

## FINFISH SEED RESOURCES OF ADYAR ESTUARY AND KOVALAM BACKWATER AROUND MADRAS, INDIA \*

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### ABSTRACT

A survey of the seasonal and specieswise distribution and abundance of finfish seed resources of Adyar Estuary and Kovalam Backwater around Madras was carried out from January 1984 to December 1986. Adyar Estuary was found to be the potentially good ground for finfish seed collection. The seasonal and percentage composition of seeds of the cultivable fishes *Mugil cephalus*, *Liza macrolepis*, *Liza parsia*, *Liza tade* and *Liza cunnesius* and *Chanos chanos* from the estuary and backwater have been assessed. Stray occurrence of other cultivable finfish seed such as *Sillago* spp., *Siganus* spp., *Etroplus* spp. and *Epinephelus* spp. were also recorded. Among the grey mullets, the striped mullet *Mugil cephalus* occurred only from December to March whereas the fry and fingerlings of other grey mullet species occurred throughout the year. The peak season for milkfish seed occurrence was from May to July and November-December being the secondary season.

The fry and fingerlings of the striped mullet *Mugil cephalus* of the length ranging 15-79 mm were collected predominantly between November and February. Those of the other grey mullet species of the length ranging 15-54 mm occurred throughout the year. In the case of milkfish, 20-59 mm size range was dominant during the peak season. A brief account on the fry and fingerlings of other finfishes has been presented. The magnitude of seed availability is correlated with the hydrological conditions of Adyar Estuary and Kovalam Backwater. Ecological significance of the results is discussed.

### INTRODUCTION

IN RECENT years, there has been a growing interest in aquaculture throughout the world to increase the fish production mainly in coastal waters, backwaters and estuaries. In the absence of any standard technology for the mass production of marine finfish seed by induced breeding, collection of seed from the natural environment is the only major source at present. This necessitated intensive seed

resources survey of cultivable finfishes in the estuaries and backwaters for locating potential areas of their availability and the relative abundance in different seasons (Tampi, 1968; Qasim, 1975).

There are about seven estuaries and one backwater along the Madras Coast. They are Pulicat, Ennore, Adyar, Cooum, Kovalam, Edayur, Sadras and Palar. Many workers have surveyed the abundance of finfish seed resources from Adyar Estuary and Kovalam Backwater (Chacko and Ganapathi, 1949; Chacko *et al.*, 1954; Evangeline, 1968; Evangeline *et al.*, 1969; Evangeline and Sudhakar, 1972; Bose *et al.*, 1978; Nammalwar, 1986). However, it may be

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noted that these assessment of finfish seed resources have been made only for limited periods and no attempt was made on the seasonal and specieswise abundance of finfish seed.

The estuaries at Madras do not remain in constant continuity with the sea throughout the year. They are cut off from the open sea for a period ranging from 6 to 9 months. It has been reported that the long shore drift on the open coast frequently closes the river mouth. As a result, acute sillage problems arise in most of the coastal rivers where a minor portion of the untreated sewage and industrial wastes is allowed to flow into the river system. Therefore, it is reasonable to expect severe oscillations in the physio-chemical characteristics of the coastal ecosystem. If the fluctuations in the abiotic regime is detrimental to the biotic components, then there may be related changes in the abundance of fish seed resources. On this basis, an attempt has been made to relate the fish seed abundance with the condition of the river mouth whether open or closed, with the hope that such an integrated survey would provide information for formulating guidelines for effective utilization of natural estuarine resources. The present survey was carried out on the seasonal and specieswise abundance of finfish seed resources of Adyar Estuary and Kovalam Backwater of Madras area.

