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ABUNDANCE OF MILKFISH FRY IN RELATION TO LUNAR PERIODICITY IN THE NEARSHORE WATERS AROUND MANOLI ISLAND, GULF OF MANNAR*

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ABSTRACT

Observations on the occurrence of fry of milkfish *Chanos chanos* carried out at Manoli Island from April 1983 to June 1984 in relation to the lunar periodicity are presented in this paper. During this period 137,175 fry were obtained, with a peak occurrence in May. Large quantities of fry were collected during day time of new moon period. The study also indicated the peak occurrence of fry in the initial flow of water during high tide. The possibilities of large scale collection from the adjoining areas appear to be bright.

INTRODUCTION

COUNTRIES of Southeast Asia and also Central and South America have shown considerable attention towards enhancement of fish production through culture of suitable species. One of the main requirements for the successful culture, is the availability of large quantities of fish seed. Milkfish *Chanos chanos* (Forskål) is one of the promising cultivable fishes. Although attempts are being made on induced mass production of seed, the culture in India still remains primarily dependent on the seed availability from the wild.

Panikkar *et al.* (1952) made initial observations on the fry of milkfish in India. The Gulf of Mannar near Mandapam with a chain of Islands is well known as prosperous ground for finfishes and shellfishes, particularly for the cultivable fishes such as milkfish and grey mullets. Chacko and Mahadevan (1956) have reported on the availability, the collection and culture of milkfish in and around Krusadai and Rameswaram Islands with notes on its biology. Quantitative studies were undertaken by Prabhakara Rao (1970) for the proper evaluation of the seed resources at Pulicat Lake near Madras. Basu and Pakrasi (1976) studied the occurrences of milkfish larvae in the Bakkhali region of lower Sunderbans. Ramanathan and Jayamaha (1970) dealt with the collection, transportation and acclimatisation of *Chanos chanos* for pond culture in Sri Lanka. Tampi (1968) while making observations on the occurrence of fry and fingerlings of milkfish along the east and west coasts of India, pointed out that more systematic surveys along these coasts would reveal many other fry collection centres. Silas *et al.* (1980) studied the quantitative distribu-

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tion of fry of milkfish in space and time along both the coasts of India. Recently Dorairaj *et al.* (1984) have observed the Manoli Island (a sand cay) near Mandapam as one of the potentially rich milkfish collection grounds. They have also reported the method of collection and transportation of milkfish fry and fingerlings.

At Mandapam, where the resources of milkfish fry is known to be abundant, the extent of natural seed availability was sought to be ascertained in order to maximise their collection, taking full advantage of the habit of milkfish fry to enter coastal strips during spring tide ingress. In order to observe the variations in the occurrence of milkfish fry with special reference to lunar periods, the present study was carried out in the same Islands.

Material and Methods

The study was carried out from April 1983 to June 1984 from one of the tidal creeks located on the northern side of the beacon in Manoli Island. Milkfish fry samples and data on environmental parameters such as water temperature, salinity and dissolved oxygen with water level were collected (at hourly intervals) during the day and night on new moon, first and last quarters and on full moon days, as detailed in the next section.

Fry collection net : Milkfish fry were collected by fixing a shooting type of stationary net made out of nylon mosquito cloth across the entire width of the creek. The net consisted of two wings measuring 6 m length and 1.3 m in breadth and a cylindrical bag net. The head rope of the wing measured 14 m long. The bottom rope was provided with lead sinker 2 cm long and 1.5 cm in diameter. The cylindrical bag measuring 1 m diameter at its mouth was provided with three aluminium rings of 1 cm thick rod to keep the bag stretched. The diameter of the larger ring fixed at a distance of 2.5 m from the mouth of the net was 70 cm. Out of two smaller rings, which are of 25 cm in diameter, one is fixed at a distance of 2.15 m from the larger ring and the other at a distance of 50 cm from the second ring. The length of the cod end was made out of bolting silk. In between the second and third rings, special provision was also made for opening the top portion of the net of area 45×35 cm well fortified by a rectangular PVC pipe frame, to enable scooping out of collected fry periodically.

For positioning the net, 14 GI pipes of 2 m length and 2.5 cm in diameter were used. As already stated, the net was set up in such a way as to allow the water to flow only through the net. Each wing at the entrance to the bag portion of the net, PVC frame and the cod end had the support of 10 GI pipes. To minimise blocking by seagrass and seaweeds carried in by tidal flow, at the mouth of the creek a 3 cm mesh sized nylon net was fixed in front of the shooting net. The accumulated seagrass and seaweeds were removed periodically allowing the fry only to enter.

