

Ichthyoplankton from Andaman and Nicobar seas

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ABSTRACT

Ichthyoplankton of the Andaman and Nicobar seas were studied for their spatial, seasonal and day and night variations from 357 zooplankton samples collected during 1986 to 1990. High density of fish larvae was encountered in the shelf waters. Maximum number of 4938 larvae/1000 m³ was obtained from an offshore station north of Andaman Island (lat. 13°57'N and long. 92°38'E). Fish eggs and larvae were represented in all months. Fish eggs were found throughout the year with higher concentrations during day but the maximum density was found in night collections during December. However there was no definite pattern of distribution of larvae during day or night. The maximum number was in November. Latitudinally fish larvae were definitely higher towards northern latitudes with the maximum number of larvae between 13° and 15°N. Eggs were abundant in the postmonsoon period. Myctophidae, Gonostomidae, Gobiidae, Bregmacerotidae and Serranidae were the dominant groups.

INTRODUCTION

The first major account of the quantitative distribution of fish eggs and larvae of the Indian Ocean was given in the plankton atlas (IOBC, 1970) based on the zooplankton collections of the International Indian Ocean Expedition (1962-65). Peter (1969, 1982) and Lalithambika Devi (1977, 1986) discussed some aspects of the ichthyoplankton of Indian Ocean. The UNDP/FAO Pelagic Fisheries Project had surveyed the shelf region of south India for ichthyoplankton (Anon, 1976); George (1979) dealt with some aspects of fish larvae of southwest coast of India. A more systematic sampling of the EEZ and adjacent waters of India was done onboard *FORV Sagar Sampada* during 1986 to 1990. These samples provide a better representation of ichthyoplankton of EEZ and adjacent waters. Manickasundaram & Ramaiyan (1990) have reported on the fish eggs and larvae of Andaman and Nicobar area, based on collections taken during June and July 1988. This paper deals with spatial, seasonal

and day and night variation of fish eggs and larvae of the Andaman and Nicobar region collected during cruises of *Sagar Sampada*.

MATERIALS AND METHODS

Fish eggs and larvae contained in the 355 oblique hauls from 150 m to surface using Bongo-60 net of 0.33 mm mesh size, collected onboard *FORV Sagar Sampada* between 15° to 5°N latitude and 89° to 96°E longitude were studied. Samples were available in all the months of the year except March. The details of methodology and the procedure for the analysis and interpretation are given by Mathew *et al.* (1990).

RESULTS

Out of the 355 samples examined, fish larvae were found in almost all collections except in 3 day-samples while eggs were absent in 7 day and 6 night collections. However, macro fish larvae occurred only in 12 samples, 11 of which were taken during night. Fish eggs were more in the shelf waters than in oceanic region. High density areas where fish eggs exceeded 1250/1000 m³ were found north of Andaman Islands. The shelf waters of Andaman and Nicobar Islands (Fig. 1) also sustained high number of eggs. The highest number 5990 eggs/1000 m³ was collected from a station situated at lat. 10°20' N and long. 92°40'E. Fish larvae were also more in the shelf waters between 92° and 94°E longitudes (Fig. 2). However, highest density of 4958 larvae/1000 m³ was recorded from a station north of Andaman Islands (lat. 13°57' N, long. 92°38'E).

Monthly variation— Considering the average number of fish eggs and larvae for different months (1986-90), the highest number of fish eggs of 897 eggs/1000 m³ in December and the lowest density 126 eggs/1000 m³ in June were recorded. The period between April to October was found to be less productive (Table 1). Fish larvae were also available throughout the year with highest number of 1153 larvae/1000 m³ in November and the lowest in June (174 larvae/1000 m³). They were less dense in May and October.

Seasonal variation— Abundance of fish eggs and larvae were considered on the basis of three seasons viz. premonsoon (Feb. - May), monsoon (June - Sept.) and postmonsoon (Oct. - Jan.) (Table 2). Highest density of fish eggs and larvae was found during postmonsoon season having 463 eggs/1000 m³ and 384 larvae/1000 m³. The lowest density of eggs was noticed during monsoon period, whereas larvae showed decrease in premonsoon period.