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#### MATERIAL AND METHODS

The survey was carried out from January 1984 to December 1986 in Adyar Estuary ( $13^{\circ}01' N - 80^{\circ}17' E$ ) and Kovalam Backwater ( $12^{\circ}49' N - 80^{\circ}15' E$ ) (Fig. 1). A nylon drag net

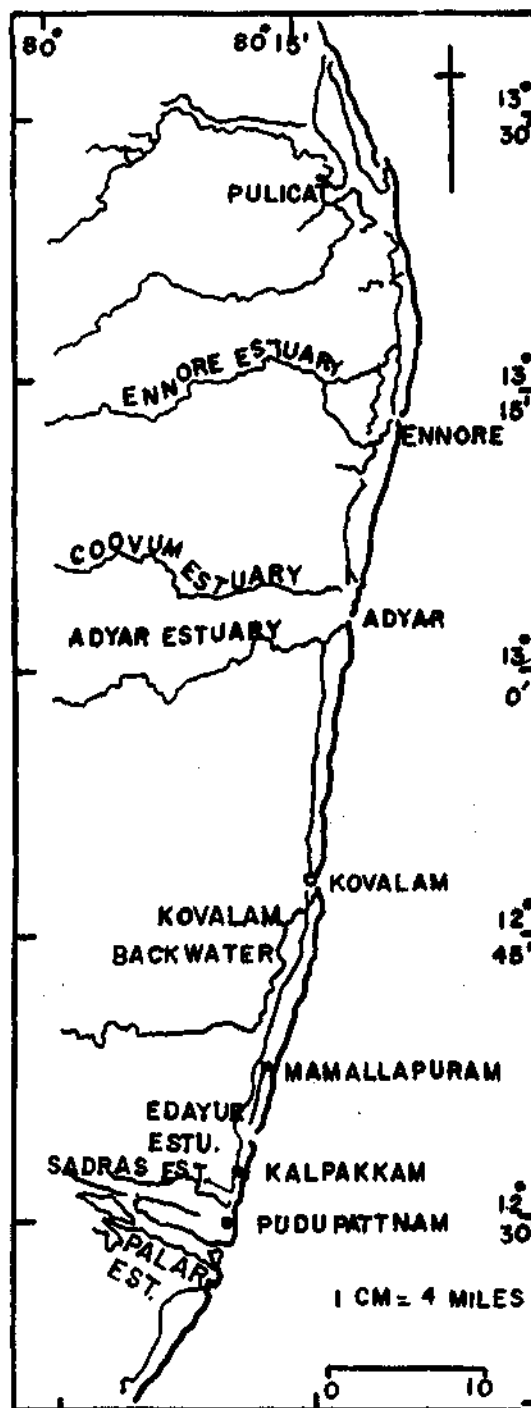


Fig. 1. Location of Adyar Estuary and Kovalam Backwater around Madras.

(4 × 3 × 1 m) of the mesh size 5 mm was used. Based on the operational time, volume of water filtered, the area covered, the number of fry and fingerlings per net/hr was estimated. Fortnightly collections were made in the early morning. A minimum of six hauls, three in high tide and three in low tide were made. The hauls made during high tides and low

computed. Fry and fingerlings belonging to the primary cultivable species of mullets such as *Mugil cephalus*, *Liza macrolepis*, *Liza parsia*, *Liza tade*, *Liza cunnesius* and milkfish *Chanos chanos*, silverwhiting *Sillago sihama*, rabbitfish *Siganus* spp., pearl spot *Etroplus suratensis* and perch *Epinephelus* spp. were sorted out for their numerical abundance.

Hydrological characteristics of the water such as temperature, salinity, dissolved oxygen, pH and water transparency were recorded from Adyar Estuary and Kovalam Backwater.

## RESULTS

### In Adyar Estuary

The average monthly abundance of total finfish seed in Adyar Estuary during January, 1984 to December, 1986 is given in Fig. 2.

It may be observed from the results that milkfish seed contributed maximum numbers, during September (958 nos/net/hr).

In order to study the distribution pattern of various size groups of fry and fingerlings of grey mullets, they were assorted with various size groups with an length interval of 5 mm. The percentage of each size group of various grey mullet species in the collections over the period 1984-86 is analysed (Fig. 3).

