

The very high rate of growth of juvenile *P. indicus* observed during the present study is corroborated by the work of Suseelan (1975) who has also reported a very fast rate of growth for *P. indicus* juveniles stocked in the salt pan reservoirs at Manakkudy; he found that the juveniles between 68 mm and 123 mm in length grew at the rate of 1 mm/day.

The fast rate of growth observed in *P. indicus* cultured in brackishwater ponds without any supplementary feeding is likely to be true of the natural population of *P. indicus* in estuaries and backwaters as well. In fact, the growth rate may be faster under natural conditions because the population density will be much less than 5/m<sup>2</sup> and they can roam over a larger area in search of food.

The present observations at Narakkal, therefore, have relevance to the estimation of the age of natural prawn populations. The development of *P. indicus* from egg to the first postlarval stage takes about 10 days (Muthu *et al.*, 1976) and from the first postlarval stage to the stocking size of 15-20 mm it takes about 20 days (present observation). Hence the prawns which were stocked were about one month old. They attained a length of 128 mm in 112 days or about 130 mm in about 4 months. So the 130 mm prawns were actually only 5 months old.

Similarly our experiment with *M. dobsoni* reveals that this species which is recruited into the marine fishery at a modal size of about 61-65 mm (George, 1961) is only 4 months old at the time of recruitment.

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### NOTE ON THE ABUNDANCE OF ZOOPLANKTON AND TRAWLER CATCH DURING THE POSTMONSOON MONTHS ALONG THE NORTHWEST COAST OF INDIA

#### ABSTRACT

Zooplankton samples collected during the cruises of M.V. *Matsya Vigyani* from October to December 1977 from the northwest coast of India were utilised for the study of the faunal composition, variation in their abundance, distribution and their relationship with the fishery. Estimated zooplankton biomass in the area 20-71 followed by 20-70 and this was due to a higher density of *Salps* spp. where they outnumbered the copepods. Copepods were dominant in the areas 18-72 (98%), 17-72 (87.5%), 19-71 (80.7%) and 17-72 (55.6%). *Evadne* sp. (39%) was next to copepods in the samples collected in the area 17-72 south of Bombay. The percentage composition of various groups of zooplankton in different areas is given. The fish catch/hour was maximum in the area 19-71 (366.7 kg/h) followed by the area 18-72 (354.8 kg/h) in October which was the most productive month for the zooplankters.

THE EARLIER studies on Zooplankton in the Indian waters have been reviewed by Panikkar and Rao (1973). Plankton abundance from Tuticorin to Ratnagiri area was studied by Menon and George (1977), from Quilon to Calicut by Nair *et al.* (1977), from Karwar to Vengurla by Goswami (1977) and Goa to Bombay by Bhargaya *et al.* (1973). Zooplankton of Bombay area was investigated by Bal (1945), Sudarsan (1964) and Pillai (1968). The north western zone which contributes a good share to the total fish landings has not been studied in detail for its plankton biomass. Some features of the zooplankton abundance along the northwest coast of India based on *R.V. Gaveshani* cruises have been reported by Nair *et al.* (1978) and Paulinose and Aravindakshan (1977) and plankton of Gulf of Kutch (Port Okha) area by Bhaskaran and Gopalakrishnan (1971). In this note the zooplankton distribution in the area between Ratnagiri and Veraval in relation to trawler catches during the postmonsoon months is presented.

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#### MATERIAL AND METHODS

Zooplankton samples collected during the cruises of *M.V. Mathsya Vigyani* during the postmonsoon months of October-December 1977 along the northwest coast of India formed the material for this study. Thirty seven samples of zooplankton were collected by surface hauls each lasting for 10 minutes by using a 0.5 m diameter conical net without flow meter. The location of the sampling stations are shown in Fig. 1. The zooplankton volume was determined by displacement method. Groupwise analysis of the sample was made and enumerated.

Seawater samples were collected simultaneously with the zooplankton sampling from surface for the estimation of salinity and dissolved oxygen. The temperature was also recorded.

#### HYDROGRAPHY

The mean values of temperature, salinity and dissolved oxygen content of surface water collected during October-December 1977 in different areas are given in Table 1. In October 1977, the surface temperature and salinity values in the region from Bombay to Veraval were more or less uniform, but a slight increase in salinity in the northern area was observed. The decreasing trend in salinity from north to south during November and December was observed in the northern region in the surface water.

