



STUDY OF FOOD PREFERENCE OF *Metapenaeus brevicornis* (H. MILNE EDWARDS) IN DIFFERENT AREAS OF MUMBAI COAST.

Dr. Durga S. Patkar.

Assistant Professor,

Department of Zoology,

Ramnarain Ruia Autonomous College, L.Nappo Road, Dadar (East), Matunga, Mumbai-400019.
Maharashtra.

Abstract

Food is directly related to growth, maturation and reproduction. The study of the natural diet of prawns has gained greater significance owing to their importance in commercial aquaculture practices all over the world. By studying the natural diet, it is also possible to formulate artificial feeds for the commercial culture of prawns. Since direct observations of prawns feeding in the sea are difficult, the analysis of their guts enables them to know their food and feeding habits and sometimes even feeding grounds. Feeding habits of any animal from different areas directly show the availability of food in that area and the food preferences by the animal. Among the two sexes the females showed more active feeding than the males in all the three fishing areas. It is therefore concluded that *M. brevicornis* is an omnivorous feeder.

Keywords- feeding capacity, food availability, feeding intensity, food preference.

Introduction

An important contributions on food of prawns were made by Patwardhan (1937), Chopra (1939), Gopalkrishnan (1952), Williams (1955), Mehendale (1959), Eldred *et al.*, (1961), Hall (1962), Dall (1968), George (1959, 1974), Tiews *et al.*, (1968), Kuttyamma (1974), Thomas (1980), Wassenberg and Hill (1987), Nandakumar and Damodaran (1998).

Kathuria (1967) has described the same for *M. brevicornis* from inshore waters of Mumbai. In this research, the study of feeding habits of the same prawn from inshore, nearshore and offshore waters of Mumbai was carried out.

Material and Methods

During January to December 1998, the fresh samples of *M. Brevicornis* were collected fortnightly from dol nets operated in inshore waters and weekly from the trawlers, which were operated in offshore waters at New ferry wharf. The samples were also collected monthly from hand trawlers operated in the near shore waters from Versova for the same time period, which represented the nearshore area. The samples were brought to the laboratory and preserved in 10% formalin. Before the analysis of gut, the prawns were segregated sexwise.

For studying the gut contents, the foreguts were removed, cut open and the gut contents were taken in a watch glass and observed under stereoscopic binocular microscope (10X). The gut contents were identified as far as possible up to group or generic level.

Result and Discussion

During the period January-December 1998, a total of 972 males and 1,560 females in the size range of 50-113 mm and 55-163 mm respectively were analysed for the gut analysis. Among them, 423, 243, 306 males and 549, 249, 762 females were analysed from dol nets, hand trawl and offshore trawls, which represented inshore, nearshore and offshore areas respectively.

Composition of food:

Inshore waters:

The monthwise composition of food in the foreguts of males and females in different months is given in Table 1.1 and Table 1.2 respectively. Major food items encountered were as follows:

Crustaceans:

It was the major food item, which occurred throughout the year. In males, its IP was maximum in October (83.72) and minimum in August (13.68) whereas in females the maximum IP was in July (82.57) and minimum in March (1.18).

Acetes:

The IP for *Acetes* was maximum (66.72) in the month of August and minimum (0.4) in June, in case of males. In females, it was maximum in May (46.82) and minimum in June (3.46). *Acetes* was not found in the guts of males as well as females in January, and in males also in March.

Prawn remains:

The remains of prawns other than *Acetes* were also found. The IP for prawn remains in the gut contents of males was the highest in May (22.6), and lowest in August (0.06). In females, IP was maximum in April (36.51) and minimum in August (0.15). During January, the prawn remains were not found in the guts of both males and females.

Fish:

In males, the IP for fish was maximum in March (58.71). In June and July the fish remains were not found in the gut contents. In females, the highest IP was in March (69.2). Fish remains were not found in the gut contents in June.

Detritus:

In males, IP for detritus was maximum in June (39.36). In January and March detritus material was not present in the guts. In females, IP was maximum in June (40.81) and minimum during March (0.39).

Foraminiferans:

In the case of males, these were not found in the gut contents except in January with IP of 32.63. In females, they showed maximum IP in January (25.33) in the months of April, September, and October foraminiferans were in negligible amounts and in the rest of the months they were not found in the gut contents.