Latitudinal abundance— With regard to the seasonal variation of fish eggs and larvae in the different latitudes, it was found that eggs were abundant during the postmonsoon season in the southern latitudes (5°-7°, 7°-9° and 9°- 11°) whereas towards the northern latitudes the variation between the seasons decreased with slight dominance during premonsoon season (Fig. 3A). Latitudinally although mixed distribution pattern was observed in the case of larvae in 7°-9° and 9°- 11° latitudes, a

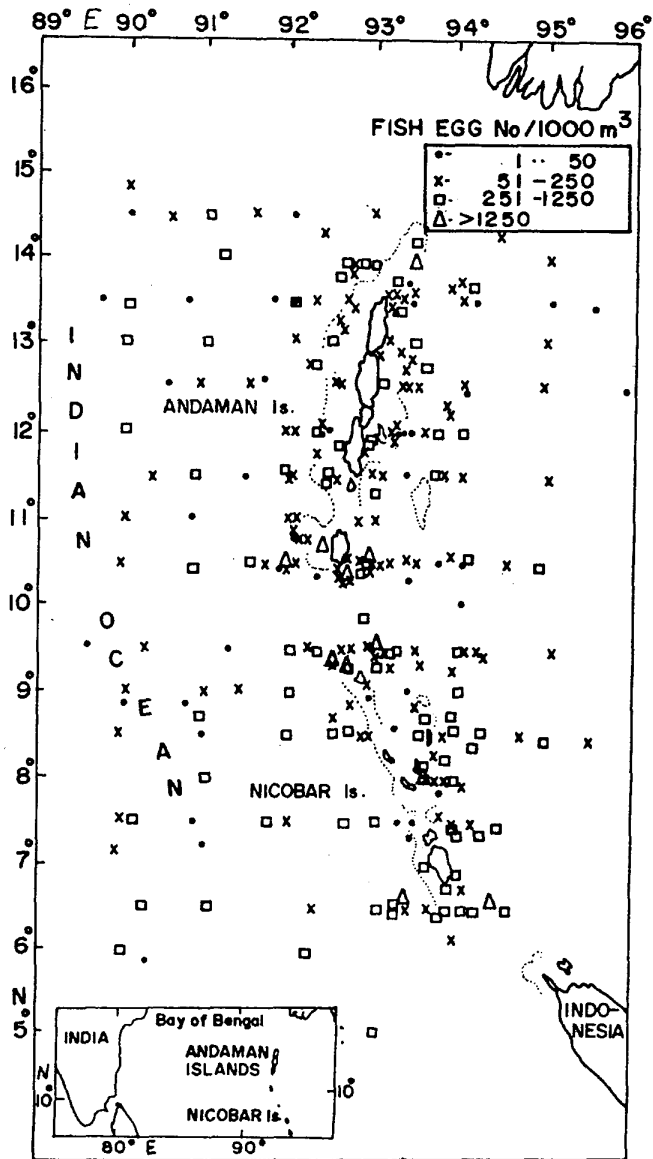


Fig. 1 - Distribution and abundance of fish eggs in the Andaman and Nicobar Seas

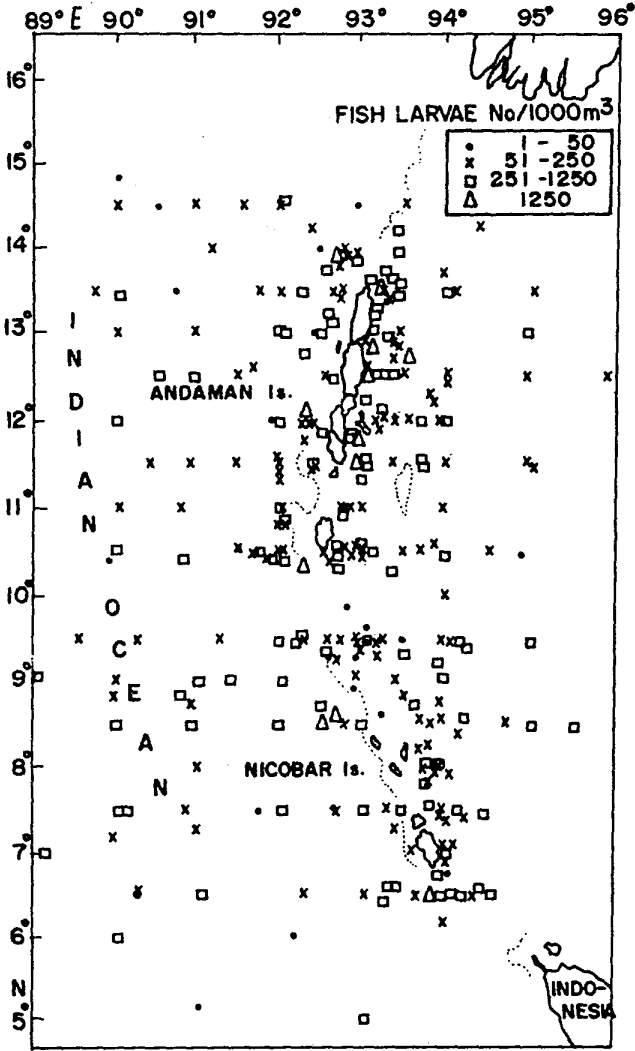


Fig. 2 - Distribution and abundance of fish larvae in the Andaman and Nicobar Seas

definite increase in their abundance from premonsoon to postmonsoon season in the latitudes 11°-13° and 13°- 15° was evident. In the 5°- 7° latitudes also larval abundance was noted during postmonsoon season (Fig. 3B). Latitudinally distribution pattern observed was of mixed type in the case of eggs, with a maximum of 425 eggs/1000 m³ at the southern latitudes (5°-7°) and minimum towards northern lati-

Table 1 — Average number (no/1000 m³) of fish eggs and larvae in different months (1986-90)

| Month | Eggs | Larvae |
|-----------|------|--------|
| February | 567 | 656 |
| March | - | - |
| April | 140 | 276 |
| May | 191 | 187 |
| June | 126 | 174 |
| July | 237 | 307 |
| August | 236 | 392 |
| September | 126 | 443 |
| October | 200 | 187 |
| November | 452 | 1153 |