Grey mullet species *L. macrolepis*, *L. parsia*, *L. tade* and *L. cunnesius* occurred throughout the year whereas *M. cephalus* were found only from December to March. An analysis of the size frequency distribution pattern indicates that in a given month one or two size groups were represented well, while the rest were poorly represented. The fry and fingerlings of mullets *M. cephalus* showed the dominance of the size group 15-19, 40-44, 45-49 mm during November, December and January, the length range 15-79 mm being collected predominantly during November-February. The other mullet species *L. macrolepis*, *L. parsia*, *L. tade* and

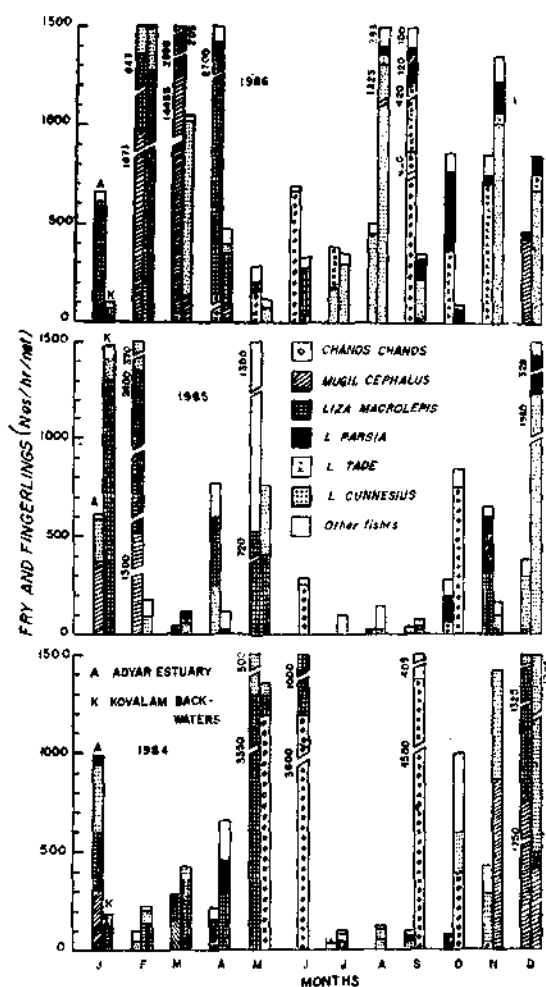


Fig. 2. Seasonal abundance of marine finfish seed in Adyar Estuary and Kovalam Backwater from January 1984 to December 1986.

tides in a month were treated separately and the average number of seed per haul/hr was

*L. cunnesius* of the length range of 15-54 mm occurred throughout the year.

Fry and fingerlings of milkfish *Chanos chanos* in Adyar Estuary were observed from April to June being the major season and from October to November the secondary season. The abundance was high (676 nos/

The fry and fingerlings of other groups like *Allanetta* spp., *Gerres* spp., *Ambassis* spp., *Lutianus* spp., *Elops* spp., *Therapon* spp., *Caranx* spp., *Sphyraena* spp., *Tachysurus* spp., *Thryssa* spp., *Rhynchorhamphus* spp., occurred in meagre numbers in most part of the survey period.

