

AVAILABILITY OF GREY MULLET SPAWNERS IN ADYAR ESTUARY AND KOVALAM BACKWATER AROUND MADRAS, INDIA*

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ABSTRACT

A survey of the grey mullet spawners in Adyar Estuary and Kovalam Backwater around Madras was conducted for 2 years from July 1985 to June 1987. Availability of spawners of different species of grey mullet *Mugil cephalus*, *Liza macrolepis*, *L. parsia* and *L. tade* in the areas surveyed was assessed. It is evident from the data that the spawners of *M. cephalus* are abundant from October to January. The peak availability of spawners of *L. macrolepis* is from January to July. In the case of *L. parsia* the spawners are available from December to March and June to August whereas, *L. tade* spawners occur from November to January.

INTRODUCTION

THE LOCATION of spawning grounds of grey mullets is of considerable importance in protecting the breeders for the management of the fishery resources both in marine and estuarine ecosystems. The knowledge on the availability of spawners is necessary to collect prospective spawners for mass production of selected varieties of fish seed to meet the growing demand of the fish farmers and private entrepreneurs. Many workers have reported on the availability of grey mullet spawners and their breeding biology along the east and west coasts of India (Jacob and Krishnamurthy, 1948; Sarojini, 1951; Chidambaram and Kuriyan, 1952; John, 1955; Luther, 1963; Shetty *et al.*, 1965; Jhingran and Natarajan, 1969; Rengaswamy, 1980; Sathyashree *et al.*, 1981; Sulochanamma *et al.*, 1981; Mohan and

Nandakumaran, 1987). Since there is no information available on the availability of grey mullet spawners in Adyar Estuary and Kovalam Backwater around Madras, an attempt is made in the present study.

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MATERIAL AND METHODS

A survey was carried out to locate the suitable areas for the collection of grey mullet spawners during the period from July 1985 to June 1987. The regions selected for the survey lies in the coastal, estuarine and backwater areas which extend for about 5 km distance from the bar mouth of Adyar Estuary and Kovalam Backwater (Fig. 1). Fortnightly observations and collections were made in the

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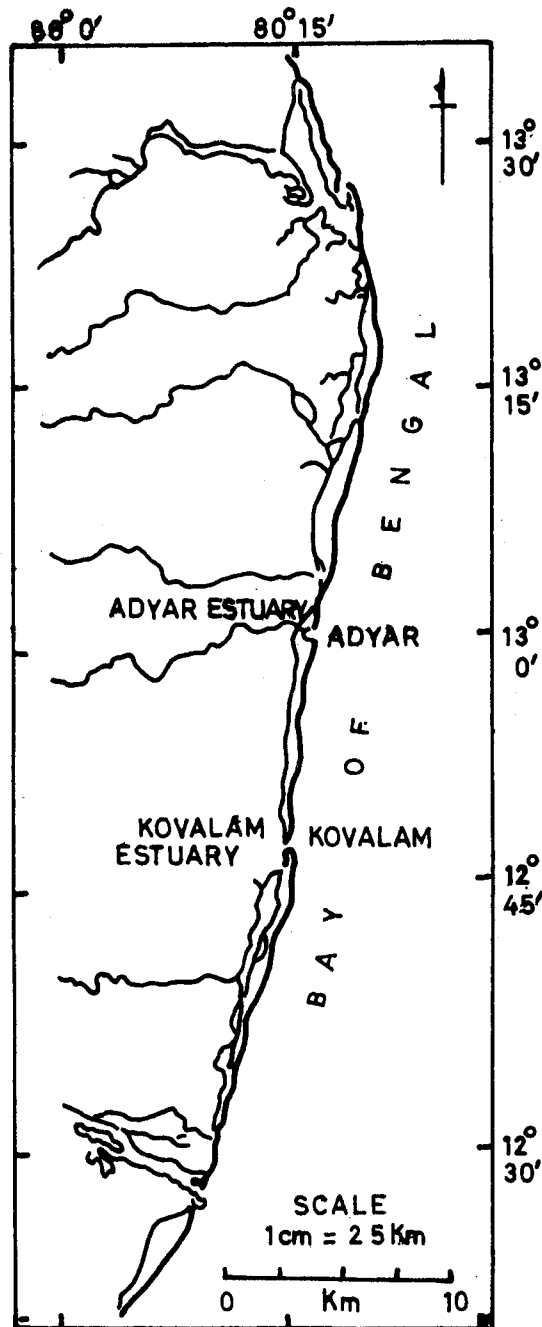


Fig. 1. The location of Adyar Estuary and Kovalam Backwater around Madras.

early morning hours. Samples were collected from 'Konda valai' (Drag net) 'Siru valai' (Bag net), 'Pera valai' (Bag net) and 'Periya pandha valai' (Bag net) operations. The first two gears with 5 mm mesh size and the other two with 10 mm mesh size were used for commercial fishing. Fifty specimens were brought to the laboratory for each observation in fresh condition. After recording the total length and weight, the specimens were cut open for sex and maturity studies. The colour and condition of gonads and stage of maturity were designated microscopically. Ovaries were preserved in 5% neutral formalin. Ova diameter studies in 250 ovaries of different maturity stages in each species of grey mullet were made. The ova diameter was measured with an ocular micrometer. The value of each micrometer division was calculated as 16.7μ . The diameters of 200 ova from each stage were measured as suggested by Clark (1934) and De Jong (1940) and the measurements were grouped into 2 ocular divisions and the percentages were calculated for each stage of maturity. The ova measuring 3 and above were taken into consideration for *M. cephalus* and 5 and above for other species while drawing percentage frequencies. Hydrological conditions such as temperature, salinity, dissolved oxygen, pH and water transparency of Adyar Estuary and Kovalam Backwater and the coastal waters of Adyar and Kovalam were monitored.

