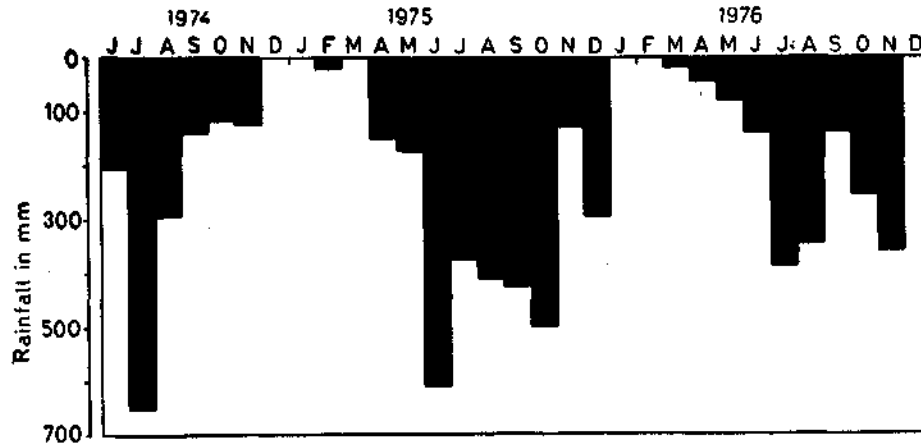


Fig. 2. Rainfall during June 1974 through 1976 at Cochin.

The occurrence of important components of zooplankton at the surface and bottom regimes at the Cochin Backwater on full moon and new moon days during 1974 through 1976 was studied. Copepods dominated in the collections followed by chaetognaths, lucifers, decapods, amphipods, mysids, medusae and gastropods. The other groups were cladocerans, polychaetes, lamellibranchs, appendicularians, cephalochordates, cumaceans, isopods, siphonophores, ctenophores, ostracods, stomatopods, doliolids, cirripeds and salps.

The data obtained on associated plankters were calculated and their average (between June 1976 and December 1978) occurrence during different months are shown in Fig. 1. The major zooplankton groups particularly copepods, chaetognaths, lucifers, decapod larvae and amphipods were encountered throughout

and salps, were observed occasionally during the period of study.

Copepods, chaetognaths, decapod larvae and amphipods were more in the bottom waters during the full moon days in April, January, August and January respectively. Lucifers were at the maximum in the surface waters on the new moon day of June.

ICHTHYOPLANKTON

Fish larvae

Larvae belonging to 19 groups of fishes were encountered at the observation centre in the Cochin Backwater during the period of study. The seasonal distribution of the fish larvae on full and new moon days is given in Fig. 3.