Fish seeds were collected at every 45 mts to 1 hr interval depending on the velocity of water flow from the beginning of high tide to its peak. The entire catch after each haul was transferred to a plastic tub and the milkfish fry were counted and measured along with the seeds of other fishes separately. The live milkfish fry so collected were transported to the mainland fish farm for rearing in culture ponds.

Observations

Lunar periodicity

During April 1983, 930 fry were obtained on the new moon, 150 in the first quarter, 7500 in the full moon and 2 in the last quarter. In May 1983, 22960, 4495, 12882 and 704 fry were recorded in the new moon, first quarter, full moon and last quarter respectively. During June '83, no fry was available in the first quarter,

whereas 704, 138 and 2017 were collected during the new moon, full moon and last quarter respectively. In July '83, September and November '83, 90, 13 and 8 fry were observed at new moon day only. During August, October and December '83 there was no occurrence of fry in the lunar periods.

In January '84, no observation was made during the new moon due to rough condition of the sea. There was no occurrence of fry in the full moon. During February '84, fry were not obtained in both the periods. In March '84, 28 fry were collected during the full moon, whereas no observation was made in the new moon due to unfavourable weather. During April '84, 12395 fry were recorded on the new moon day and no observations were made on the rest of the periods. About 64650 fry on the new moon day and 7500 on the full moon day were obtained in May '84. During the first and last quarter, no collection was done due to the rough sea condition. In June '84, only 14 fry were collected during the full moon and in the new moon no milkfish fry could be obtained. Due to rough condition of the sea, no observations were made in the first and last quarter.

Diurnal periodicity

During the period of observation, 16 day and 10 night collections were made on the new moon, 5 day and 2 night collections in the first quarter, 19 day and 10 night hauls on the full moon and 4 day and 3 night collections in the last quarter. A total number of 91345 fry in the new moon, 3520 in the first quarter, 25523 in the full moon and 2605 fry in the last quarter were obtained in the day collection. During night time, 10400, 1125, 2539 and 118 fry were recorded in respect of the above lunar periods (Fig. 1).

Occurrence of fry in relation to tidal flow

In order to observe the abundance of fry in relation to the tidal flows, three levels of flow such as initial, mid and peak flow were taken into consideration. During the new moon, 44165 nos in the initial, 40174 in the mid and 17406 fry in the peak flow were recorded. A total of 600, 3570 and 475 fry were obtained in the initial, mid and peak flow respectively during the first quarter. During the full moon, the occurrence of fry in the initial, mid and peak flow were 9043, 14400 and 4619 respectively. On the other hand, 311, 2143 and 269 fry were collected in respect of initial

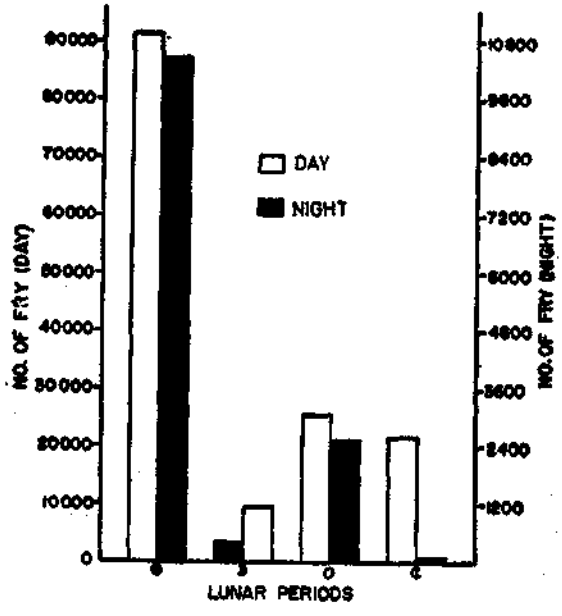

FIG. 1. Diurnal variations in the occurrence of milkfish fry.

mid and peak flow of water during the last quarter. The average number of fry collected per month were 2944 in the initial, 2678 in the mid and 1160 in the peak flow on new moon, 40, 238 and 32 in the initial, mid and peak flow respectively in the first quarter, 603 in the initial, 960 in the mid and 808 in the peak flow during full moon and 21,143 and 18 fry in the initial, mid and peak flow respectively during the last quarter.

