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Note

Food and feeding habits of *Macrobrachium lar* (Decapoda, Palaemonidae) from Andaman and Nicobar Islands, India

S. N. SETHI[1], NAGESH RAM[2] AND V. VENKATESAN[3]

[1]*Chennai Research Centre of Central Marine Fisheries Research Institute, 75 – Santhome High Road R. A. Puram, Chennai-600 028,Tamil Nadu, India*
[2]*Central Agricultural Research Institute (CARI), Port Blair-744 103, Andaman and Nicobar Islands, India*
[3]*Central Marine Fisheries Research Institute, Cochin -682 018, Kerala, India*
e-mail: sethisatyanarayana@yahoo.co.in

ABSTRACT

The stomach content of the freshwater prawn *Macrobrachium lar* from the inland water bodies of Andaman and Nicobar Islands were analysed in relation to size, sex and season during the period from January to December 2008. Feeding habits of *M. lar* were studied using the index of preponderance and feeding intensity methods. Mainly organic detritus, supplemented by animal and plant materials formed the food in all stages of *M. lar*. The animal food items mainly consisted of aquatic insects, polychaetes, other crustaceans, fish, molluscs and zooplankton. The plant matter was chiefly composed of fragments of aquatic plants, planktonic algae and diatoms. Variation in diet in relation to size, sex or season were found insignificant. Though, all size groups of this species feed animal and plant materials, it exhibited slight preference for animal food especially in larger size groups. Females appear to feed more actively than the males. Feeding intensity was more in monsoon season compared to dry season. Results indicate that the adults are mostly predators of slow moving benthic invertebrates rather than detritus feeders/scavengers.

Keywords: Andaman and Nicobar Islands, Feeding habit, *Macrobrachium lar*

The freshwater prawns of the genus *Macrobrachium* are found mostly in inland freshwater areas including ponds, lakes, rivers, irrigation ditches as well as in estuaries (New, 2002). *Macrobrachium lar* (Fabricius, 1798), commonly known as monkey river prawn, is a freshwater prawn species distributed ubiquitously throughout the tropical Indo-Pacific high islands. A detailed list of distribution of *M. lar* has been reported by Holthuis (1950). This prawn has been reported as a native species of Andaman and Nicobar Islands (A & N Islands) by several workers (Costa, 1979; Sarangi *et al.,* 2001). *M. lar* is one of the potential species for aquaculture in the insular Pacific (Atkinson, 1977). The use of local species for sustainable prawn farming activities is more advisable than exotic ones because of genetic and environmental reasons. In general, prawns have been described as omnivorous scavengers or detritus feeders. There is no report on the natural diet of *M. lar* from India. However, studies on the diet of other species of freshwater prawns reported a wide range of food items. In India, *Macrobrachium equidens* (Murthy and Rajagopal, 1990) and *Macrobrachium choprai* (Shree Prakash and Agarwal, 1989; Roy and Singh, 1997) feeds mainly on detritus, filamentous algae and benthic invertebrates. African river prawn *(Macrobrachium vollenhovenii)* of Nigeria in the Epe Lagoon is known to feed on a variety of plankton species and detritus (Jimoh *et al.,* 2011).

In the present study, a total of 348 individuals of *M. lar,* at various stages of life history, were collected with the assistance of fishermen using cast net from 4 sites *viz.*, Burmanallah (lat. 11°35'55.615" N; long. 92°43'11.539" E), Rangat (lat. 12°38'17.196" N; long. 92°45'55.635" E), Lamiya Bay (lat. 13°11'8.007" N; long. 93°5'38.122" E) and Patharnallah (lat. 7°1'22.302" N; long. 93°53' 29.875" E) during January 2008 to December 2008. Sampling was done at monthly intervals. The prawns collected were placed immediately in plastic jars containing clove oil solution, and the jars were then kept in ice box with salt solution before being taken to the laboratory. Specimens were examined immediately after they were brought to laboratory in fresh condition.

Prawns were segregated according to the size and sex. The total length was measured with a meter ruler to the nearest mm, while the body weight was taken, to the nearest 0.01 g with an electronic balance. The extent of feeding was determined by the degree of fullness of the

stomach and was expressed according to their fullness, as follows: 1- fully gorged with food; 3/4-full, but not gorged; 1/2-half full; 1/4-containing a small but significant amount of food; trace, possibly containing bits of debris and 0 - empty. The gut content analyses were carried out as per the standard methods developed by Pillay (1952; 1953) and Natarajan and Jhingran (1961).