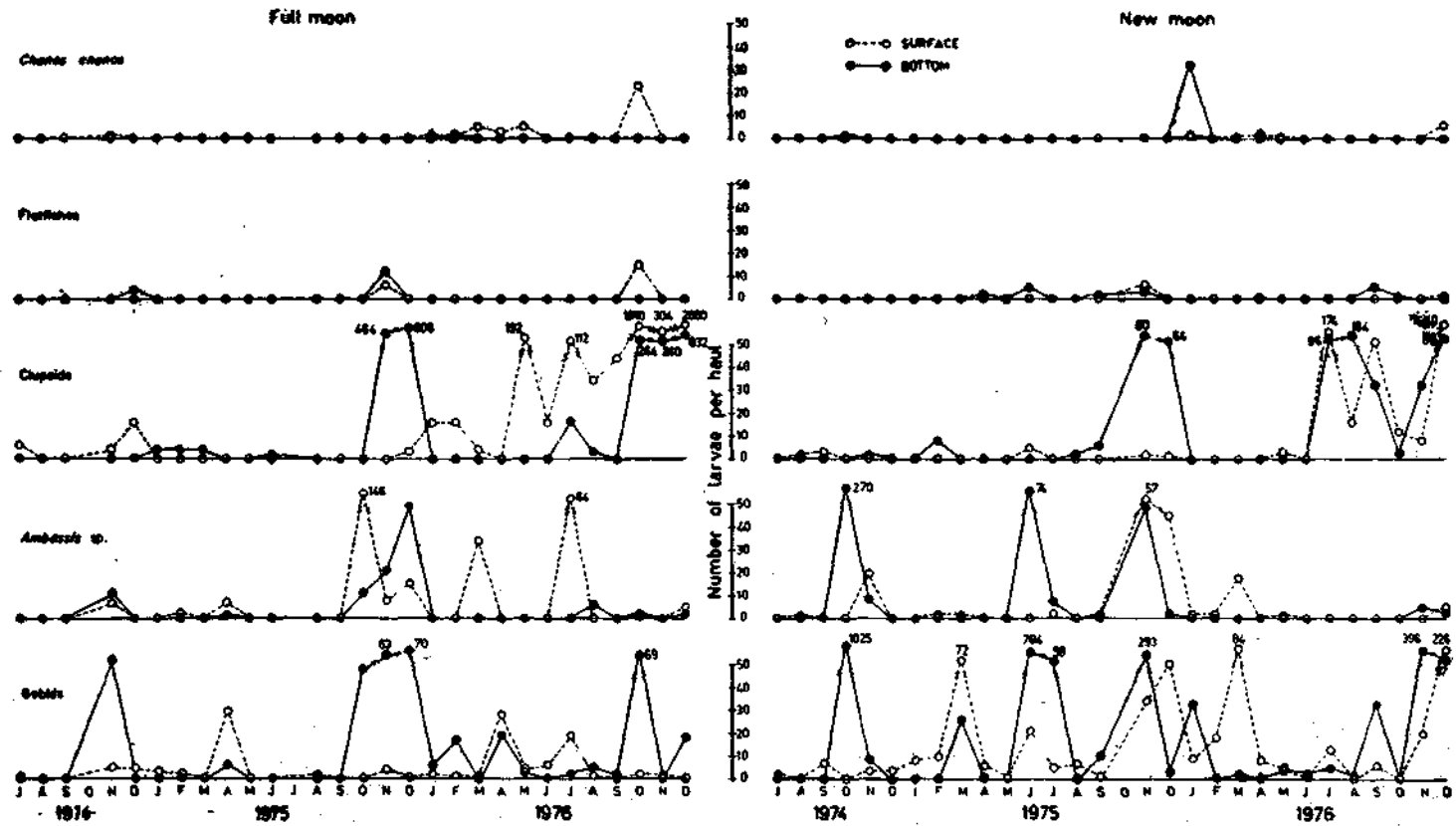


Fig. 3. Distribution of larvae of gobids, *Ambassis* sp., clupeids, flatfishes and *Chanos chanos* at the surface and bottom waters during full moon and new moon spring tides.

The fish larval population of the area was mainly composed of gobids, *Ambassis* sp. and clupeids in that order of abundance. Gobid larvae were represented equally well in both the surface and bottom collections, while the latter groups were predominating at the surface water. The larvae of the gobid fishes were found to occur in all the months with a peak in the new moon days of October 1974 as well as 1976.

Similarly the larvae of *Ambassis* sp. were recorded throughout the year September–December and June–July being the peak periods of abundance. The distribution of clupeid larvae showed two peaks of abundance, the primary one during October–December and the secondary peak in April–June/July. They were more at the surface and bottom waters on full moon days than in new moon days. Flatfish larvae belonging to mainly *Cynoglossus* sp., *Solea* sp., *Pseudorhombus* sp. and *Samaris* sp. were common during September–November and found to occur more on full moon days than on new moon days.

An important component of ichthyoplankton was that of milkfish *Chanos chanos*. The larvae of the species were poorly represented in 1974 and 1973, when they were observed in surface collections only once in November and December. However, in 1976 they were more common in the months of January through April and September through November (Fig. 3). The length of the milkfish larvae found in the estuary ranged between 3.5 mm in the month of September and 15.0 mm in the month of April 1976. The larvae of other groups of fishes such as *Elops* sp., *Siganus* sp., *Chirocentrus* sp. and *Leiognathus* sp. were found occasionally in isolated months.