Polychaetes:

In males, maximum IP (5.73) was in February and the foreguts did not show their presence in March, July, and October. In females, maximum IP was in February (8.45) and in July they were not found.

Bivalves:

In February, males showed the highest IP (5.52) and these shells were not found in the guts in January, May, June, July, September, October, and December. In August, the IP was maximum in case of females (7.47) and in March and May they were not found in the guts.

Miscellaneous did not show marked difference monthwise and ranges between 0.05-3.99.

Months	Acetes	Fish	Crustacean	Bivalve	Foraminiferans	Detritus	Polychaetes	Prawn	Miscellaneous
January	0	14.99	51.23	0	32.63	0	1.04	0	0.1
February	23.76	0.92	52.2	5.52	0	4.5	5.73	7.37	0
March	0	58.71	18.25	4.8	0	0	0	17.29	0.96
April	22.73	1.18	50.39	0.2	0	5.42	0.39	19.69	0
May	27.12	2.26	44.06	0	0	3.39	0.56	22.6	0
June	0.4	0	52.73	0	0	39.36	0.34	7.15	0
July	35.78	0	33.23	0	0	20.44	0	10.54	0
August	66.72	18	13.68	0.24	0	0.96	0.02	0.06	0.32
September	47.56	4.96	36.59	0	0	2.35	0.26	8.1	0.18
October	1.99	7.97	83.72	0	0	0.33	0	1.99	3.99
November	1.44	12.95	49.63	1.44	0	17.62	0.72	15.11	1.08
December	9.86	1.32	78.29	0	0	1.48	4.6	0.99	3.45

Table 1.1 Monthwise index of preponderance in males of *M. brevicornis* from inshore waters.

Months	Acetes	Fish	Crustacean	Bivalve	Foraminiferans	Detritus	Polychaetes	Prawn	Miscellaneous
January	0	10.92	60.26	0.16	25.33	2.79	0.49	0	0.05
February	8.57	6.98	55.11	2.89	0	2.89	8.45	15.11	0
March	26.6	69.2	1.18	0	0	0.39	0.26	2.36	0
April	3.6	5.92	49.58	0.11	0.68	2.25	1.35	36.51	0
May	46.82	2.51	17.56	0	0	5.85	0.17	27.09	0
June	3.46	0	53.15	1.2	0	40.81	1.2	0.18	0
July	6.84	2.56	82.57	0.34	0	3.84	0	3.84	0
August	23.57	5.27	60.61	7.47	0	1.32	0.59	0.15	1.03
September	20.64	0.27	66.46	0.82	0.07	5.35	1.92	4.11	0.34
October	21.65	1.67	72.82	1.11	0.25	0.5	0.11	1	0.89
November	3.89	8.6	50.34	0.82	0	31.72	0.27	4.09	0.27
December	26.48	2.2	59.56	0.37	0	7.35	0.37	3.68	0

Table 1.2 Monthwise index of preponderance in females of *M. brevicornis* from inshore waters.

Nearshore water:

The composition of food in the foreguts of males and females in different months is given in Table 1.3 and Table 1.4 respectively. In this area, the IP calculated for different food materials was as under:

Crustaceans:

In males, maximum IP for crustaceans was in May (84.32) and minimum in March (21.95). Whereas in females, the maximum IP was in December (77.08) and minimum in March (18.82).

Acetes:

Its IP was found to be maximum in September (26.5) and minimum in January (0.1) in case of males. In case of females, the IP was maximum in September (22.78) and in January, these were not present in the gut contents.

Prawn remains:

In males, maximum IP was found in December (40.51) and minimum in January (0.2). While in females, IP was maximum in April (20.79) and in January, prawn remains were not found in the gut contents.

Fish:

In males, the IP was maximum in March (32.93), and in October it was not found in the gut. In females, the IP was maximum in March (18.83), whereas in September, October, and December it was not found in the gut.

Detritus:

In June, the males showed maximum IP (24.39), while in March and September, it was not present in the guts of prawns. Females also showed maximum IP in June (44.28), minimum in March (0.05).

Foraminiferans:

The maximum IP was in January (28.57) in males, and these were not present in the guts in June and September. In females, the IP was maximum in March (26.99), whereas in September and December these were not present in the guts.