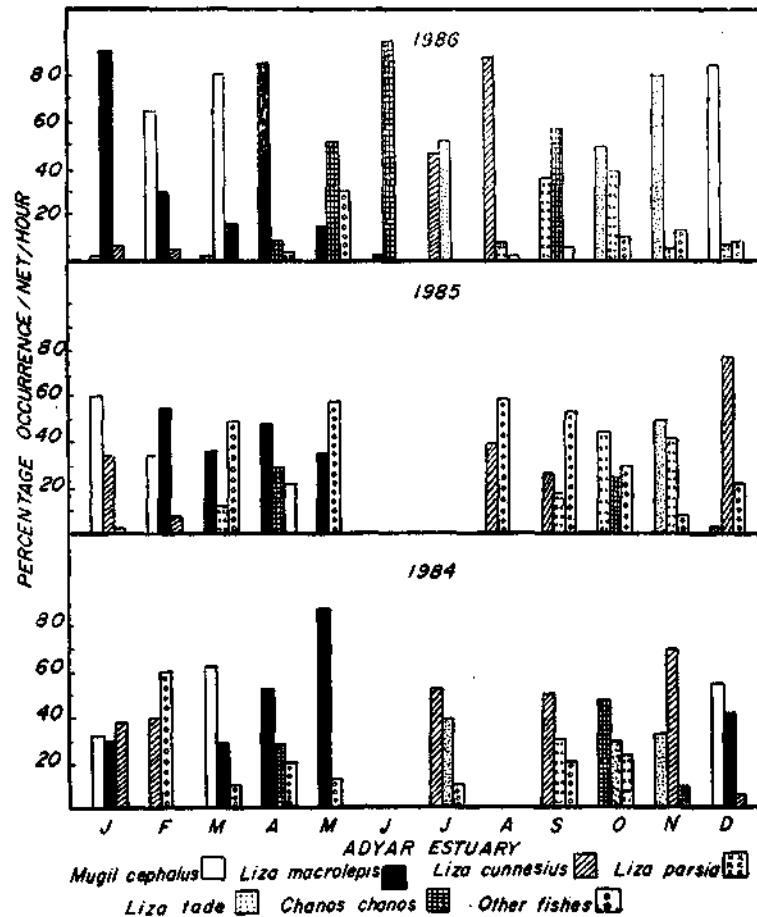


Fig. 3. Percentage occurrence of marine finfish seed in Adyar Estuary from January 1984 to December 1986.

net/hr) in the month of April and June, when milkfish of 20-44 mm size was dominant. Fry and fingerlings of pearlspot *Etroplus suratensis* and silverwhiting *Sillago sihama* were recorded in high numbers from August-November in Adyar Estuary.

#### In Kovalam Backwater

Kovalam Backwater is located 35 km south of Madras and runs parallel to the sea coast. It is connected with the sea about a kilometre from Kovalam Village. During the northeast monsoon period flood waters collected from

the surrounding areas constitute the backwater proper and there is no river connection. This backwater extends to a distance of about 20 km. The survey area covered extends for about 5 kms from the bar mouth of the backwater.

to August and fingerlings of *L. parsia* and *L. tade* from September to December were collected. The occurrence of fry and fingerlings of milkfish was abundant during June (3600 nos/net/hr) and September (4,500 nos/net/hr) in Kovalam Backwater.

The abundance of marine finfish seed was maximum during June (5650 nos/net/hr) and

The size frequency distribution of fry and fingerlings of grey mullets revealed that in a