TOPOGRAPHY AND ENVIRONMENTAL CONDITIONS

Adyar Estuary ($13^{\circ} 10' N$ and $80^{\circ} 17' E$) extends from the Guduvancheri Hills in the Kancheepuram Taluk of Chingleput District of Tamil Nadu and runs for about 30 km towards the southern border of Madras Coast. The estuarine part of the Adyar River runs perpendicular to the sea coast and mixes with the sea near Foreshore Estate.

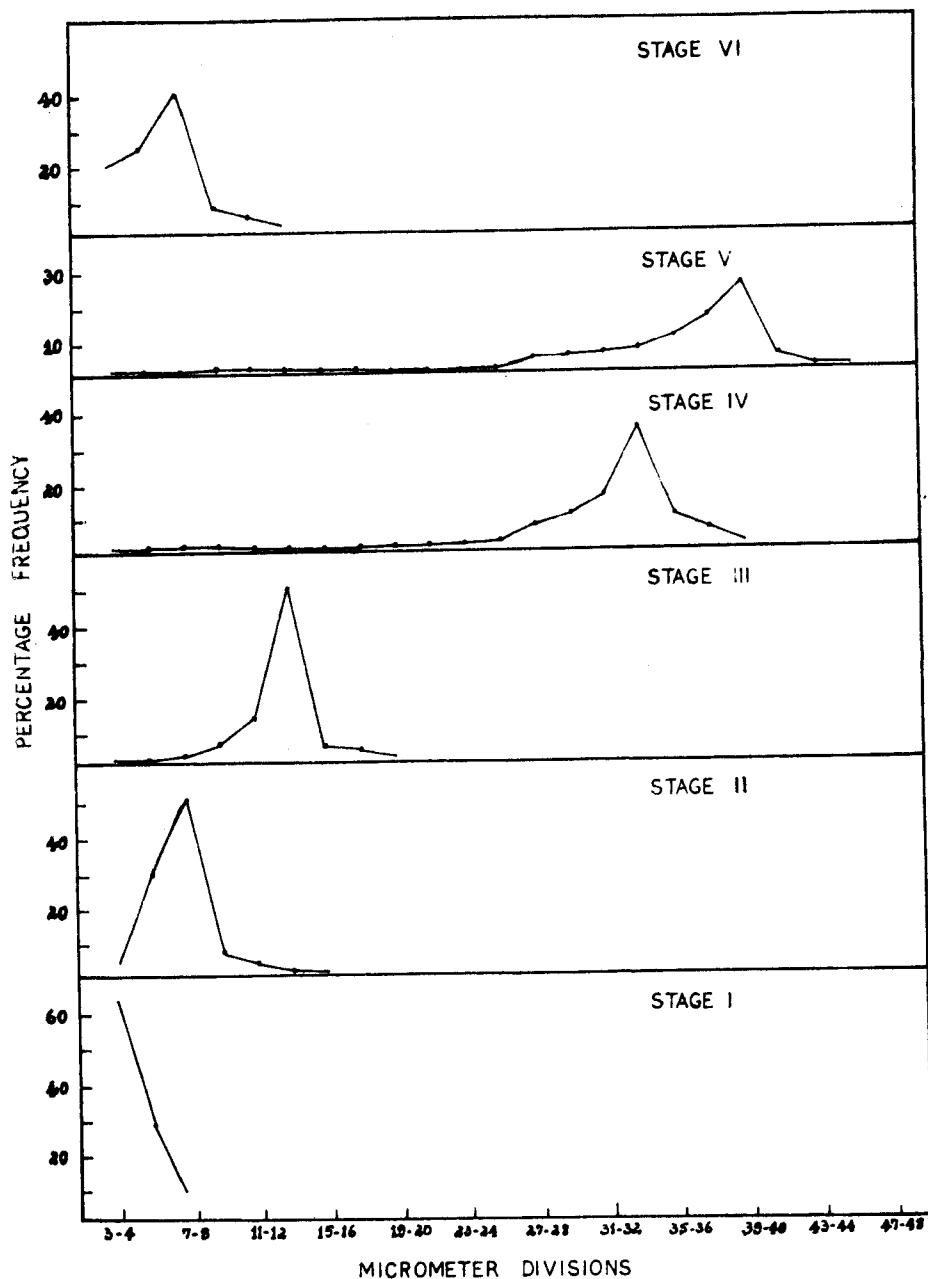


Fig. 2. Ova diameter percentage frequency of different stages of maturity of *Mugil cephalus*.

Kovalam Backwater (12° 49' N and 80° 15' E) is located 35 km south of Madras and runs parallel to the sea coast. It is connected

with the sea between Karikattukuppam and Kovalam villages. In the formation of this backwater, adjoining coastal waters and flood

waters collected from the surrounding areas constitute the backwater proper and there is no

In Adyar Estuary, the annual variations in temperature, salinity, dissolved oxygen, pH

