

Diet of *Parapenaeopsis stylifera* (H. Milne Edwards) from Mangalore Region

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Parapenaeopsis stylifera, an important penaeid shrimp caught along Mangalore coast was taken for the study of its diet. The stomach contents of 3197 specimens, of which 68.75%, females and 31.25% males, were analysed. The analysis of gut contents indicated *P. stylifera* to be an omnivorous bottom feeder. The stomach contents mainly consisted of crustaceans, mud and detritus, vegetable matter, gastropods, bivalves, diatoms and sand particles. *P. stylifera* was also found to feed on polychaetes. Juvenile shrimp fed more on diatoms and vegetable matter while adult fed mainly on crustaceans, mud and detritus. Higher feeding intensity occurred with sexual maturity of shrimp.

Key words : *P. stylifera*, Diet, Mangalore coast.

India is the largest producer of shrimps through capture fisheries, sharing over 10% of the total global capture shrimp output. *P. stylifera*, popularly called as "Karikkadi" in India, constitutes an important shrimp fishery along Mangalore coast. It contributes about 18% by volume to the total shrimp landing in India (Bal & Rao, 1990).

Although, *P. stylifera* is commercially important and considerable knowledge on the diet of *P. stylifera* has been accumulated, published information regarding their diet from Mangalore region is limited. In this communication,

the results of an investigation on the diet of *P. stylifera* from Mangalore region are presented, based on studies carried out during 1990-1992.

Materials and Methods

Weekly samples of *P. stylifera* were obtained from the commercial catches landed by shrimp trawler over a period of 2 years from November 1990 to October 1992. Of the 3,197 specimens examined, 999 were males and 2478 were females. Samples were not procured between June and October of both years during which trawl fishing operation remained suspended.

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Both qualitative and quantitative analysis were carried out to study the stomach contents. The qualitative analysis consisted of identification of all the organisms in the stomach contents. The identification of different items was mostly upto group level, as most of the items were in the advanced stage of digestion, rendering specific identification difficult. Digested animal and plant matter found mixed with mud in the stomach was treated as "mud".

Quantitative analysis was done by points volumetric method (Hynes, 1950., Pillay, 1952). The stomach contents were washed thoroughly into a petridish and points awarded depending on the relative volume of each food item taking the extent of fullness and the amount of food in the stomach, into consideration. The fullness of stomach, in this study,

was classified as gorged, full, $\frac{3}{4}$ full, $\frac{1}{2}$ full, $\frac{1}{4}$ full, little and empty.

Volume points were allotted for each item of foods out of 100 volume points in each stomach. From these values monthly average and percentage were computed.

The intensity of feeding was determined by the degree of distension of the stomach and expressed as full, $\frac{3}{4}$ full, $\frac{1}{2}$ full, $\frac{1}{4}$ full, little and empty. From the total number of shrimps examined in the month, the percentage occurrence of stomachs with different intensity of feeding was computed.

Results and Discussion

Percentage composition of prey of *P. stylifera* by month are presented in Table 1. Data indicated that smaller crustaceans (17.75%), larger crustaceans

Table 1. Percentage composition of the gut contents of *Parapenaeopsis stylifera* from November 1990 to May 1992

Food items	Smaller Crustaceans	Larger Crustaceans	Bivalves	Gastropods	Polychaetes	Vegetable matter	Diatoms	Sand particles	Mud & Detritus
Months									
Nov. 90	22.04	18.02	4.02	3.65	2.50	6.01	2.78	15.00	26.00
Dec.	24.03	21.02	6.01	3.01	3.03	7.61	1.80	11.49	22.00
Jan. 91	20.02	16.50	5.04	4.04	3.12	5.51	2.25	12.00	31.52
Feb.	19.00	15.25	2.52	2.04	8.80	8.52	2.44	13.18	30.25
Mar.	17.02	18.21	6.22	7.30	6.52	4.40	1.02	10.31	29.00
Apr.	10.62	17.20	4.62	5.60	10.60	3.56	10.98	11.32	35.50
May	11.52	15.62	5.78	4.62	9.29	4.85	1.12	13.50	33.62
Nov.	20.50	17.30	3.82	2.45	2.50	7.01	1.82	10.08	34.62
Dec.	24.01	20.05	4.02	4.01	1.86	8.26	1.97	9.82	26.00
Jan. 92	19.62	17.58	3.46	2.62	3.02	8.05	1.02	10.65	34.00
Feb.	16.65	13.52	3.01	2.56	7.20	10.25	1.06	12.65	33.10
Mar.	19.02	20.65	4.78	2.08	1.57	9.82	0.99	11.08	30.03
Apr.	13.05	18.60	5.62	5.61	9.75	2.65	1.82	11.05	33.01
May	14.60	18.20	4.40	3.30	9.30	2.60	1.30	11.00	35.30

