

FOOD AND FEEDING HABIT OF A PENAEID PRAWN
METAPENEOPSIS STRIDULANS (ALCOCK 1905)¹

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Metapeneopsis stridulans feeds on a variety of food items, viz. diatoms, foraminiferans polychaetes, molluscs, crustaceans and detritus consisting of unidentifiable decaying matter along with sand and mud. The species does not show a preference for any particular food item. There is no significant difference in the food habits among the various size groups observed in the prawn. Monthwise feeding intensity for males and females shows males with empty stomach to be prevalent in most months.

INTRODUCTION

Food and feeding habits help to understand the rate of growth, population concentration, maturation of gonads and other metabolic activities of marine organisms. They also help to find links in the food chain and predator-prey relationship in the particular habitat where these organisms occur. Some of the important contributions on food and feeding habits of prawn are of: Williams (1955) on a North American shrimp; Eldred *et al.* (1961) on *Penaeus duorarum*, Hall (1962) on the food of Indo-West Pacific penaeids, Dall (1967) on Australian penaeid prawns. Tiews *et al.* (1972) on Philippine shrimp and Wassenberg and Hill (1987) on the natural diet of Tiger Prawn *Penaeus monodon*. In spite of investigations on food and feeding habits of some Indian marine prawns (Panikkar and Menon 1956, Kunju 1967, George 1959 & 1974, Rao 1988), of several neglected species, which are now gaining economic importance, remain uninvestigated. To fill this lacuna, a study of the food, feeding habits and the feeding intensity of the penaeid prawn *Metapeneopsis stridulans* from Mumbai waters is presented here.

MATERIAL AND METHODS

Metapeneopsis stridulans were collected at Sassoon Dock landing centre (South Mumbai).

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The gut contents of 673 specimens were analysed sexwise from January to December, 1992. 339 males, ranging from 50 to 90 mm in total length and 334 females, ranging from 40 to 100 mm in total length, were analysed. The animals were cut open and the foregut removed. These were examined and the intensity of feeding was determined by the degree of stomach distension and expressed as full, three-fourths full, half-full, one-fourth full and empty, depending on their fullness. Further, foreguts were dissected and the contents were observed qualitatively under a microscope. The foregut of *Metapeneopsis stridulans* is very minute and the gut contents for the anterior and posterior proventriculus were, therefore, considered together.

RESULTS

A qualitative analysis of the proventriculus of 673 specimens of *Metapeneopsis stridulans* revealed the presence of the following food items:

Diatoms: These were present in the stomach contents in small quantities, with mud and detritus.

Foraminiferans: The shells of foraminiferans were noticed in many guts and in some cases the entire stomach was full of the foraminiferan *Elphidium* sp.

Polychaetes: These worms were easily located by their iridescent setae and jaws, which sometimes occupied the entire proventriculus.

Molluscs: Fragments of gastropod shells and sometimes bivalves were also noticed in the

stomach. Crushed shells of various forms were observed.

Crustaceans: These formed an important and dominant constituent of the diet, consisting mainly of amphipods, isopods and sometimes *Acetes* sp. Crustaceans were easily identified by the presence of their jointed appendages, plumose setae and stalked eyes.

Fish: Though not often present, fish in the stomach could be identified from their scales, fragments of bones and eye lens.

Detritus: It formed an important item, consisting of unidentifiable decaying matter, along with sand and mud. In general, sand predominated in the stomach of *Metapeneopsis stridulans*.

Miscellaneous: Components seen were bryozoans, shells, filamentous algae and hooks of unidentified animals.

During the present investigation, 301 prawns (44.73 DO) showed empty stomachs, followed by one-fourth full stomach in 113 prawns (16.79 TO), full in 97 prawns (14.41 DO), three-fourths full in 82 prawns (12.18 DO) and half full in 80 prawns (11.89 TO).

Comparing male and female specimens revealed that empty stomachs were more prevalent in males (47.20%) than in females (42.22%). The percentage of females with full stomachs was, however, greater (22.75%) than males (6.19%). In general, the intensity of feeding in males was lower than in females (Table 1).

TABLE 1

FEEDING INTENSITY IN MALES AND FEMALES OF *M. STRIDULANS* (% IN PARENTHESES)

Sex	Total	Full	¾ Full	½ Full	¼ Full	Empty
Male	339	21 (6.19)	39 (11.50)	47 (13.86)	72 (21.24)	160 (47.20)
Female	334	76 (22.75)	43 (12.87)	33 (9.88)	41 (12.28)	141 (42.22)
Total	673	97 (14.41)	82 (12.18)	80 (11.89)	113 (16.79)	301 (44.73)

Monthwise intensity of feeding for males and females is given in Tables 2 and 3 respectively. The data shows that males with empty stomachs were more prevalent in most of the months. However, the percentage of these prawns was higher in May (84%), October (77.27%) and September (76%). Males with full stomach were noticed during November - February and July - August.