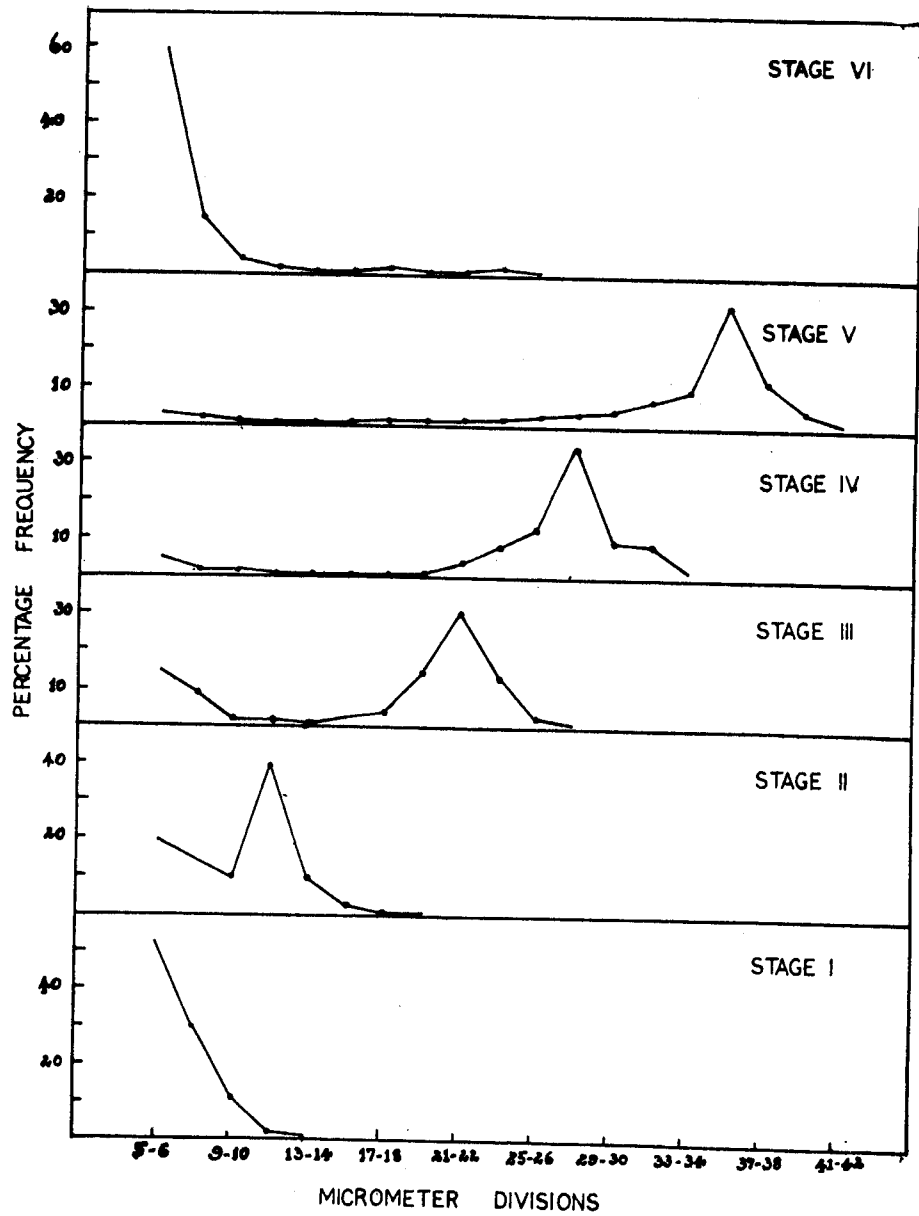


Fig. 3. Ova diameter percentage frequency of different stages of maturity of *Mugil cephalus*.

river connection. This backwater extends to a distance of about 20 km.

and water transparency ranged from 25.0 - 29.9°C; 4.24-30.56‰; 1.92-5.28 ml/l; 7.5.8.4

and 38 - 57 cm respectively. In Adyar coastal waters, the annual fluctuations in temperature,

In Kovalam Backwater, the seasonal variations in temperature, salinity, dissolved