| December | 897 | 287 |
| January | 394 | 553 |

Table 2 — Average number (no/1000 m³) fish eggs and larvae showing seasonal variation.

| Season | Eggs | | Larvae | | Total | |
|-------------------------|------|-------|--------|-------|-------|--------|
| | Day | Night | Day | Night | Egg | Larvae |
| Premonsoon (Feb.-May) | 213 | 181 | 231 | 301 | 199 | 263 |
| Monsoon (June-Sept.) | 222 | 106 | 301 | 392 | 181 | 334 |
| Postmonsoon (Oct.-Jan.) | 424 | 620 | 389 | 363 | 463 | 384 |

tudes (Table 3). A reversing trend was found for the fish larvae with higher density towards northern latitudes with a maximum of 406 larvae/1000 m³ at 13°- 15°N.

Day and night variation— In general, day and night variation was not pronounced. Slight dominance of eggs were noticed during day in all months except December when 2997 eggs/1000 m³ were found during night (Fig. 4A). A slight dominance was noticed during night in April also. Generally larvae were more during night except in January, May and October (Fig. 4B). Eggs were dominant at night (620 eggs/1000 m³) during postmonsoon season whereas they were dominant during day with other two seasons. This was just reversed in the case of larvae which showed dominance during day in the postmonsoon season (389 larvae/1000 m³) but in other two seasons they were abundant at night (Table 2). Eggs were more during daytime in the different latitudes except 13°-15°N. In contrast to this; larvae were abundant during night in all latitudes except 5°-7°N (Fig. 3).