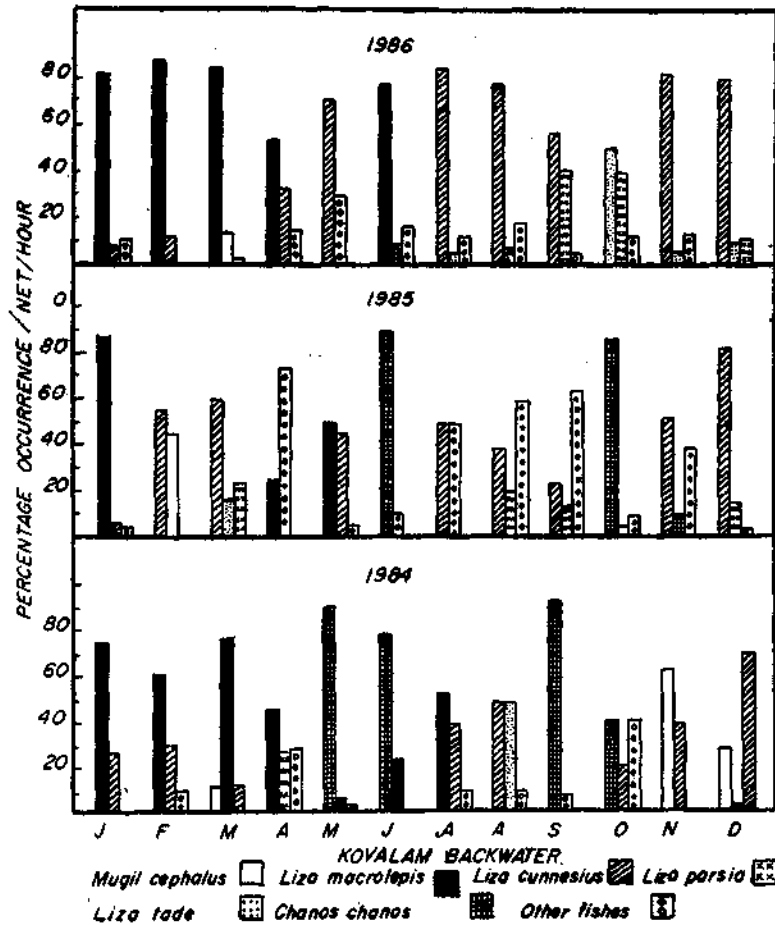


Fig. 4. Percentage occurrence of marine finfish seed in Kovalam Backwater from January 1984 to December 1986.

minimum during January (86 nos/net/hr). Significant fluctuations in abundance was recorded in the rest of the months.

Fry (10-40 mm) and fingerlings (50-70 mm) of *L. macrolepis* and *L. cunnesius* from January

given month only two or three size groups may be well represented (Fig. 4). The fry and fingerlings of mullets *M. cephalus* of size 25-29 and 60-64 mm were dominant during November and December, *L. macrolepis*, *L. parsia* and *L. cunnesius* of the length range of 15-54 mm

occurred throughout the year. In the case of November. The occurrence of 15-75 mm *L. tade*, the fry and fingerlings of size 20-24 length range was high during May-August and 70-74 mm occurred from September to and of 40-75 mm during October-November. December.