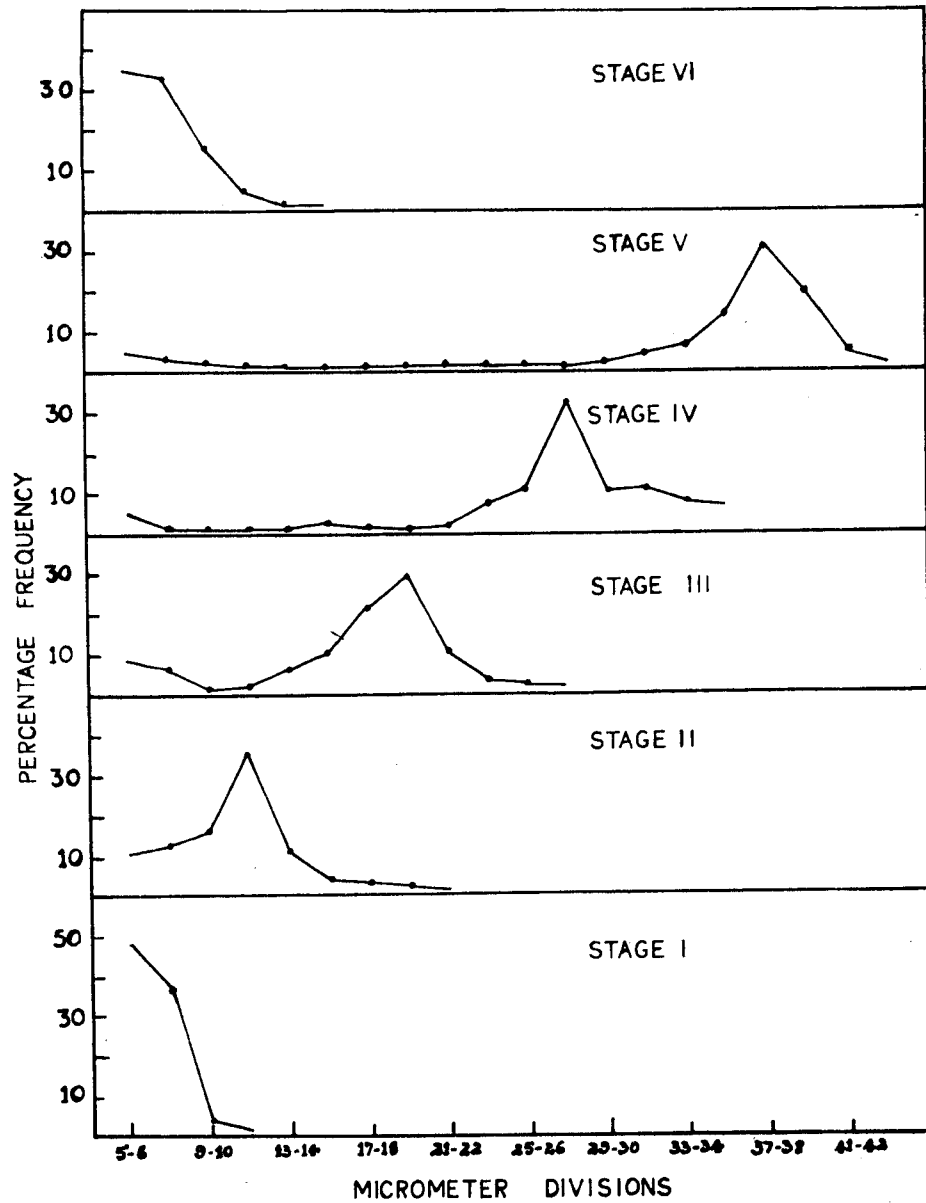


Fig. 4. Ova diameter percentage frequency of different stages of maturity of *Mugil parsia*.

salinity, dissolved oxygen and pH ranged from 26.2-31.2°C; 22.16-34.42‰; 3.9-5.03 ml/l and 8.0-8.5 respectively.

oxygen, pH and water transparency ranged from 26.0-32.5°C; 9.88-37.36‰; 3.07-5.28 ml/l; 7.7-8.5 and 30-85 cm respectively. In Kovalam

coastal waters, the seasonal fluctuations in temperature, salinity, dissolved oxygen and pH varied from 26.2-31°C; 25.92-34.61‰; 4.02-5.3 ml/l and 8.0-8.5 respectively.

beyond stage IV in the case of females and early V stage for males. Female fish in early V stage and fully mature male fish were collected in the coastal areas only.

TABLE 1. *Gonadal condition of Grey mullets*

Stage	Female	Male	Maturity scale of I.C.E.S.
I - Immature	Pinkish occupying 1/4 to 1/2 body cavity. Ova irregular and transparent.	Whitish, ribbon shaped occupying 1/2 body cavity.	I-II
II - Maturing I	Yellowish occupying 1/2 to 2/3 body cavity. ova round, partially yolk laden.	Whitish, occupying 2/3 body cavity.	III
III - Maturing II	Yellowish, occupying 2/3 to 3/4 body cavity. Ova round and fully laden with yolk.	Whitish occupying 2/3 to 3/4 body cavity.	IV
IV - Mature	Yellowish, occupying nearly the entire body cavity with some ova visible to the exterior; yolk vacuolated, perivitelline space present.	Creamy white, occupying the entire body cavity.	V
V - Oozing	In the oozing stage.	Fish in the oozing stage.	VI
VI - Spent	Flaccid with blood vessels prominent over the surface occupying not more than 1/2 the body cavity.	Flaccid occupying about 1/2 body cavity.	VII

RESULTS AND DISCUSSION

The different stages of development of ova in the ovaries were studied for each species of grey mullet (Fig. 2-5). The maturity stages adopted in the present study are given in Table 1 along with the corresponding maturity scale of I.C.E.S (Wood, 1930) for comparison. The ova diameter frequency polygons of the mature ovaries of all the species present only single well differentiated group of ova. Hence, it is inferred that individual fish spawns only once in a season. The survey on the availability of the spawners revealed that ripe fish of all the species of grey mullet occur during the Northeast monsoon period, even though the peak availability varies for each species. Other fishes such as *Chanos chanos*, *Magalops cyprinoides*, *Nematolosa nasus*, *Gerres* spp., *Ambassis* spp. and *Oreochromis mossambicus* were recorded occasionally along with mullets. The mullets caught in the estuary and backwater were never

Mugil cephalus

The mature fish of *M. cephalus* occurred during the Northeast monsoon period in both the estuary and backwater. The percentage composition of various stages of maturity is given in Fig. 6. At Kovalam Backwater, fish with V stage gonads were recorded from October to January whereas at Adyar Estuary fish with ripe gonads were available from November to January. The immature and maturing fish occurred in both the estuary and backwater during the rest of the period, especially the indeterminates dominated from February to July. The average size and weight of the spawners ranged between 350 and 445 mm & 380 and 725 g for males.

Luther (1963) opined that the spawning season for *M. cephalus* was of short duration in Mandapam Coast. Jhingran and Natarajan (1969) recorded the spawning season of *M. cephalus* in Chilka Lake from September to December. According to Shetty *et al.* (1965) the spawning

season of *M. cephalus* in Mahanadhi Estuary was from September to December. Das (1978) to February. The present observations reveal that fish with stage V gonads (oozing stage)