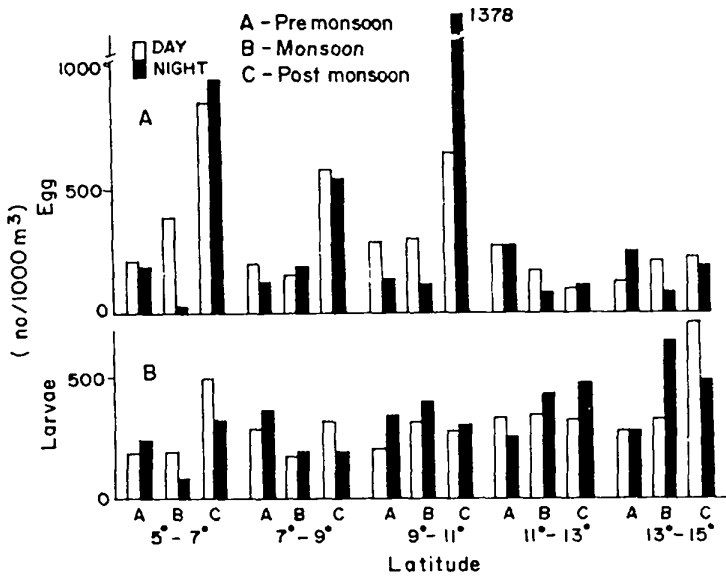


Fig. 3 - Latitudinal abundance of fish eggs (A) and larvae (B) with seasonal and day - night variation

Table 3 — Average number (no/1000 m³) of fish eggs and larvae in different latitudes showing day and night variation.

| Latitude (°N) | Eggs | | Larvae | | Total | |
|------------------|------|-------|--------|-------|-------|--------|
| | Day | Night | Day | Night | Eggs | Larvae |
| 5° - 7° | 502 | 244 | 317 | 211 | 425 | 286 |
| 7° - 9° | 224 | 200 | 271 | 272 | 215 | 271 |
| 9° - 11° | 434 | 321 | 270 | 342 | 394 | 295 |
| 11° - 13° | 186 | 160 | 330 | 371 | 175 | 347 |
| 13° - 15° | 176 | 185 | 400 | 419 | 179 | 406 |

Larval abundance in relation to zooplankton biomass— No direct relationship was discerned between the volume of zooplankton and the number of fish larvae (Fig. 5). The maximum number of 4938/1000 m³ was recorded not from the sample of highest volume of zooplankton but from 183.6 ml/1000 m³. The minimum number of 5 larvae/1000 m³ was from a sample of 18.31 ml/1000 m³. However, higher density of larvae (above 1800/1000 m³) was found in samples of the quantity of 110 to 230 ml/1000 m³. In fish larvae encountered Myctophidae, Gonostomidae, Gobiidae, Bregmacerotidae and Serranidae were the dominant families.

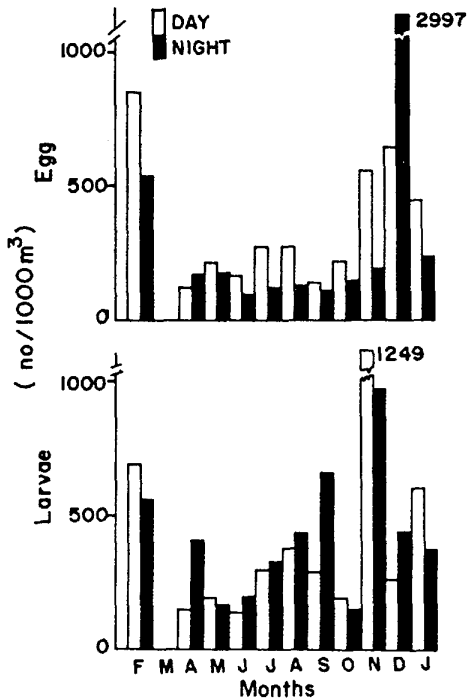


Fig. 4 - Monthly day - night variations in the abundance of fish eggs (A) and larvae (B)

DISCUSSION

In general the Islands of this archipelago have steep slopes and hence oceanic conditions prevail even in the near shore areas. The surface salinity values varying from 33.22 to 34.58x10⁻³ showed an increasing trend from south to north on the western side as well as the eastern side. The Andaman Sea receives varying quantities of fresh water and is connected to the South China Sea through Strait of Malacca. The surface water temperature varied from 26° to 28°C. Temperature showed a northward decreasing trend. (Laly Mathew & Pillai, 1990).