(16.71% & 17.39%), vegetable matter (5.87% & 6.33%), polychaetes (5.89% & 4.59%), gastropods (4.32% & 2.95%), bivalves (4.80% & 4.24%), diatoms (1.56% & 1.16%), sand particles (12.37% & 10.75%) and mud and detritus (17.78% & 13.23%) respectively were the % composition of diet for the period 1990-91 and 1991-92. It should be noted that copepods, mysids and amphipods formed important constituent of smaller crustaceans, while smaller crabs, prawn larvae, crustacean appendages and other crustacean remains formed the important items in larger crustacea.

The occurrence of various food items in the stomach contents of *P. stylifera* for different size groups are

presented in Table 2. It is clear that mud and detritus are the most dominant food items of all the size groups observed.

In 1990-91, the percentage occurrence of empty stomachs ranged from 24.51% (March) to 47.6% (February) (Table 3). During 1991-92, empty stomachs occurred between 11.96% (December) to 39.26% (May). The percentage occurrence of actively fed shrimps was 6.11% (May) to 22.66% (January) during 1990-91; while in 1991-92, the percentage was in the range of 21.85 (May) to 27.33% (December).

The major food items identified in the gut contents of *P. stylifera* specimens, were crustaceans, mud and detritus,

Table 2. Percentage composition of gut contents of *Parapenaeopsis stylifera* in different size groups from November 1990 to May 1992

Food items Size group	Smaller crustaceans	Larger crustaceans	Bivalves	Gastropods	Polychaetes	Vegetable matter	Diatoms	Sand particles	Mud & detritus
51-55	28.25	9.50	1.26	1.00	2.00	13.00	15.00	6.00	25.00
56-60	30.00	8.80	2.00	2.00	1.82	11.00	12.00	6.52	26.00
61-65	26.05	9.76	2.02	2.82	2.56	6.12	8.60	12.06	30.02
66-70	25.01	10.02	25.50	3.01	1.82	6.62	6.12	10.22	35.62
70-75	19.20	15.62	3.02	4.08	4.02	8.62	1.82	15.02	28.62
76-80	16.52	15.00	4.05	4.01	6.35	8.12	2.30	13.60	30.05
81-85	18.01	15.82	3.60	2.48	6.25	9.10	1.80	15.62	28.08
86-90	19.05	16.65	4.02	6.00	4.35	10.43	0.92	14.08	25.78
91-95	16.25	19.65	3.08	3.10	5.62	9.48	0.80	12.24	30.78
96-100	13.56	22.14	4.08	2.21	9.00	11.25	0.56	18.25	28.94
101-105	15.02	21.56	1.56	3.62	6.05	5.75	0.70	15.02	30.72
106-110	14.76	22.28	2.80	3.52	5.60	6.42	0.24	21.02	23.56
111-115	13.56	21.56	3.62	4.02	4.96	6.26	0.92	18.06	26.10
116-120	16.68	23.62	2.60	2.25	6.60	7.20	1.10	15.06	27.25
121-125	18.05	20.02	2.60	2.62	6.75	3.62	0.26	18.00	29.19
126-130	15.52	25.05	1.65	0.98	2.75	4.82	1.02	17.09	31.12
131-135	14.52	26.06	2.32	1.72	3.62	6.01	1.05	16.10	29.60

Table 3. Percentage index of fullness in the stomach of *P. stylifera* from November 1990 to May 1991 and November 1991 to May 1992.