By adopting this method, a total number of 8582, 41041, 2859 and 90 milkfish fry were collected during April, May, June and July 1983, respectively. In August, October, December 1983, January and February 1984, ingress of fry was either negligible or totally absent. During September, November '83, March and June '84, very few fry were observed

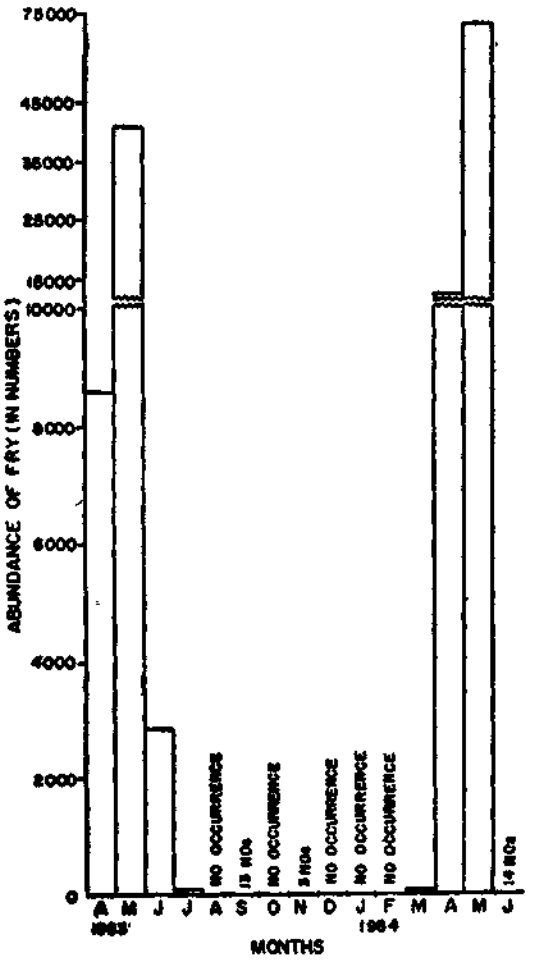

FIG. 2. Monthwise occurrence of milkfish fry.

(13, 3, 28 and 14 fry respectively). In April and May '84, a total number of 12396 and 72150 fry were collected. During the entire period under investigation, about 137175 fry of the size ranging between 10 mm and 21 mm were obtained. The peak abundance of fry appeared in May (Fig. 2).

Hydrological conditions

During the whole period of observation, the temperature of surface water in the creek ranged between 21.0 and 39.0°C, salinity from 26.63 to 44.28 ppt and dissolved oxygen from 1.15 to 6.95 ml/l during night time. The variations at day time were 28.0 to 41.0°C, 25.27 to 45.73 ppt and 1.15 to 11.31 ml/l for water temperature, salinity and dissolved oxygen respectively (Table 1).

Occurrence of other fish seeds

During the period of observation, 10698 (10-72 mm) seeds of *Valamugil seheli*, 407 (15-75 mm) *Liza macrolepis*, 1665 (11-50 mm) *L. vaigiensis*, 111 (13-75 mm) *Silago sihama*, 2786 (10-68 mm) *Gerres* spp., 27603 (8-16 mm) prawn mysis, 1138 (13-80 mm) *Penaeus indicus*, 906 (10-60 mm) *Elops* spp., 3786 (7-75 mm) *Therapon* spp., 31 (14-66 mm) *Ambassis* spp., 362 (14-46 mm) *Metapenaeus* spp., 44 (10-35mm) *Siganus* spp., 26 (22-79 mm) *Sphyraena* spp., 79 (12-51 mm) crabs, 101 (31-67 mm) *Allonetta* spp., 16 (22-84 mm) *Lutianus* spp., 17 (19-86 mm) *Caranx* spp., 22 (19-55 mm) *Gobids*, 56 (9-40 mm) *Sepia* spp., 96 (10-60 mm, bufferfish and 42 (10-32 mm) *Stolephorus* spp) seeds were also obtained.