Bay of Bengal is regarded as a cradle for young fishes as eggs and larvae are abundant as compared to other regions of Indian Ocean (Peter, 1969, 1982; Lalithambika Devi, 1977, 1986). Information on fish eggs and larvae of Andaman and Nicobar islands is meagre. Madhupratap *et al.* (1980) reported that fish larvae were better represented around Andaman Islands based on the samples collected during February. Manickasundaram & Ramaiyan (1990) have reported relative abundance of larvae over that of eggs invariably at all stations based on the samples taken during June and

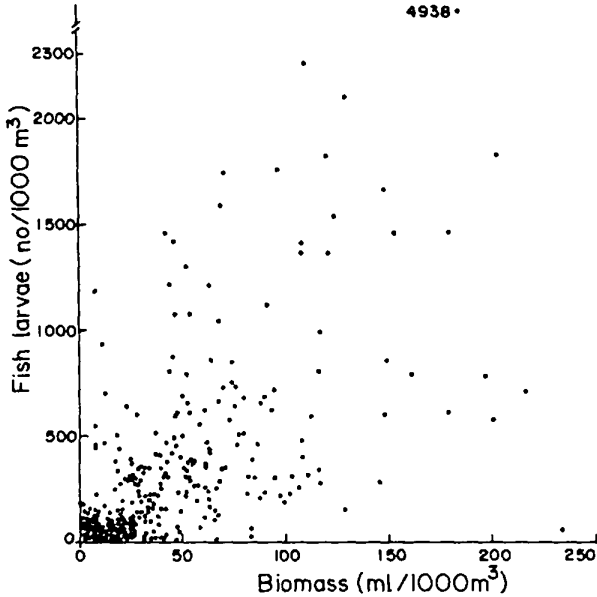


Fig. 5 - Relationship between abundance of zooplankton biomass and the number of fish larvae

July. In the present study also larvae were dominant over eggs in the premonsoon and monsoon seasons but the trend was reversed during postmonsoon season. Eggs and larvae obtained during plankton collections provide a direct measure of the spawning areas and seasons. The abundance of eggs towards southern latitudes and larvae towards northern latitudes may be due to the prevailing current pattern. Balachandran (1980) indicated that the major factor controlling vertical migration of fish larvae is light rather than temperature. In the present study the day and night variation was not pronounced. Studies on different species of larvae of Bothid flat fishes showed that some species prefer day rather than night (Lalithambika Devi, 1986).

Variation in the number of fish larvae in some of the collections might be due to the patchiness or predation or both. The uneven distribution of larvae could also be due to the tendency of adult fishes to release clumps of eggs as well as to choice of food. Cushing (1966, 1967) stated that coincidence of food supply with larval distribution was important and probably critical for their survival. The role of hydrographic parameters in the distribution of fish larvae cannot be ignored. The annual variation in the concentration of larvae in the Bay of Bengal changed directly with

southerly (cyclonic) and northerly (counter cyclonic) circulation of water during changing monsoon. The distribution of larvae in the equatorial area is governed by the eastward drift and westward flow. According to Peter (1982) during the southwest monsoon period high concentration of fish larvae was seen as patches along the coastal areas and were maximum during NE monsoon period in Bay of Bengal.

Although the maximum plankton biomass always coincided with the peak period of upwelling followed by larval abundance brought about by the prevailing upwelled water from the mesopelagic region to the surface. The number of larvae has no direct relation with the biomass. Peter (1969) indicated that when the plankton volumes were high, the number of larvae were not proportionately higher or *vice-versa*. Peter (1982) and Lalithambika Devi (1986) observed that the maximum number of larvae was not found in samples of larger biomass but from samples which were neither high nor low. This is true in the present study also. However, George (1979) has reported a positive correlation from coastal waters of southwest coast of India. Nakamura & Matsumoto (1966) have stated that large number of fish larvae was contained in low or moderate volume of zooplankton.

The presence of predators like medusae, ctenophores, ostracods, chaetognaths and others may affect the number of fish larvae in the plankton. The inconsistent and irregular relationship between the number and the biomass could also be due to the type of gear used, region, time and duration of sampling.

Biogeographical distribution of zooplankton - fish larvae - depends on specific environmental factors such as light, temperature, salinity and dissolved oxygen. Lalithambika Devi (1977) reported that highly significant negative correlation existed between number of flat fish larvae and salinity as well as dissolved oxygen. In the present study fish eggs were found more towards the southern latitudes where the salinity is comparatively low and temperature high and larvae were found more towards northern latitudes where the salinity is comparatively high and temperature low.

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