Females with empty stomach were also encountered in most months except December. The percentage of empty stomachs was higher in September (68%), May (65.38%) and November (73.33%). Females with full stomachs were observed during December (85%), January (41%) and August (33.33%).

In order to study the relation of size to intensity of feeding, males and females were grouped into size groups of 10 mm. Sizewise fullness of stomach shows (Table 4) that prevalence of empty stomach is 71.42% in the 50-60 mm size-group, followed by 58.16% in 60-70 mm, 49.39% in 70-80 mm and 25.67% in 80-90 mm. Thus, the percentage of empty stomach in males decreases with increase in length. Conversely, the percentages of full and three-fourths full stomachs show an increasing trend with increase in length.

The size-related intensity of feeding in females and males showed similar trends, the full and three-fourths full stomach exhibiting predominance with increase in length (Table 5).

Empty stomach among immature (40%), early maturing (43.22%) and mature (43.05%) prawns is nearly equal; the predominance of full and three-fourths full in females shows an increasing trend of feeding as they mature (Table 6).

DISCUSSION

Investigations have shown that penaeid prawns have varied food habits. Gopalakrishnan (1952) showed that *Penaeus indicus* is an omnivorous species feeding on crustaceans and

TABLE 2
MONTHWISE FEEDING INTENSITY OF MALE
M. STRIDULANS (% IN PARENTHESES)

Months	Prawns analysed	Full	¾ Full	½ Full	¼ Full	Empty
Jan.	77	9 (11.69)	11 (14.28)	14 (18.18)	30 (38.96)	13 (16.88)
Feb.	44	3 (06.81)	5 (11.36)	6 (13.64)	15 (34.09)	15 (34.09)
Mar.	7	-	1 (14.29)	1 (14.29)	1 (14.29)	4 (57.14)
Apr.	24	-	8 (33.33)	4 (16.67)	3 (12.50)	9 (37.50)
May	25	-	-	1 (04.00)	3 (12.00)	21 (84.00)
Jun.	19	-	2 (10.53)	2 (10.53)	4 (15.79)	12 (63.16)
Jul.	22	1 (04.55)	-	2 (09.09)	4 (18.18)	15 (68.18)
Aug.	24	2 (08.33)	4 (16.67)	7 (29.17)	1 (04.17)	10 (41.67)
Sep.	25	-	1 (04.00)	3 (12.00)	2 (08.00)	19 (76.00)
Oct.	22	-	1 (04.55)	3 (13.64)	1 (04.55)	17 (77.27)
Nov.	20	2 (10.00)	1 (05.00)	1 (05.00)	3 (15.00)	13 (65.00)
Dec.	30	4 (13.33)	5 (16.67)	3 (10.00)	6 (20.00)	12 (40.00)
Total	339	21 (06.19)	39 (11.50)	47 (13.86)	72 (21.24)	160 (47.20)

TABLE 3
MONTHWISE FEEDING INTENSITY OF FEMALE
M. STRIDULANS (% IN PARENTHESES)

Months	Prawns analysed	Full	¾ Full	½ Full	¼ Full	Empty
Jan.	39	16 (41.03)	8 (20.51)	3 (97.69)	8 (20.51)	4 (10.26)
Feb.	6	2 (33.33)	1 (16.67)	1 (16.67)	1 (16.67)	1 (16.67)
Mar.	46	12 (26.09)	9 (19.57)	4 (08.70)	3 (06.52)	8 (39.13)
Apr.	28	1 (03.57)	3 (10.71)	3 (10.71)	7 (25.00)	14 (50.00)
May	26	1 (03.84)	4 (15.38)	2 (07.69)	2 (07.69)	17 (65.38)
Jun.	32	7 (21.88)	3 (09.38)	8 (25.00)	7 (21.88)	7 (21.88)
Jul.	28	5 (17.86)	2 (07.14)	2 (07.14)	2 (07.14)	17 (60.71)
Aug.	27	9 (33.33)	6 (22.22)	2 (07.41)	1 (03.70)	9 (33.33)
Sept.	25	1 (04.00)	-	2 (08.00)	5 (20.00)	17 (68.00)
Oct.	27	3 (11.11)	5 (18.52)	1 (03.70)	3 (11.11)	15 (55.56)
Nov.	30	2 (06.67)	-	4 (13.33)	2 (06.67)	22 (73.33)
Dec.	20	17 (85.00)	2 (10.00)	1 (05.00)	-	-
Total	334	43 (22.75)	43 (12.87)	33 (09.88)	41 (12.28)	141 (42.22)