#### Zooplankton

Analyses of zooplankton samples showed that the biomass was highest in the area 20-71 (22.6 ml) followed by 20-70 (12.4 ml) and 19-71 (7.0 ml). Least value was recorded from the area 19-72 (5.3 ml). From Table 1, it is clear that zooplankton organism collected from north of Dhanu differed considerably in volume and percentage composition from the samples collected from south of Dhanu.

In October, the zooplankton composition in the 20-70 and 20-71 was notable when compared to other areas. The dominant group was *Salpa* spp. which comprised 95.6% of zooplankton followed by copepods (3%) chaetograths (0.5%), amphipods (0.4%), decapod larva (3.3%) and medusae (0.2%). The salps were represented by *S. democratica* and *S. cylindrica* of which the former dominated the samples. Maximum numbers of *Salpa* spp. were recorded in distant waters

of the area 20-70 than the near coastal water area (20-71).

The dominance of copepod was observed during October in the area 19-72 followed by 19-71. In the area 19-72 the order of

of the area 19-71. Salps increased again occupying the second place with 15.4% followed by chaetograths (2.2%), ctenophore (1.5%) and Medusae (0.2%). When *Salpa* spp. dominated the samples the presence of copepod and other organisms was poor. As

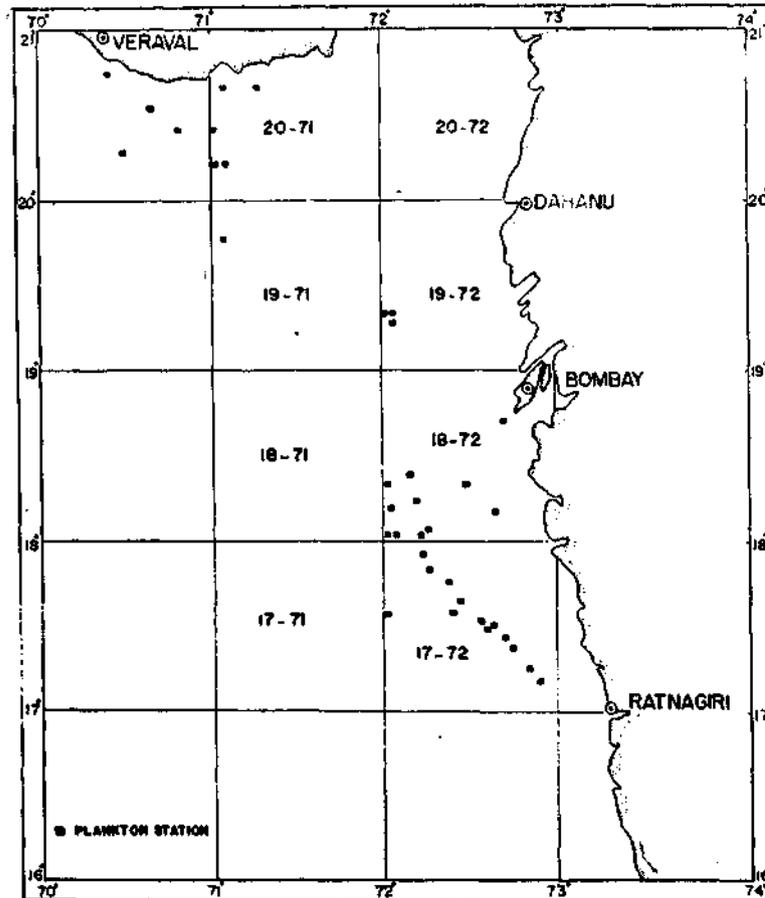


Fig. 1. Map of the area studied and stations from where samples collected.

zooplankton abundance was copepod (85.4%) followed by *Salpa* spp. (4.6%), *Oikoplura* (3.8%), Medusae (3.1%), Chaetognatha (2.7%) and others (0.4%).

Copepod still dominated, but to a lesser degree (80.7%) in the zooplankton

in the case of previous observation the salps were more in offshore waters in the area 19-71 (15.4%).