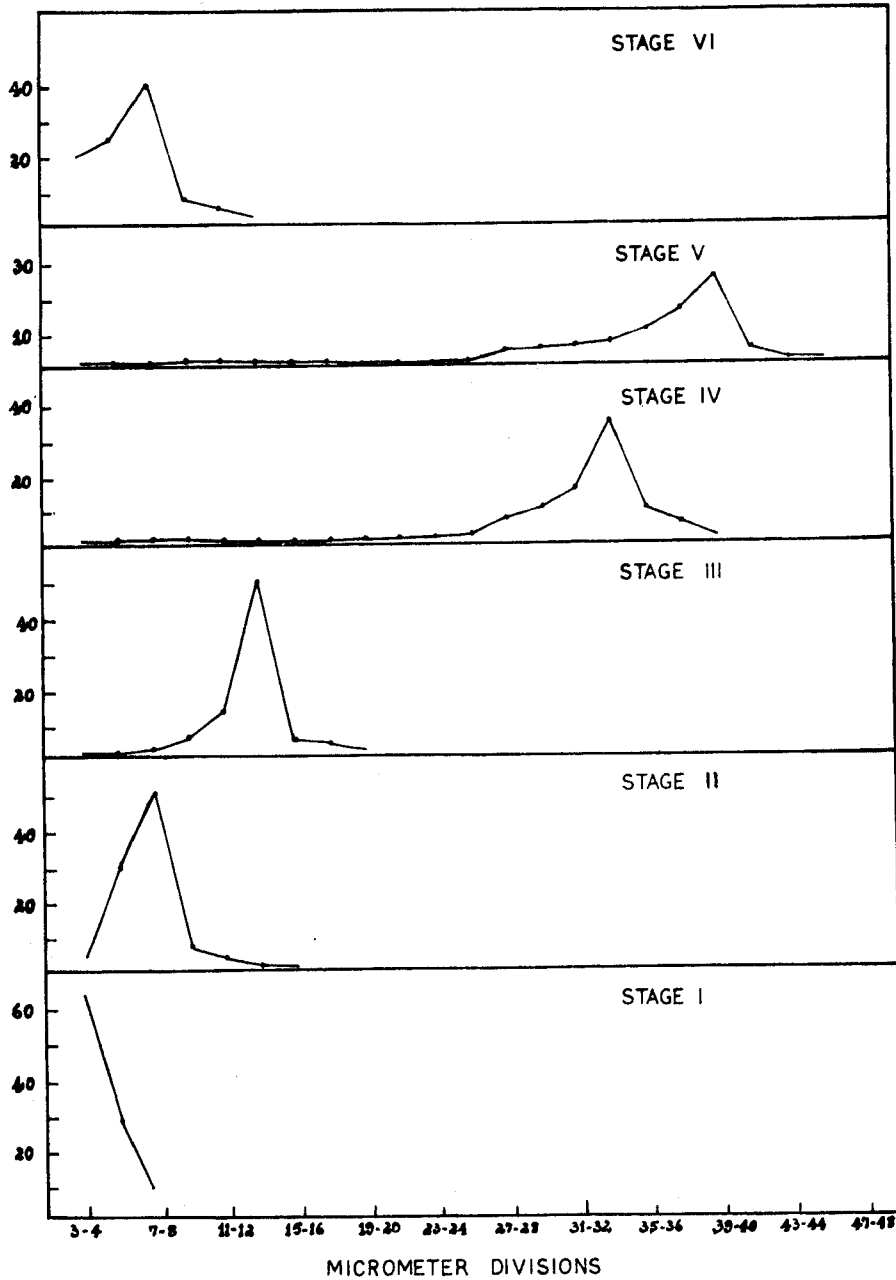


Fig. 5. Ova diameter percentage frequency of different stages of maturity of *Mugil tade*.

observed a prolonged spawning season for *M. cephalus* in Goan waters from September and stage VI (Spent) occur from November to January which was obviously the spawning