TABLE 4
FEEDING INTENSITY OF MALE *M. STRIDULANS*
(% IN PARENTHESES) AS PER SIZE

Size (mm)	Full	¾ Full	½ Full	¼ Full	Empty	Total No. of Prawns examined
40-50	-	-	-	-	-	-
50-60	-	1 (14.29)	1 (14.29)	-	5 (71.43)	7
60-70	3 (03.06)	8 *08.16	16 (16.33)	14 (14.29)	57 (58.16)	98
70-80	8 (05.00)	17 (10.63)	19 (11.86)	37 (23.13)	79 (49.38)	160
80-90	10 (13.51)	13 (17.57)	11 (14.86)	21 (28.38)	19 (24.68)	74
90-100	-	-	-	-	-	-
Total	21 (06.19)	39 (11.50)	47 (13.86)	72 (21.24)	160 (47.20)	339

TABLE 5
FEEDING INTENSITY OF FEMALE *M. STRIDULANS*
(% IN PARENTHESES) AS PER SIZE

Size (mm)	Full	¾ Full	½ Full	¼ Full	Empty	Total No. of Prawns examined
40-50	-	-	-	-	1	1
50-60	1 (05.56)	1 (05.56)	2 (11.11)	2 (11.11)	12 (66.67)	18
60-70	11 (14.29)	11 (14.29)	8 (10.39)	11 (14.29)	36 (46.75)	77
70-80	33 (22.30)	16 (10.81)	14 (09.46)	21 (14.19)	64 (43.24)	148
80-90	29 (33.72)	13 (15.11)	9 (10.47)	7 (08.14)	28 (32.56)	86
90-100	2 (50.00)	2 (50.00)	-	-	-	4
Total	76 (22.75)	43 (12.87)	33 (09.88)	41 (12.28)	141 (42.22)	334

TABLE 6
FEEDING INTENSITY OF FEMALE *M. STRIDULANS* IN
DIFFERENT MATURITY STAGES (% IN PARENTHESES)

Maturity stage	Full	¾ Full	½ Full	¼ Full	Empty	Total No. of Prawns examined
I	13 (20.00)	7 (10.77)	6 (09.23)	13 (20.00)	26 (40.00)	65
II	39 (20.31)	24 (12.50)	24 (12.50)	22 (11.46)	83 (43.23)	192
III	20 (27.78)	12 (16.67)	3 (04.17)	6 (08.33)	31 (43.06)	72
IV	2 (100.00)	-	-	-	-	2
V	2 (66.67)	-	-	-	1 (33.33)	3
Total	76 (22.75)	43 (12.87)	33 (09.88)	41 (12.27)	141 (42.21)	334

vegetable matter, which form the bulk of the gut contents. Panikkar and Menon (1956) have concluded that the food of prawns consists of detritus of both animal and plant origin, which accumulates at the bottom of the habitat. The prawns *Metapenaeus dobsoni*, *Penaeus stylifera* and *P. indicus*, prefer area of muddy habitat indicating their preference for detritus. However, Hall (1962) stated that penaeids in general cannot be considered as detritus feeders. The gut contents of *Metapenaeus monoceros* has shown the presence of small crustaceans along with sand grains and mud, while detritus was of less importance (George 1974).

The present study reveals that *Metapenaeopsis stridulans* is not predominantly a detritus feeder but a carnivore, feeding on crustaceans, molluscs, small fishes and

polychaetes. Moreover, it also feeds on foraminiferans in the benthic region and takes up diatoms, sand particles, mud and detritus along with them. These results agree with the conclusions of Hall (1962) that prawns are carnivorous.

Low feeding intensity, indicated by the prevalence of empty, one-fourth full and half-full stomachs during maturation and pre-spawning period is widely known in fishes. In penaeid prawns, major expansion of ovary during maturation takes place in the abdominal region (Rao, 1968). The gut of prawns is located in the cephalothorax, in which ovarian expansion is less; therefore, the prevalence of full and three-fourths full stomachs in mature female prawns does not seem to be affected. In fact, the females must feed intensively in order to derive more energy for reproductive output during maturation. The presence of a larger number of full and three-fourths full stomachs in mature females and the increasing order of intensity with maturity supports this view. Higher feeding intensity, as indicated by a greater number of full and three-fourth full stomachs during the breeding period, i.e., December to January, also corroborates this view.

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