A total of 348 specimens of *M. lar* were examined, out of which 2.87% had empty gut. The gut contents were categorised into seven groups *viz.,* those containing fragments of aquatic plants, algae, animal matter, diatoms, amorphous mass, unidentified organisms and sand grains. Relative importance of food items of the prawn is shown in Fig. 1. Gut contents in the order of abundance recorded were (i) amorphous mass (ii) fragments of aquatic animals (iii) fragments of aquatic plants (iv) algae (v) diatoms (vi) unidentified organisms and (vii) sand grains. Monthly variation in composition of gut contents of *M. lar* is given in Fig. 2.

Amorphous mass or unidentified debris comprised of fragments of decomposing organic matter which could

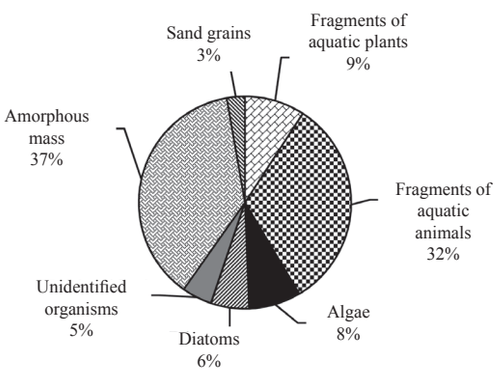

Fig. 1. Relative importance of major groups of food items in *M. lar* from inland water bodies of A & N Islands during 2008

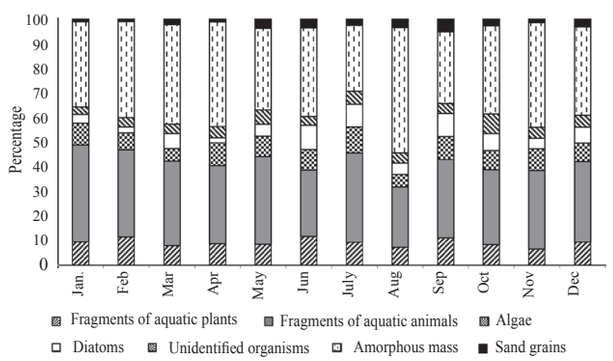

Fig. 2. Monthly variation in the major groups of gut contents in *M. lar* (2008)

not be accurately identified due to their tiny size or poor physical condition. This formed the most predominant food items (37.43%) of *M. lar* in all size groups in both sexes and was recorded maximum in August and minimum in September.

Animal matter consisted of parts of insects such as eyes, cuticular exoskeleton and legs, parts of fish such as scales, vertebrae and spines, parts of polychaetes represented by bristles, jaws, body fragments, parts of zooplankton such as antennae, pleopods and molluscs represented by fragments of shells.

Fragments of aquatic animals were observed in the gut of the prawn throughout the year and ranked second (32.29%) in importance among the food constituents during most of the months. Insects formed the most important group among the food items of animal origin which was followed by polychaetes, other crustaceans, fish, molluscs and zooplankton in the order of availability in gut contents. Fragments of aquatic plants such as parts of seeds, roots, leaves and stems were often found in the gut of both sexes in all size groups. Fragments of aquatic plants ranked third among the food items during June, September and February months.

Fragments of green and blue green algae were observed throughout the study in both sexes and also in all size groups. *Microsystis, Akistodesmus, Oscillatoria* and *Anabaena* were the major genera observed under blue green algae group. The most important genera of green algae were *Scenedesmus, Spyrogyra, Closterium, Stylosphaeridium, Microspora, Cladophora, Hydrodictyon, Genicularia, Desmidium* and *Ulothrix.* Algae formed the fourth (7.94%) important food constituents\ in the months of June, July and November. The fifth important food item in the gut content was diatoms (5.8%) especially in the months of June, July and November. Diatoms were represented mainly by *Fragilaria, Pinularia, Nitzchia, Camphylodiscus* and *Gomphonema.* Unidentified organisms were probably part of the undigested food items of both plants as well as animal origin. These were observed in the gut throughout the study period and dominated in July, August and November months. Sand grains were found in meager percentage (2.78%) in the gut content of both sexes throughout the year. This item was possibly an accidental inclusion along with other food items, while the prawn feed at the bottom. These were comparatively more in June, August and September.

Results of gut contents analysis in relation to size groups are summarised in Table 1. Variation in the gut contents was also observed with respect to size.