Fish eggs

During the present investigation, fish eggs belonging to only three groups of fishes, namely

clupeids, anchovies and hemirhamphids were recorded. It was observed that clupeid eggs were abundant in the surface plankton particularly in summer months. However, eggs of hemirhamphid were collected from the bottom water.

DISCUSSION

Possessing a well defined cyclic pattern of hydrographical features with relatively low saline and temperature conditions during the southwest monsoon (June–September), a widely fluctuating, but increasing hydrological conditions in the post-monsoon period (October–January) and a uniformly high salinity and temperature during the pre-monsoon period (February–May), the Cochin Backwater is a dynamic ecological system with high biological productivity. It forms an ideal habitat for the young ones of several marine and fresh water finfishes and shellfishes. During the present investigation, high production of zooplankton was observed during September through April and it was dominated by copepods, chaetognaths, lucifers, decapods, amphipods, mysids, medusae, ctenophores and gastropods. The observations on the zooplankton biomass, its faunal composition, abundance and fluctuations generally agree with the earlier works of George (1958), Nair and Tranter (1971), Haridas *et al.* (1973), Rao *et al.* (1975) and Menon *et al.* (1971). The occurrence and distribution of the specific plankters such as hydromedusae, chaetognaths, siphonophores, copepods and fish eggs and larvae also confirmed the earlier observations by Vannucci *et al.* (1970), Santhakumari and Vannucci (1971), Nair (1971), Srinivasan (1971), Rengarajan (1974), Wellershaus (1969, 1970) and Pillai (1971) on the concerned groups.

The ichthyoplankton of the area observed during the spring tide on the full and new moon periods was found to be composed

of larvae of 19 groups of fishes. The overall abundance of larvae showed two peaks, one during September–April and the other in June–July. It was also observed that the ichthyoplankton biomass during the monsoon and post-monsoon months was relatively more as compared to that of zooplankton biomass in the same month. The larvae of gobids, *Ambassis* sp. and clupeids formed the major constituents of the larval population encountered during the spring tide. Although the larvae of as many as 19 groups of fishes were encountered, it is interesting to note that fish eggs were relatively scarce in the collection. This clearly indicates that the area of investigation does not form the breeding ground for any fishes and the eggs of clupeids, anchovies and hemirhamphids obtained might probably have been brought in by the high tide from adjoining inshore area.

Among the fish larvae encountered, the larvae of *Chanos chanos* are of importance for aquaculture development. The larvae of the species showed two peaks of abundance, one in January and the other in September. This is confirmatory with the observations made by Delsman (1926) along the north coast of Kra-wang, Saanin (1954) in Indonesian waters, Thiemmedh (1954) in Thailand waters and Rao (1971) in Pulicat Lake. The occurrence of *Chanos* fry has been reported during November/December at Chinnapalam (Panikkar *et al.*, 1952) and along the Coromandal Coast (Ganapati *et al.*, 1959). Tampi and Bensam (1976) have given a brief review on the occurrence and abundance of *Chanos* fry and fingerlings at different centres along the Indian Coast.

The occurrence of *Chanos* larvae in January–April and September–November coincided with relatively less rainfall. There was no rain in January 1976 when the maximum number of larvae of the milkfish was observed. This indicated an inverse relation between rainfall and the occurrence of *Chanos* larvae in this

area as noticed at the Pulicat Lake by Rao (1971). It was also observed that the milkfish larvae were generally encountered when the salinity of the backwater was above 17‰.

Except for milkfish larvae, it is noted that the larvae of other cultivable fishes have not been represented in the present collection. However, it is known that fishes such as mullets, pearlspot and *Lates calcarifer* contribute to brackishwater fish culture practised in the low lying fields adjoining the backwater. The absence of larvae of these fishes in the collections might be due either to the limited efficiency of the gear employed or the different habitat preference of the larvae.

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