Polychaetes:

In males, maximum IP was in December (16.06). In females, the maximum IP was in November (9.02) and these were not found in the guts in March, May, and June both in males and females.

Bivalves:

The maximum IP for males was in June (9.21) and for females was in January (10.69). These were not found in the guts of males and females in October.

Copepods:

In this fishing area, copepods were present in considerable numbers. So they were taken into consideration separately.

Males showed maximum IP in November (4.46) and females showed maximum IP in September (3.38). Both the sexes did not show copepods in the guts from January to May. In addition to that also in October and December in case of females.

The IP of miscellaneous ranged between 0.04-4.41.

Months	Acetes	Fish	Crustacean	Bivalve	Foraminiferans	Detritus	Polychaetes	Prawn	Copepod	Miscellaneous
January	0.1	1.41	52.02	7.71	28.57	0.02	7.06	0.2	0	0.91
February	9.74	22.51	52.62	0.2	4.78	0.58	0.58	9	0	0
March	14.4	32.93	21.95	5.49	19.2	0	0	6.04	0	0
April	17.15	2.68	56.3	0.27	0.54	2.68	0.27	20.11	0	0
May	0.43	0.43	84.32	1.99	0.28	5.11	0	7.45	0	0
June	2.6	2.52	53.11	9.21	0	24.39	0	5.67	2.36	0.16
July	0	0	0	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0	0	0	0
September	26.5	1.61	29.12	0.32	0	0	5.14	33.4	3.86	0.04
October	0.98	0	49.27	0	1.47	24.2	1.83	22.01	0.12	0.17
November	2.93	0.21	47.45	0.07	18.56	9.21	15.08	1.88	4.46	0.14
December	2.08	0.57	34.27	1.13	0.09	0.95	16.06	40.51	3.78	0.57

Table 1.3 Monthwise index of preponderance in males of *M. brevicornis* from nearshore waters.

Months	Acetes	Fish	Crustacean	Bivalve	Foraminiferans	Prawn	Copepod	Detritus	Polychaete	Miscellaneous
January	0	10.83	40.91	10.69	22.47	0	0	6.01	4.68	4.41
February	9.81	14.73	38.49	0.38	18.12	9.43	0	0.57	8.49	0
March	19.77	18.83	18.82	4.18	26.99	11.35	0	0.05	0	0
April	15.2	0.57	50.55	0.38	8.49	20.76	0	3.78	0.28	0
May	6.11	4.1	76.25	0.05	2.35	8.21	0	2.93	0	0
June	2.92	3	34.32	9.68	0.08	2.77	2.69	44.28	0	0.27
July	0	0	0	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0	0	0	0
September	22.78	0	63.3	1.27	0	1.05	3.38	4.43	3.8	0
October	3.96	0	30.9	0	4.45	0.49	0	57.85	2.22	0.12
November	9.35	2.66	50.77	1.13	16.12	7.66	0.97	1.61	9.02	0.73
December	4.76	0	77.08	0.89	0	5.36	0	7.15	4.76	0

Table 1.4 Monthwise index of preponderance in females of *M. brevicornis* from nearshore waters.

Offshore waters:

The composition of food in the foreguts of males and females in different months is given in Table 1.5 and Table 1.6 respectively. In this area, the IP calculated for different food materials was as under:

Crustaceans:

In males, maximum IP was in November (57.3), and minimum in June (8.19). The maximum IP in case of females was in August (67.44), and minimum in July (10.39).

Acetes:

IP was found to be maximum in June (75.88) and minimum in November (0.6) in case of males. While it was maximum in May (79.48) and minimum in January (1.44), in case of females.

Prawn remains:

In males, maximum IP was found in February (17.85) while in females, IP was maximum in March (7.79). In January, the prawn remains were not found in the gut contents of both males and females.

Fish:

In males, the IP was maximum in January (43.72) and minimum in July (0.46). In females, the IP was maximum in January (17.29) and minimum in August (0.3).

Detritus:

It showed maximum IP in January for males (26.04) as well as for females (10.82) while in October, November and December it was not found in the guts of males. The IP for detritus was minimum in September (0.27) for females.

Foraminiferans:

In males, the maximum IP was in November (32.4), and these were not present in the guts in April and May. In females, the IP was maximum in September (31.12) and minimum in May (0.01).