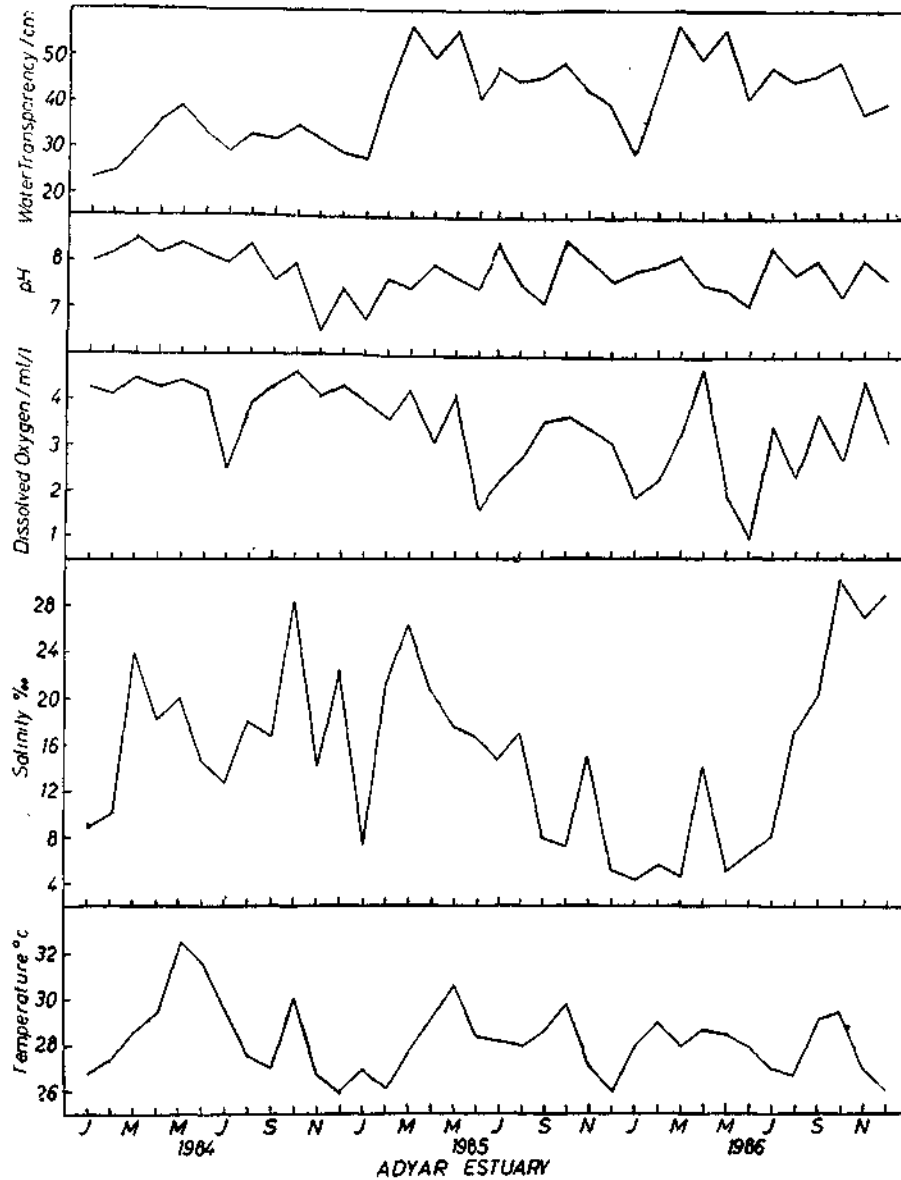


Fig. 5. Hydrological conditions of Adyar Estuary from January 1984 to December 1986.

The fry and fingerlings of *Chanos chanos* occurred from May-August and October-  
 Stray number of fry and fingerlings of *Etroplus suratensis*, *Sillago sihama*, *Epinephelus*

*tauvina* and *Siganus* spp. occurred during the period of study. Fry (30-45 mm) of *S. sharma* and fingerlings (75-130 mm) of *E. suratensis* and *E. tauvina* were met with only during July and September.

spp., *Nematalosa nasus*, *Allanetta* spp., *Lutianus johnii*, *Therapon jarbua*, *Caranx* spp., *Tachysurus* spp., *Rhynchorhamphus* spp. and *Leiognathus* spp. were also found in large numbers during the present investigation.