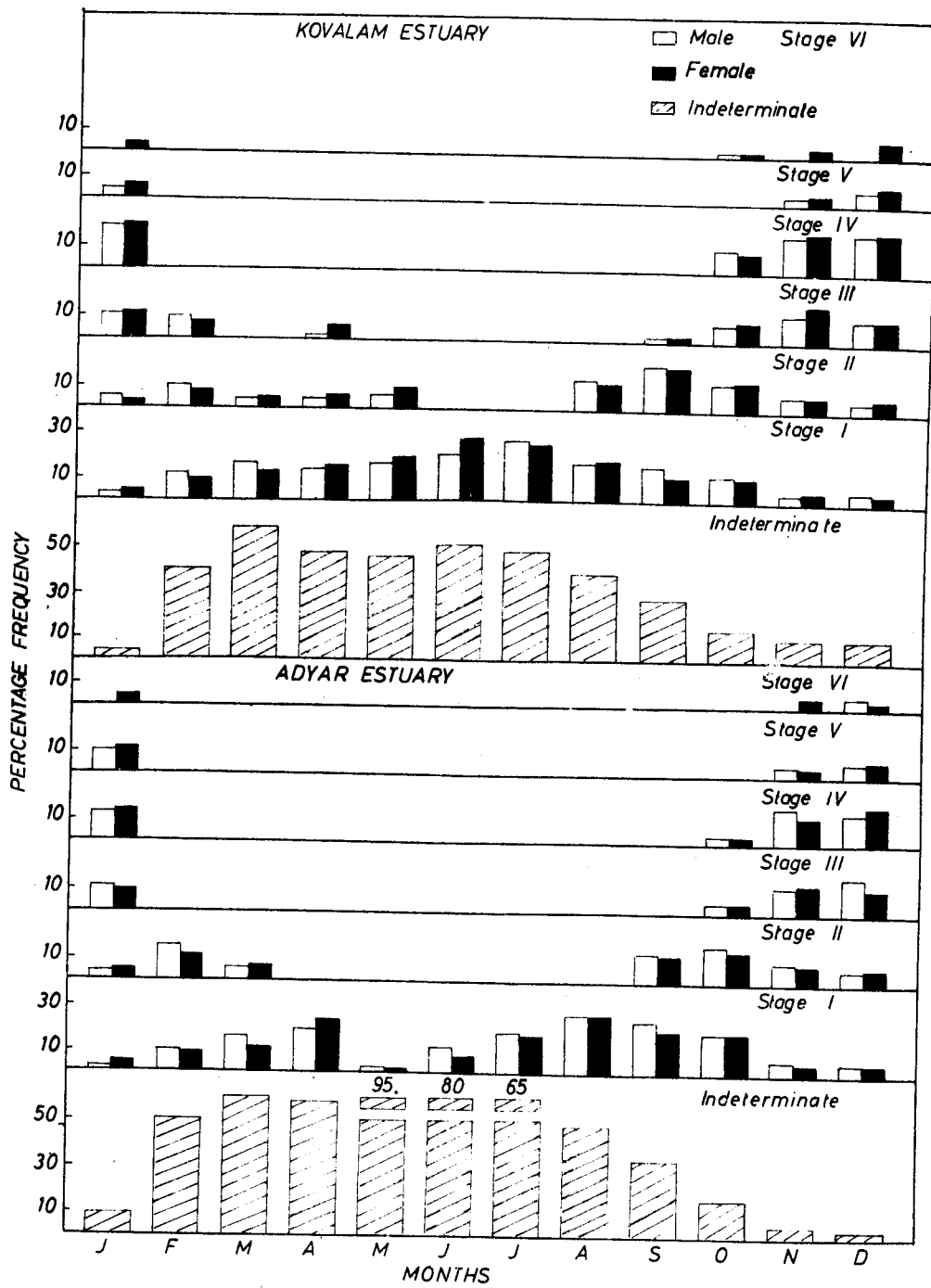


Fig. 6. Percentage distribution of various maturity stages of *Mugil cephalus*.

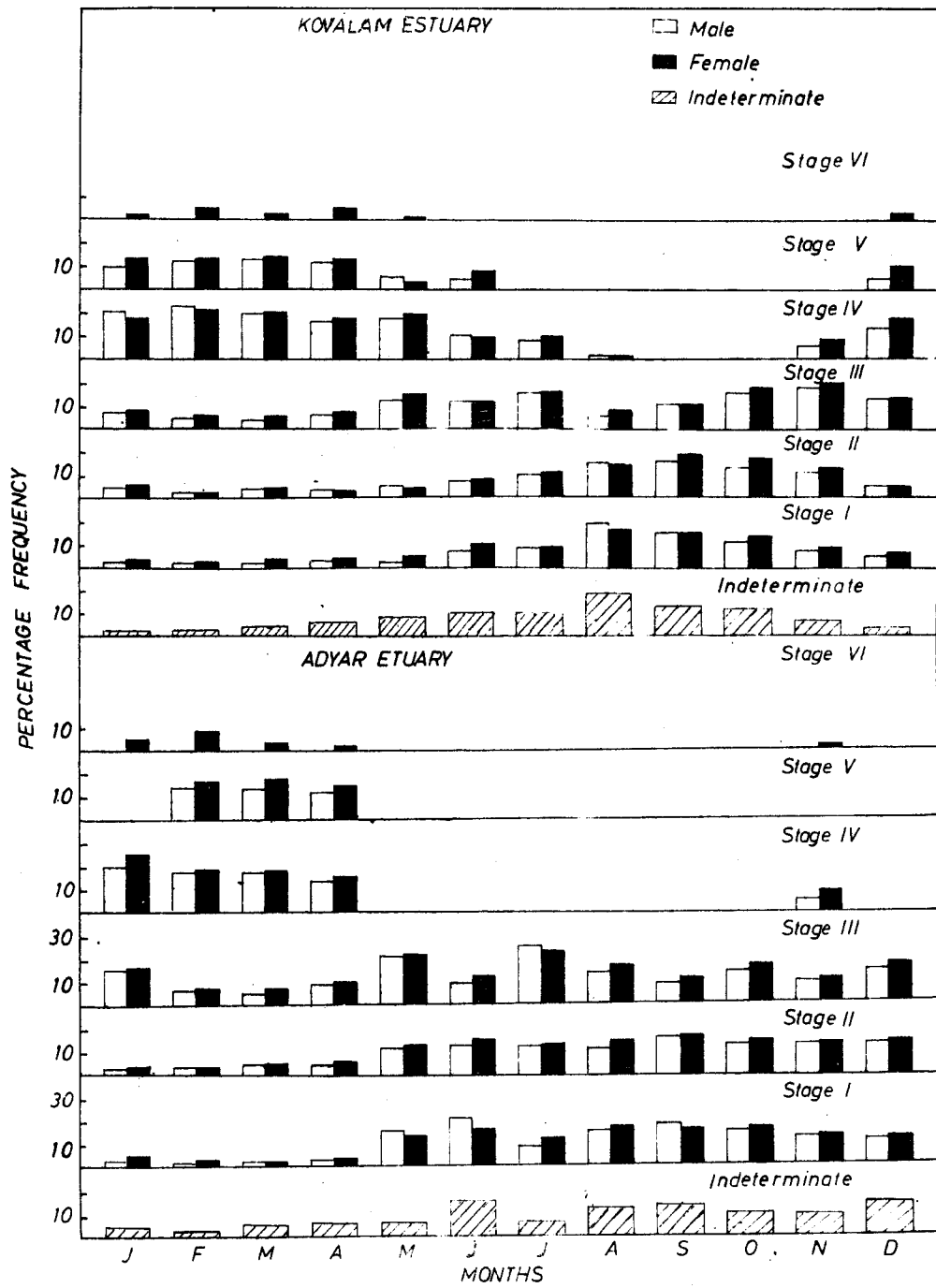


Fig. 7. Percentage distribution of various maturity stages of *Liza macrolepis*.