Polychaetes:

Maximum IP was in January for males (8.23) as well as for females (24.42). It was not found in the gut contents of males in May, June, July, September, November, and December and in May and June in females.

Bivalves:

The maximum IP for males was in February (6.69). These were not found in the guts of males in April, May, July, September, October, and December. In females IP was maximum in February (3.93) and in May it was not found in gut contents.

The IP of miscellaneous ranged between 0.01-4.41.

Months	Acetes	Fish	Crustacean	Bivalve	Foraminiferans	Polychaetes	Prawn	Detritus	Miscellaneous
January	3.7	43.72	17.28	0.21	0.41	8.23	0	26.04	0.41
February	29.63	4.59	35.63	6.69	0.51	1.78	17.85	3.12	0.19
March	36.05	6.37	37.31	0.52	0.87	0.52	13.34	4.42	0.61
April	33.46	25.59	29.55	0	0	0.14	6.19	5.07	0
May	53.17	5.06	30.38	0	0	0	10.12	1.27	0
June	75.88	11.27	8.19	0.13	1.68	0	1.84	0.7	0.3
July	51.14	0.46	25.58	0	2.28	0	2.28	18.11	0.15

August	0	0	0	0	0	0	0	0	0
September	24.71	0.6	50.29	0	15.72	0	7.49	0.45	0.75
October	16.01	1.03	48.05	0	17.25	0.1	13.14	0	4.41
November	0.6	6.57	57.3	0.15	32.4	0	2.98	0	0
December	68.73	2.48	20.43	0	2.48	0	4.65	0	1.24

Table 1.5 Monthwise index of preponderance in males of *M. brevicornis* from offshore waters.

Months	<i>Acetes</i>	Fish	Crustacean	Bivalve	Foraminiferans	Polychaete	Prawn	Detritus	Miscellaneous
January	1.44	17.29	36.55	0.96	6.01	24.52	0	10.82	2.4
February	48.82	4.32	31.25	3.93	1.26	1.92	3.46	4.09	0.94
March	49.75	6.77	14.62	2.48	5.6	6.62	7.79	5.69	0.68
April	56.95	3.3	28.59	0.51	2.28	0.33	4.89	3.15	0
May	79.48	3.89	10.5	0	0.01	0	5.27	0.72	0.13
June	62.68	3.43	20.42	0.48	11.02	0	0.95	0.34	0.68
July	65.38	1.08	10.39	0.05	20.64	0.03	1.25	0.97	0.21
August	8.21	0.3	67.44	0.09	20.8	0	1.01	2.14	0.01
September	23.6	4.83	37.68	0.02	31.12	0.04	2.42	0.27	0.02
October	43.7	0.86	25.76	0.11	25.5	0.02	2.45	1.53	0.07
November	5.11	1.8	61.57	0.6	23.6	0.01	4.24	3.06	0.01
December	21.77	0.95	53.66	0.55	17.67	0.18	4.74	0.48	0

Table 1.6 Monthwise index of preponderance in females of *M. brevicornis* from offshore waters.

Conclusion

In the case of *M. brevicornis*, Hall (1962) remarked that vegetable matter dominated the gut contents, in addition to crustaceans in small quantities. Similarly, Kathuria (1967) found that algae form the main food item in the species from Mumbai waters. However, the present study revealed that the crustaceans with maximum index of preponderance were the most preferred food followed by *Acetes*, fish, detritus, foraminiferans and prawn remains. The algal matter was however in negligible quantity.

The absence of algae in the guts may be attributed to the disappearance of benthic algae in the inshore and nearshore waters of Mumbai due to heavy degradation of these areas and coastal waters, due to pollution over the period of time (Anon,2000).

As compared to the offshore area, the prawns from inshore and nearshore areas showed a higher percentage of detritus. This may be attributed to the presence of decomposing organic matter, which is converted into detritus by the bacterial growth in that area. The foraminiferans and bivalves were observed in relatively higher percentages than gastropod shells, harpacticoid copepods, filamentous algae, amphipods,