Analyses of seven plankton samples in the area 18-72 near Bombay and six samples in the area 17-72 south of Bombay collected

TABLE 1. *Areawise zooplankton biomass, fish catch and hydrological parameters observed along the northwest coast during October - December 1977*

Months	October				November			December		
	20-70	20-71	19-72	19-71	18-72	17-72	18-72	17-72	17-71	18-71
Salinity (‰)	36.0 (35.8-36.3)	35.9 (35.7-36.4)	36.2 (26.2-36.3)	35.9 (35.9-36.0)	34.92 (34.2-35.7)	34.88 (33.8-35.7)	34.46 (33.7-35.5)	34.92 (34.92-35.5)		
Dissolved Oxygen (ml/l)	4.27 (3.1-5.2)	4.64 (4.2-4.8)	4.4 (4.1-4.7)	4.70 (4.4-5.0)	3.7 (3.0-4.4)	4.40 (3.1-5.7)	4.34 (2.9-5.6)	4.8 (3.8-4.7)		
Atmospheric temp.(°C)	29.0 (28.7-29.1)	28.9 (28.8-29.3)	29.1 (28.9-29.3)	29.1 (28.9-29.1)	27.3 (27.0-27.4)	27.3 (27.0-27.6)	27.12 (27.1-27.2)	27.3 (27.1-27.5)		
Sea Surface Temp(°C)	29.3 (29.0-29.6)	29.3 (29.1-29.6)	29.4 (29.2-29.6)	29.3 (29.2-29.4)	27.5 (27.4-27.6)	27.4 (27.2-27.7)	27.1 (27.1-27.2)	27.5 (27.1-27.4)		
Zooplankton (ml)	12.4	22.6	5.3	7.0	5.3	4.1	4.4	11.6		
Samples analysed	4	5	2	2	7		6	5		
Total fish catch (kg)	2982	2750	1080	4877.5	13484	7523	995	776	160	654
Catch/hour (kg)	(152.9)	(229.16)	(180.0)	(366.7)	(354.8)	(206.0)	(65.0)	(50.7)	(53.3)	(80.2)

NOTES

in November showed that copepod were the dominant group in both the areas, whereas it was higher in 18-72(87.5%). when the salinity and temperature decreased remarkably in November the contribution of chaetognath increased (9.6%, 8.5%) in the areas 17-72 respectively. Except the occurrence of cladoceran (28%) in 17-72 the density of other organism in both areas was more or less same. The total biomass was 5.3 ml and 4.1 ml respectively in areas 17-72 and 18-72.

In December, copepod continued to dominate the zooplankton samples in the areas 17-72 and 18-72 being 55.6% and 98% respectively. Cladocern, *Evadne* sp. increased again occupying second place with 39.0% in the area 17.72. Juveniles of *Acetes indicus* one of the non-penaeid prawn of Maharashtra and *Pegea confederata* of the salps were recorded in small numbers in both the areas.

#### Fishery

*M. T. Matsya Vigyani* of Fishery Survey of India operated 45 m two seam bottom trawl. In October the vessel surveyed four areas. The catch/hour (366.7 Kg/h) was maximum in the area 19-71 followed by the area 20-71 (229.16 kg/h). In November the catch per hour was maximum (354.8 kg/h) in the area 18-72 where zooplankton was 5.3 ml. Catch / hour was minimum in December (80.2 kg/h). Based on the zooplankton biomass and fish catch the area north of Dahanu can be considered as more productive (20-70 and 20-71).

#### Major trawl fishes

Small sciaenids were the dominant group in the areas surveyed in October north of Dahanu and its percentage composition ranged from 38.6% to 69.4%. The

maximum was observed in the area 19-72. Its abundance was moderate to poor during November and December in the area trawled. Secondly catfish was fairly abundant in the areas 18-72(73.9%) and 17-72 (55.9%). The areas south of Bombay upto Ratnagiri was observed to be comparatively better in cat fish while north of Bombay they occurred in small quantities. Elasmobranchs were obtained in moderate quantities from all the areas, but its occurrence was relatively higher in the areas 17-71 (42.5%) and 17-72 (20.9%). *Nemipterus japonicus* was maximum in the area 18-72 (25.2%) followed by the area 19-72(13.2%), 18-71(12.2%) and 20-70(11.2%). *Upeneus* spp. were also observed in small quantities in all the areas and relatively higher abundance was noticed in the area 17-72 (5.0%). *Trichiurus* spp. were represented in small quantities; maximum in the area 20-70 (7.6%). The occurrence of *Polynemus* spp. was maximum in the areas 20-71 (5.0%) followed by 19-71 (2.9%) and 20-70 (2.8%). Generally the Cephalopods were poor; higher abundance was noticed in the area 18-72 (18.1%) and 17-71 (15.6%).