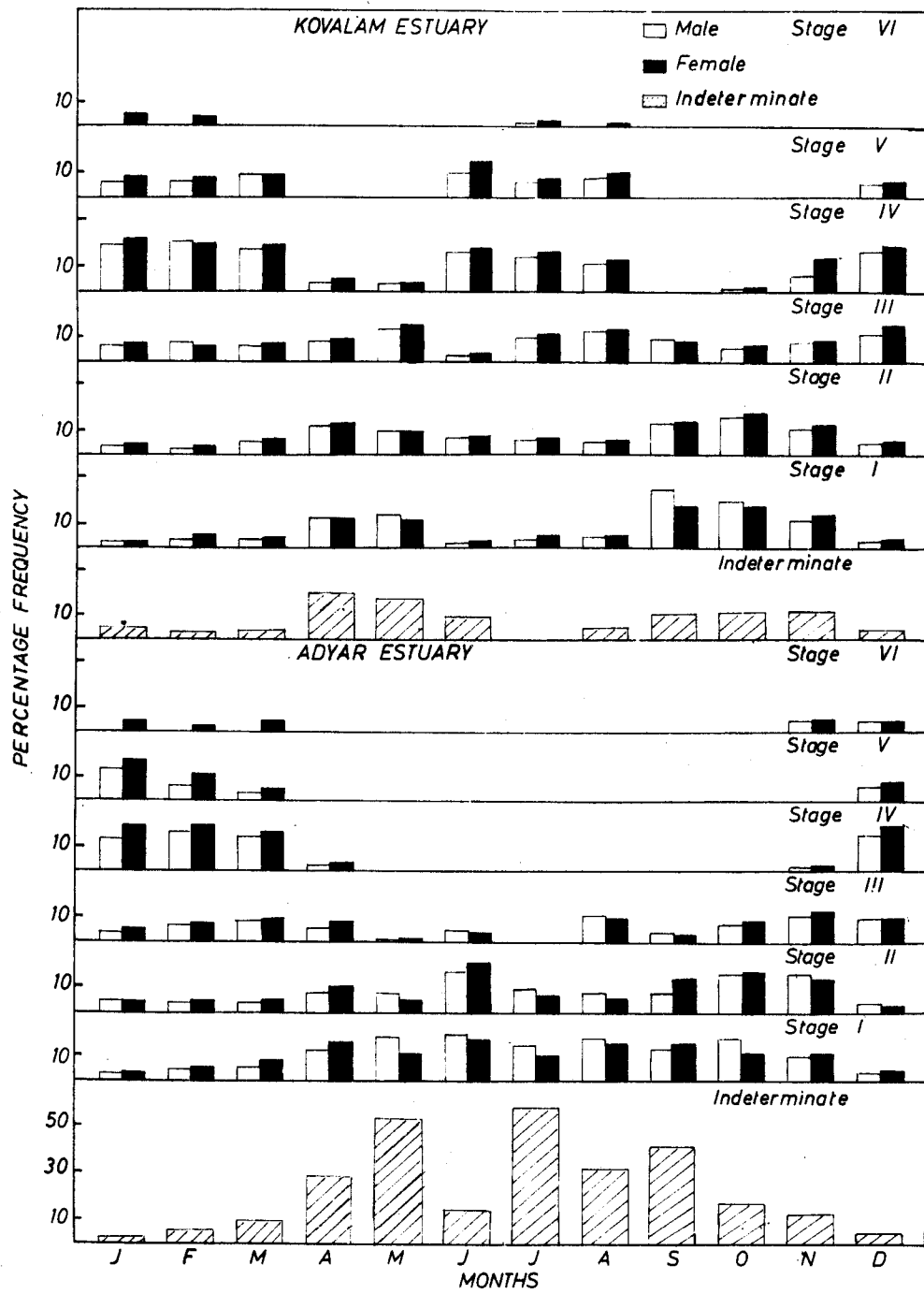


Fig. 8. Percentage distribution of various maturity stages of *Liza parsia*.