cephalopods, caridean eggs, protozoans and crustacean larvae which are grouped in miscellaneous. This may be due to the fact that the prawns are bottom feeders and scavengers, feeding on the organisms that are present in the mud and while feeding on them they may be devouring foraminiferans and bivalves. But the ingestion of foraminiferans and bivalves can not be accidental, the prawns require large amounts of calcium for the synthesis of new exoskeleton after each moult. Since prawns continuously undergo moulting during their life cycle, their requirement of calcium may be fulfilled by the intake of foraminiferans and bivalves as they contain lime in the shells. Passano (1960) pointed out that the initial hardening after ecdysis results from the redeposition of the stored calcium but the main calcification of endocuticle uses calcium and other salts obtained from the external medium. Similarly, Heydron (1969 b) also reported that in the case of *J. lalandii*, calcium requirement after ecdysis is met with heavy intake of shelled organisms. The presence of prawn remains in the guts could be not only by predation on other species of prawns, but also excuvae of themselves which probably also support their calcium requirement.

Among the two sexes the females showed more active feeding than the males in all the three fishing areas. Since the reproductive output of females is far higher, their metabolic requirement must be greater than that of males. Therefore in order to meet their higher metabolic requirements, the feeding intensity of females must be higher.

Declarations

The author has no conflicts of interest to declare that are relevant to the content of this article.

Bibliography

Anon, 2000. Environment Status of Brihanmumbai, 1998-99. *Municipal Corporation of Greater Mumbai*. 60 pp.

Chopra, B.N. 1939. Some food prawns and crabs of India and their fisheries. *J. Bombay Nat. His. Soc.*, 41(2): 221-234.

Dall, W. 1968. Food and feeding of some Australian penaeid shrimps. *FAO Fish. Rep.*, 57(2): 251-258.

Eldred, B. *et. al.*, 1961. Biological observations on the commercial shrimp, *Penaeus duorarum* Burkenroad, in Florida waters. *Proc. Pap. Ser. Mar. Lab. Fla.* 3:1-139.

George, M. J. 1959. Notes on bionomics of prawn *Metapenaeus monoceros* (Fabricius). *Indian J. Fish.*, 6 (2):268-277.

George, M. J. 1974. Food of the shrimp *Metapenaeus monoceros* (Fab.) caught from the backwaters. *Indian J. Fish.*, 21 (2): 495-500.

Gopalkrishnan, V. 1952. Food and feeding of *Penaeus indicus*. *Madras Uni. J.*, 22 B: 69-75.

Hall D.N.F. 1962. Observations on the biology of some Indo west Pacific Penaeidae (Crustacea, Decapoda). *Fish. Publ. Colonial off* . London, 17: 1-229.

Heydron, A. E.F. 1969b. The rock lobster of the South African west coast, *Jasus lalandii* (H. Mine Edwards). 2. Population studies, behaviour, reproduction, moulting, growth and migration. *S. Afr. Div. Sea Fish. Invest. Rep.*, 69: 1-22.

Kathuria, J. 1967. Study of Bombay prawns, Ph. D. thesis, University of Bombay.

Kuttyamma. V.J. 1974. Observation on the food and feeding habits of some penaeid prawns of Cochin area. *J. mar. biol. Ass. India.*, 15(1): 189-194.

Mehendale, D.D. 1959. A study of prawns, M.Sc. Thesis. University of Bombay.

Nandakumar, G. and R. Damodaran 1998. Food and feeding habits of the speckled shrimp *Metapenaeus monoceros* (Fabricius). *J. mar. biol. Ass. India*. 40(1&2): 30-40.

Passano, L.M. 1960. Moulting and its control. In : *The Physiology of Crustacea*, edited by T.H. Waterman New York, Academic Press, Vol. I, 473-536.

Patwardhan S.S. 1937. Palaemon, *Indian Zool Mem.* 6: 120p.

Thomas M.M. 1980. Food and feeding habits of *Penaeus semisulcatus* de Haan. *Indian J. Fish.*, 22: 133-142.

Tiews, K. *et al.* 1968. On the food and feeding habits of some Philippine shrimps in Manila Bay and San Miguel Bay. *Proc. IPFC.*, 13 (3): 85-91.

Wassenberg, T.J. and B.J. Hill. 1987. Natural diet of tiger prawns *Penaeus esculentus* and *P. semisulcatus*. *Aust. J. Mar. Freshw. Res.*; 38,169-182.

Williams, A.B. 1955. A contribution to the life histories of commercial shrimps (Penaeidae) in N. Carolina. *Bull. Mar. Sci. Gulf Caribb.* 5(2): 116-146.