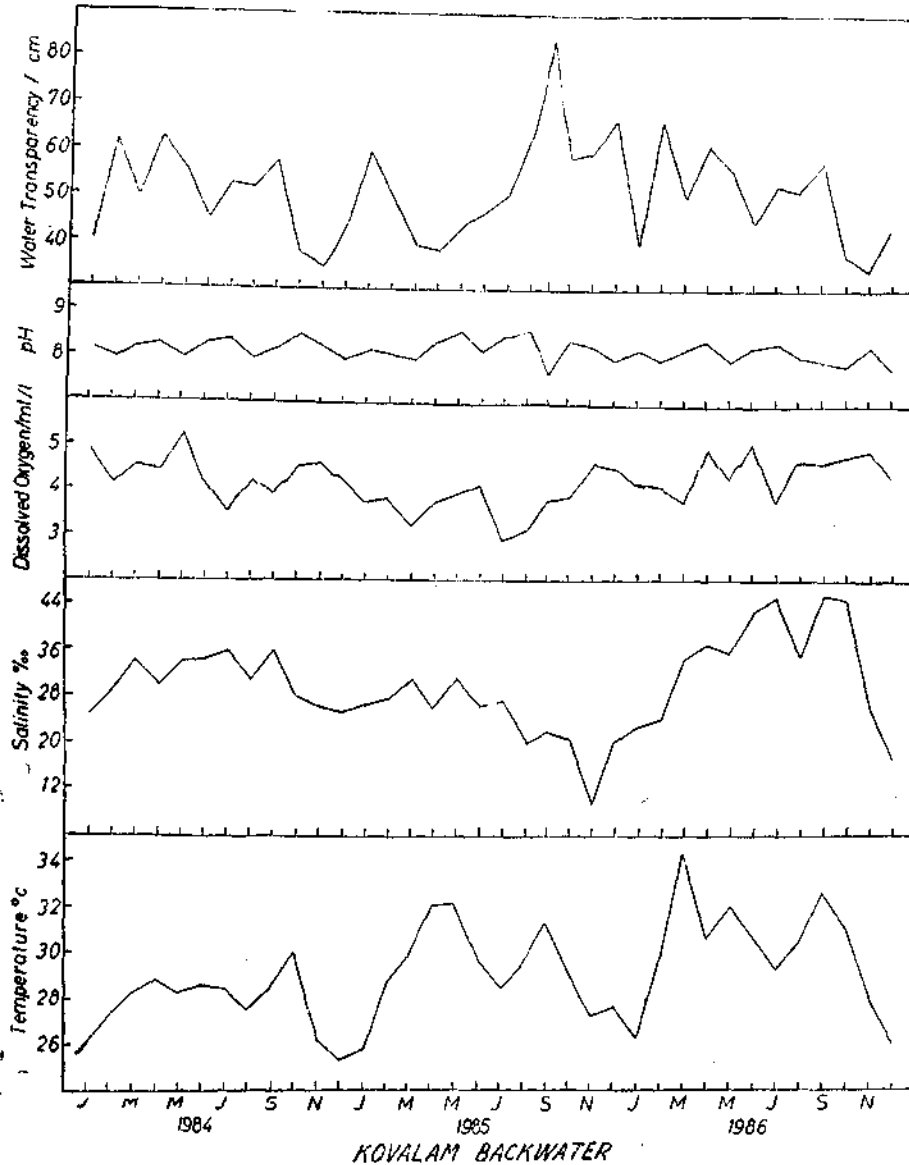


Fig. 6. Hydrological conditions of Kovalam Backwater from January 1984 to December 1986.

Fry, fingerlings and juveniles of the Premonsoon, monsoon and postmonsoon commercially important fishes such as *Ambassis commersoni*, *Elops saurus*, *Thyrssa* spp., *Gerres* months recorded higher number of young ones of these groups.

## HYDROLOGICAL CONDITIONS

Temperature, salinity, dissolved oxygen, pH and water transparency were monitored from January 1984 to December 1986.

*Adyar Estuary**Temperature*

Temperature ranged between 26.0°C and 32.6°C. The maximum during May (32.6°C) and minimum (26.0°C) during December were recorded.

*Salinity*

Salinity ranged from 4.24‰ to 36.56‰; Peak salinity (30.56‰) was recorded during October and low salinity (4.24‰) during January.

*Dissolved oxygen*

The dissolved oxygen content of the water ranged from 0.91 ml/l to 4.78 ml/l. Maximum DO content of 4.78 ml/l was observed during April and the minimum of 0.91 ml/l during July. In general DO content of the water during high tide period was higher.

*pH*

The annual variation in pH ranged from 6.5 to 8.6. Maximum pH was 8.6 in October and minimum (6.5) in November.

*Water transparency*

The secchi disc depth which was used as a measure of transparency of the water ranged from 23 in January to 57 cm in March.

*Kovalam Backwater**Temperature*

The temperature ranged from 25.2°C to 34.2°C. The maximum temperature of 32.5°C was recorded during March and minimum during December, the value being 25.2°C. The annual pattern of temperature is bimodal.

*Salinity*

The salinity fluctuation was significant, and ranged from 9.88‰ to 45.6‰. Peak salinity (45.6‰) was in September and minimum salinity (9.88‰) in November.

*Dissolved oxygen*

The dissolved oxygen content ranged from 2.92 ml/l (July) to 5.36 ml/l (May).

*pH*

There was no significant variation in the pH and it ranged from 7.79 (December) to 8.60 (May).

*Water transparency*

Maximum transparency (85 cm) was observed during September and low (35 cm) during November.