Months	No. of shrimps examined	Condition of stomach						
		Full	¾	Full½	Full¼	Full	Little	Empty
Nov. 90	100	3.00	3.00	17.00	41.00	9.00	27.00	
Dec.	223	2.24	2.24	8.96	50.00	2.69	32.42	
Jan.	172	3.48	4.65	14.53	43.60	2.00	30.81	
Feb.	242	2.60	4.30	5.20	38.10	2.20	47.60	
Mar.	259	4.00	3.20	4.80	63.60	0.40	24.50	
Apr.	249	2.40	1.20	8.83	56.62	0	30.92	
May	264	0.30	1.51	4.30	56.00	0	36.90	
Nov.	255	4.70	7.05	10.19	52.54	1.17	24.31	
Dec.	234	5.12	5.93	16.23	60.68	0	11.96	
Jan. 91	262	5.80	5.40	13.20	54.20	0.20	21.30	
Feb.	252	5.95	6.34	18.65	55.92	4.00	9.12	
Mar.	224	4.46	6.66	11.60	60.71	1.33	15.77	
Apr.	244	4.09	5.73	14.75	50.00	0.82	24.59	
May	219	3.60	7.30	10.95	38.81	0	39.26	

vegetable matter, gastropods, bivalves, diatoms and sand particles. Similar observations have been recorded by Dall (1968). The occurrence of a variety of food items in the diet of this species suggests that it is an omnivorous feeder, which is in conformity with various other workers (Menon, 1953; George, 1974; Subramanyam, 1974; Kuttyamma, 1974; Moriarty & Barclay, 1981; Achuthankutty & Purulekar, 1986; Sudhakar Rao, 1988). Several workers are of the opinion that shrimps are detritus feeders (Hindley, 1975; Dall *et al.*, 1990). In this study *P. stylifera* was found to feed on detritus and also on appreciable quantities of crustaceans and molluscs. Thus, it can be concluded that detritus forms one of the major food items in the diet of *P. stylifera* followed by crustacea and molluscs. Such observations have also been recorded by

various workers (Rao, 1967; Flint & Robalais, 1981; Achuthankutty & Purulekar, 1986; Dall *et al.*, 1990). However, contrary to the findings of this study some workers are of the opinion that penaeids are selective in their feeding habit (Hall, 1962; George, 1974). Detritus contains enormous quantities of microflora and meiofauna which may be an ideal food for penaeid shrimps (Dall, 1968). However, it is difficult to assess the nutritional role of detritus (Robertson, 1988).

Foraminiferans have been found to be the most common food items of different penaeid species in Philippines (Tiews *et al.*, 1972). However, contrary to this, stomach content analysis in this study did not reveal any dominance of foraminiferans. This underlines the conflicting opinion that exists regarding the diet of individual species of penaeids, among the researchers (Dall *et al.*, 1990).

The negligible quantity of diatoms encountered in the gut contents of adult *P. stylifera* as compared to the juveniles, suggests low consumption of diatoms by the adults. Similar trend was observed with respect to the vegetable matter also. This is in conformity with the findings of several workers in different penaeids (George, 1974; Subramanyam, 1974; Chang & Sasekumar, 1981; Robertson, 1988). Several workers have also reported plant material or vegetable matter as one of the major food items of juvenile penaeids (Kuttyamma, 1974; George, 1974; Thomas, 1980; Mohanty, 1975). But in present study vegetable matter was not a significant food item.

Crustacean remains identified in the diet of *P. stylifera* may be trawl discards (Flint & Robalais, 1981) and penaeids

have been thought to be the main scavengers of trawl discards in Gulf of Mexico (Sheridan *et al.*, 1981). However, direct observation in Australian waters have disproved the fact that trawl discards are an additional food source (Dall *et al.*, 1990)

In the study *P. stylifera* did not exhibit significant presence ($P < 0.05$) for any of the food items. Similar observations have been recorded by several workers (Dall, 1968; Ruello, 1973; Achuthankutty & Purulekar, 1986). But, many workers have claimed that penaeids feed selectively on food items (Karim & Aldrich, 1976; George, 1974; Balasubramanyam *et al.*, 1979; El-Hag, 1984; Hill & Wassenberg, 1984). A statistically significant occurrence ($P > 0.05$) for polychaetes, decapods, tintinids and crustaceans over other crustaceans was reported in the case of *P. duorarum* (Nelson, 1981). But, in the present study preference by *P. stylifera* for any food item was not significant ($P < 0.05$).

Higher feeding intensities coincided with the attainment of sexual maturity thus indicating the influence of feeding intensity on gradual maturation. However, the observations of other workers reveal that the feeding intensity is influenced by tidal phenomenon (Sastrakusumah, 1971; Luna Marte, 1980).

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