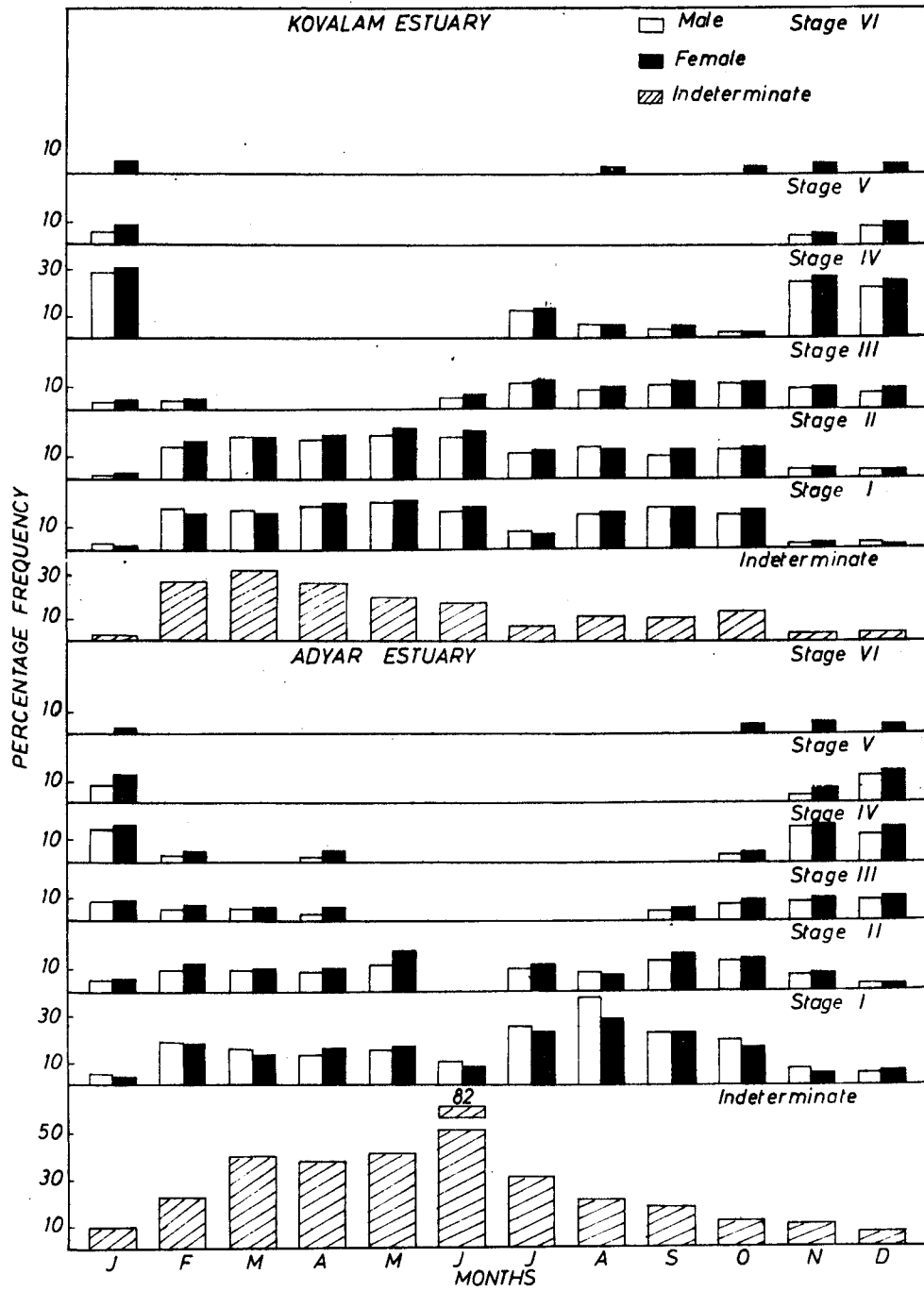


Fig. 9. Percentage distribution of various maturity stages of *Liza tade*.

season. Jacob and Krishnamurthy (1948) reported that in the Ennore Estuary, fish with mature gonads were available from October to May. John (1955) reported that in Kayamkulam Lake, ripe *M. cephalus* was found with roe from October to January. Sulochanamma *et al.* (1981) recorded *M. cephalus* fish with stage V gonads from September to April in Porto-Novo waters. The present study indicates that fish with roe are abundant during October to January in both Adyar Estuary and Kovalam Backwater.

Liza macrolepis

The percentage composition of various maturity stages has been given in Fig. 7. At Kovalam Backwater, fish with mature gonads were available during December to January period. At Adyar Estuary, fish with stage IV and V gonads were abundant during January to April. At Kovalam Backwater fish with ripe gonads were available from December to June period, even though fish with stage IV gonads were recorded throughout the year excepting few months. The average size of the spawners ranged between 184 and 333 mm (64-318 g) for females and 134 and 274 mm (30-180 g) for males.

The occurrence of maturing, mature and spent fishes of *L. macrolepis* were observed during June to February at Mandapam (Luther, 1963). At Pulicat Lake *L. macrolepis* appeared to breed throughout the year with two peaks one in January to July and another in February to April (Rengaswamy, 1980). The present observations indicate that *L. macrolepis* spawns throughout the year with peak from January to June.

Liza parsia

The percentage composition of various stages of maturity of *L. parsia* is given in Fig. 8. Ripe fish of *L. parsia* were recorded from December to March and June to August

at Kovalam Backwater. At Adyar Estuary, fish with stage IV and V gonads were recorded from December to March. The average size and weight of the spawners ranged from 124-244 mm and 27-134 g for females and from 113-203 mm and 25-70 g for males.

Jacob and Krishnamurthy (1948) observed that at Ennore Estuary, the gonads of *Mugil dussumieri* (= *parsia*) were ripe from October to May. Luther (1973) recorded *M. parsia* with roe during June to August at Mandapam. Rengaswamy (1980) has recorded the mature specimens of *L. parsia* at Pulicat Lake throughout the year with a peak in July to September and another in March. The present observations show that mature fish of *L. parsia* are available from December to March and June to August at Kovalam Backwater and from December to March at Adyar Estuary.

Liza tade

The average size and weight of the spawners ranged from 184-333 mm and 64-318 g for females and 135-274 mm and 30-180 g for males. Ripe fish occurred from November to January both at Kovalam Backwater and Adyar Estuary (Fig. 9). John (1955) recorded *L. tade* with roe at Kayamkulam Lake from September to March. The present study revealed that ripe fish were available during Northeast monsoon period.

Liza cunnesius

Ripe fish of *L. cunnesius* were available during December and January months at Adyar Estuary. The mean size and weight of the spawners ranged between 156 and 180 mm and 36 and 52 g for females, and 154 and 166 mm and 35 and 44 g for males.

At Kayamkulam Lake fish with roe were observed from September to December (John, 1955). Sarojini (1958) reported that maturing

L. cunnesius were obtainable from May to July in Bengal waters. Based on the present observations, it may be seen that ripe fish of *L. cunnesius* occur at Adyar Estuary during Northeast monsoon period.

Liza oligolepis

Spawners of the large scaled mullet *L. oligolepis* with the mean size ranging from 343-503 mm (300-1200 g) occur in the coastal areas of Kovalam during January to April.

INFLUENCE / CORRELATION OF
ENVIRONMENTAL FACTORS ON GONADAL
MATURATION OF GREY MULLET

The various environmental factors such as temperature, salinity, dissolved oxygen, pH and water transparency recorded in Adyar Estuary, Kovalam Backwater and Coastal waters of both

the study centres revealed that the temperature and salinity values were lower during the monsoon period which synchronises with the spawning season of all the grey mullet species. Majority of the grey mullet species spawn in low temperature ranges of 20.0-24.5°C and optimum salinity of 32-35 ppt and observations made by many earlier workers supports this view (Jhingran, 1958; Chaudhuri, 1968; Rengaswamy, 1975; Thomson, 1966). Grey mullets attain gonadal maturity in enclosed ponds and lagoons and undertake spawning migration towards sea and bar mouth of estuaries (Kurian, 1960, 1974; Sarojini, 1957, 1958). All published informations record a strong preference of ocean waters by the grey mullets for incubation (Nash and Shehadeh, 1980) which further confirms the present study.

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