## DISCUSSION

The results of the present study have brought to light the existence of potentially good grounds in Adyar Estuary and Kovalam Backwater for the cultivable marine finfish seed exploitation along the Madras Coast. Based on the relative abundance of the seed, it may be stated that Adyar Estuary could be considered to be rich for grey mullet assemblage. The tidal pools of Kovalam Backwater were found to be potential areas for milkfish seed. Investigations on the seed resources, hydrobiology and fisheries of Adyar Estuary and Kovalam Backwater have been carried out by many earlier workers (Chacko and Ganapathi, 1949; Chacko *et al.*, 1954; Evangeline, 1968; Evangeline *et al.*, 1969; Evangeline and Sudhakar, 1972; Bose *et al.*, 1978; Nammalwar, 1986). They have reported a maximum occurrence of about 35 to 40% for grey mullet seed among the fish seed resources in these estuary and backwater. In the present study however, grey mullets accomplish 50 to 55% of fish seed resources. Evangeline *et al.* (1969), while commenting



on the occurrence of mullet seed, drew attention to the role of the formation of sand bar at the mouths of the river. They emphasized that the abundance of fish seed within the estuary is governed by the length of time for which the river mouth was in continuity with the open sea coast. During the present study the bar mouths of Adyar and Kovalam Backwater were found naturally in an open condition for a period of about 7 to 8 months. It is evident that the increase in the abundance of fish seed resource now reported on, may primarily be due to the open condition of the bar mouth of the estuary over a longer period facilitating the entry of seed during most months of the year. Thus, the opening of the bar mouth is an important factor for the abundant marine finfish seeds, besides recuperation of the river during the high tide period. Therefore, every effort must be made to maintain an year round continuity of the estuary and backwaters with the sea in order to maintain a sustained augmentation of fish seed resources.

While the seed of grey mullets *Liza macrolepis*, *Liza parsia*, *Liza tade* and *Liza cunnesius* occurred throughout the year with two peak seasons, October to December and April to June that of *Mugil cephalus* occurred only from December to March. It is known that the seed of grey mullets migrate into the estuarine and backwater regions soon after spawning (Panikkar and Aiyar, 1939; Jacob and Krishnamurthy, 1948; Rengaswamy, 1980). In both Adyar Estuary and Kovalam Backwater, the peak abundance of grey mullet seed coincided with the peak spawning seasons of mullets suggesting thereby that the regulatory function of the estuarine mouth during these peak spawning seasons would increase seed abundance of grey mullets in these estuarine and backwater areas. Surveillance work carried out by the Tamil Nadu Public works Department in keeping the bar mouth open and the concomitant increase in marine finfish seed yield, as reported in the present study,

may be taken as an initial promise of high degree of success that can be achieved in this direction if such a coordinated environmental management of the coastal estuarine system is carried out.

It has been observed in the present study that seed measuring 15-54 mm length occurred almost throughout the year giving a positive indication for commercial exploitation. Relatively, more abundant occurrence of milkfish of the size 20-59 mm dominated as also of other marine finfish seed, during May-July deserves special mention. Further, it may be observed that there was consistency in the seasonal abundance and size range for different species of finfish met within Adyar Estuary and Kovalam Backwater during the present study. However, there are greater possibilities for the exploitation of finfish seed over a major part of the year.

It may be seen from the present study that in Adyar Estuary and Kovalam Backwater both the extremes of salinity and temperature conditions are met with. For instance, during December, January, March and September, minimum and maximum salinity and temperature recorded were 4.24-45.60‰ and 25.2°C - 34.2°C respectively. Physiological adaption of the grey mullets and milkfish to cope with the extreme salinity and temperature variations are yet another factor for their successful colonization in estuarine and backwater habitat (Kutty 1967; Nammalwar, 1982). However, the oxygen regime present in the estuary and backwater impose some limitations for the abundance of mullets. During the present study, it was found that a huge oxygen deficit was registered (0.91 ml/l) in Adyar Estuary. If the dissolved oxygen level in Adyar Estuary and Kovalam Backwater is maintained above 2 ml/l the future prospects of grey mullets and milkfish culture could be improved. This could only be achieved if the bar mouth of the estuary could be kept open.

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