DISCUSSION

Saha *et al.* (1964) stated that the occurrence of milkfish larvae was from April to September with peak abundance in May. The existence of two peaks (*i.e.* April and September) of milkfish larval ingress at Pulicat Lake (Prabhakara Rao, 1970) was in conformity with the observations made by Delsman (1926), Saanin (1954) and Thiemmedth (1954). A secondary peak in the Coromandal Coast during October-November was reported by Ganapati *et al.* (1950). Basu and Pakrasi (1976) mentioned

that milkfish larvae were available from April to June with peak in May which is quite in agreement with the present observations. Record of fry during November is also in conformity with the observations of Panikkar *et al.* (1952).

fry was abundant during the new moon period. The abundance of fry on new moon days in the present observation coincided with the findings of Chacko and Mahadevan (1956) and Prabhakara Rao (1970). The occurrence of more fry in day time than at night in the

TABLE 1. *Hydrological parameters during observation periods*

Month	Night			Day		
	Surface temperature (°C)	Salinity (ppt)	Dissolved oxygen (ml/l)	Surface temperature (°C)	Salinity (ppt)	Dissolved oxygen (ml/l)
Apr. '83 ..	27.8—39.0	34.1 —40.8	2.94—6.95	34.8—41.0	34.58—36.66	6.49—6.71
May ..	28.0—33.0	26.63—36.85	2.53—5.25	32.0—40.8	25.27—34.70	4.04—11.3
June ..	26.8—34.4	33.28—44.28	1.72—3.46	28.0—38.0	32.24—45.73	1.31—7.91
July ..	———	———	———	32.2—35.2	34.29— 37.30	3.65—5.35
Aug. ..	———	———	———	32.0—34.8	35.82—39.47	2.65—5.20
Sept. ..	———	———	———	32.0—34.0	36.40—38.32	3.33—4.15
Oct. ..	———	———	———	37.0—39.0	35.55—35.84	3.70—7.94
Nov. ..	———	———	———	34.0—34.2	33.28—34.52	4.56—7.05
Dec. ..	———	———	———	32.0—33.1	34.82—36.25	3.20—8.32
Jan. '84 ..	———	———	———	29.0—30.0	32.50—32.10	5.20—7.80
Feb. ..	———	———	———	30.0—32.4	28.25—33.56	2.20— 4.1
Mar. ..	———	———	———	32.0—33.0	32.10—36.12	3.13—5.16
Apr. ..	26.0—30.0	30.15—34.67	1.15—4.16	31.0—39.4	31.25—40.15	1.98—5.15
May ..	21.0—33.0	28.23—36.19	2.25—6.56	31.4—40.0	33.22—40.16	1.15—9.16
June ..	27.0—29.6	32.88—43.22	3.13—5.00	29.2—31.0	30.22—35.12	1.56—6.98

Observations on lunar periodicity on larval catch by Basu and Pakrasi (1976) did not indicate any specific bearing on its abundance in any particular lunar phase. Ramanathan and Jayamaha (1970) reported that the collections of milkfish fry were generally more on full moon and new moon days than in the first and last quarter. Chacko and Mahadevan (1956) and Prabhakara Rao (1970) have mentioned that the occurrence of milkfish present observation, is also in agreement with the reports of Prabhakara Rao (1970).

Basu and Pakrasi (1976) reported that the first hour catch from the onset of high tide was maximum followed by the second hour, while the third hour catch was insignificant. But there is no such similarity observed in the present study, where maximum fry occurred during initial flow at one occasion and during the mid flow at other times.

Schuster (1958) stated that milkfish is known to tolerate the temperature upto 40°C. Prabhakara Rao (1970) reported that there was a positive correlation between surface temperature and *Chanos* fry in the temperature range of 26.5 to 30.3°C and the fry appeared in the optimum salinity of 34.3 to 34.4 ppt. Ramanathan and Jayamatha (1970) have mentioned that the fry collections were more, when the salinity of the water was about 36-38 ppt and the temperature at 32°C. Basu and Pakrasi (1976) mentioned that the abundance of *Chanos* larvae have been noted at the surface temperature of 30.5 to 31.1°C with the salinity tolerance between 34.55-34.59 ppt. The results of the present study indicated that *Chanos* fry were more in the surface temperature range of 21.0 to 41.0°C, salinity of 25.27 to 45.73 ppt and the dissolved oxygen of 1.15 to 11.31 ml/l.

From the results of the present investigation, it may be confirmed that greater number of *Chanos* fry can be collected in day time during new moon periods in April-June.

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