The percentage composition of pomfrets ranged from 0.9 to 9.2% and maximum catch was obtained in the area 18-71. Even though *Pomadasyss hasta* was represented in small quantities and its maximum was in December in the area 17-72 (11.0%). Penaeid prawns, lobsters and sand lobsters formed a small percentage particularly in October. *Rastrelliger kanagurta* was observed in very small numbers in the area 18-72 in November. Thirty one numbers of juveniles of mackerel of size range from 73-88mm in total length were observed in the area 17-72. Species of *Pellona*, *Chirocentrus*, *Saurida tumbil*, *Lutianus*, *Sphyraena*, *Pseudosciaena*, *Caranx*, *Lactarius*, *Platycephalus*, *Cybium*, *Gynoglossus*, *Psettodes* were represented in small quantities.

## DISCUSSION

Coastal upwelling during October-November in the Bombay area has been proved to influence the productivity of these waters (Carruthers et al., 1959). Bal and Pradhan (1945) have mentioned that plankton of Bombay showed an appreciable increase after monsoon months. The IIOE atlas (IOBC, 1968) also gives high biomass values for the northwest coast of India. Sudarsan (1964) concluded that trawler catch of Bombay showed two peaks in a year one following the period of plankton maximum in March and the other coinciding with the period of very high plankton crop during postmonsoon months upto October/November. The present period of zooplankton study fall under the upwelling period and the observed high zooplankton production agrees with earlier observation.

Several attempts have been made to study the relationship between plankton

production and fish catch (Chidambaram and Menon, 1945; Pillai, 1968; Sudarsan, 1964; Panikkar and Jayaraman, 1966 and Mukundan, 1967) and they revealed that high catch coincided with the period of high plankton standing crop. The high zooplankton production and a good catch rate per hour in areas 19-71, 20-71 and 18-72 in October-November of the present study are in the agreement with earlier observation. There was a northward increase in the catch rate for all categories of fishes from 18° N latitude zone with 263.89kg/h to 22° N latitude zone with 346.62 kg/h as reported by Rao (1973). The present study revealed that zooplankton biomass was increasing towards the northern region with the maximum abundance off Veraval. The inverse relationship between salps and other zooplankton were observed in the samples collected in the area 20-70 and 20-71. When salps were abundant in two of the sampler (99.4%) and 95.3% the occurrence of other organisms was meagre being 0.6 and 4.7% respectively.

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### OCCURRENCE OF PEACRABS *PINNOTHERES GRACILIS* BURGER AND *P. ALCOCKI* RATHBUN AT KAKINADA

#### ABSTRACT

Peacrabs *Pinnotheres gracilis* Burger and *P. alcocki* Rathbun associated with bivalves *Amusium pleuronectes* (Linnaeus) and *Anadara granosa* (Linnaeus) respectively are described in detail. These two molluscs are the new hosts recorded and *P. alcocki* is recorded for the first time from Indian waters.

It is well known that Pinnotherid crabs are associates of various host animals representing most of the larger phyla, in temperate and tropical waters. A number of bivalves occurring at Kakinada were found to be commensalised by peacrabs. These crabs were identified as *Pinnotheres gracilis* Burger and *Pinnotheres alcocki* Rathbun.

#### *Pinnotheres gracilis* Burger (Fig. 1)

*Pinnotheres gracilis* Burger 1895, p. 368-369; Tesch 1918, p. 249; 253; Pillai 1951, p. 26; Silas and Alagarwami 1967, p. 1199; George and Noble 1968, p. 392.

**Material:** 3 females - One Ovigerous and two 2nd stage females from the mantle cavity near the inhalent siphon of *Amusium pleuronectes* (Linnaeus) collected from the commercial trawlers of Kakinada.

**Host:** Previous records of this crab are from the hosts *Solen* spp. and *Katelysia opima*.

This is the first record from the host *Amusium pleuronectes*.

**Distribution:** This species has been reported from Indian waters by George and Noble (1968) along the west coast of India. The present report extends its distribution to the east coast.

**Remarks:** Length of the carapace ranges from 3 to 7 mm; ratio of length of carapace to the breadth of carapace 1:1.09; of dactylus to length of upper border of palm 1:1.66; of dactylus to width of palm 1.5:1; dactylus of external maxilliped almost reaches the propodus. Second pair of legs and dactylus of the same the longest. Asymmetry in walking legs observed even in 3 mm size crab, legs on the right side being longer than those of the left side.

Incidence of infestation is 2% and the length (Dorso-ventral measurement) of the