Table 1. Percentage composition of the gut contents of *M. lar* in relation to size groups

Size in mm	Fragments of a aquatic plants (%)	Fragments of aquatic animals (%)	Algae (%)	Diatoms (%)	Unidentified organisms (%)	Amorphous mass (%)	Sand grains (%)	No. examined
Female								
< 85	4.33	25.05	12.23	7.51	2.72	46.21	1.95	53
85.1 - 100	11.12	34.81	8.28	2.24	3.63	37.45	2.47	48
100.1 - 120	11.26	38.44	8.16	4.15	3.86	30.82	3.31	36
120 <	10.43	35.02	5.61	4.53	4.46	33.37	6.58	42
Male								
< 85	6.43	24.22	11.67	6.2	5.22	45.51	0.75	46
85.1 - 100	10.29	33.96	6.28	3.24	4.53	38.25	2.21	32
100.1 - 120	9.25	34.05	10.37	4.62	3.53	34.66	3.52	43
120 <	10.16	37.71	4.22	4.13	4.17	33.25	6.36	38

Amorphous mass appeared relatively uniform in the diet of all size groups with slight increase in larger groups. Relatively smaller amount of plant fragments and sand grains were observed in size group below 85 mm as compared to larger ones. No distinct variation was noticed in the food habits of the various size groups as all stages were found to feed upon both plant and animal matter. However, slight preference to animal food was observed in stages above 86 mm.

Monthly variatons in degree of fullness of guts (%) of *M. lar* during 2008 are given in Table 2. Of the *M. lar* examined throughout the study period, less than 3% had empty stomachs and a high proportion (62%) had ≥ 50% full stomach. Full, '3/4 full', '1/2 full', stomachs were taken as actively fed while '1/4 full', 'trace', 'empty' stomachs were considered as poorly fed. The percentage of actively fed prawns ranged from 43.48 to 77.7.

Feeding intensity in females and males of *M. lar* recorded are presented in Table 3. Actively fed prawns formed about 61.49% during the present study. The highest numbers of actively fed individuals (77.78%) were observed in July 2008 while the lowest numbers (43.48%) were seen in the month of May. Feeding intensity was found to be more in females (66.47%) than

Table 2. Monthly variation in degees of fullness of the guts (%) in *M. lar*

Months	No. examined	Degree of fullness of guts (%)					
		Empty	Trace	1/4 full	1/2 full	3/4 full	Full
Jan-08	32	0.00	18.75	28.13	25.00	09.38	18.75
Feb	30	3.33	16.67	23.33	23.33	6.67	26.67
Mar	35	2.86	28.57	14.29	17.14	14.29	22.86
Apr	31	6.45	12.90	22.58	22.58	12.90	22.58
May	23	8.70	26.09	21.74	17.39	13.04	13.04
Jun	36	0.00	16.67	27.78	13.89	25.00	16.67
Jul	27	0.00	07.41	14.81	11.11	25.93	40.74
Aug	26	7.69	15.38	3.85	11.54	26.92	34.62
Sep	25	4.00	12.00	20.00	32.00	16.00	16.00
Oct	34	2.94	17.65	08.82	20.59	11.76	38.24
Nov	28	0.00	14.29	17.86	28.57	14.29	25.00
Dec.-08	21	0.00	14.29	19.05	19.05	19.05	28.57
Total	348	2.87	16.95	18.68	20.11	16.09	25.29

Table 3. Feeding intensity in females and males of *M. lar* from A&N Islands

Months	No. examined	Actively fed (%)		Poorly fed (%)		Combined (%)	
		Female	Male	Female	Male	Actively fed	Poorly fed
Jan	32	57.65	48.62	42.35	51.38	53.13	46.87
Feb	30	55.33	58.01	44.67	41.99	56.67	43.33
Mar	35	56.40	52.17	43.60	47.83	54.29	45.71
Apr	31	52.53	63.59	47.47	36.41	58.06	41.94
May	23	34.15	52.92	65.85	47.08	43.48	56.52
Jun	36	67.71	43.40	32.29	56.60	55.56	44.44
Jul	27	93.20	62.35	6.80	37.65	77.78	22.22
Aug	26	81.62	64.53	18.38	35.47	73.08	26.92
Sep	25	80.20	47.80	19.80	52.20	64.00	36.00
Oct	34	74.52	66.65	25.48	33.35	70.59	29.41
Nov	28	78.73	56.98	21.27	43.02	67.86	32.14
Dec	21	68.23	65.11	31.77	34.89	66.67	33.33
Total	348	66.47	56.51	33.53	43.49	61.49	38.51

in males (56.51%). The highest feeding intensity was recorded in July in both sexes (93.2% for females and 62.35% for males).

Results of analysis of the stomach contents of *M. lar* from the present study in general, agree with the reports of Subrahmanyam (1975) for *Palaemon styliferus*, Lee *et al.* (1980) for *Macrobrachium rosenbergii*, Murthy and Rajagopal (1990) for *M. equidens,* Roy and Singh (1997) for *M. choprai,* Collins and Paggi (1998) for *Macrobrachium borelli* and Sharma and Subba (2005) for *Macrobrachium lamarrei* and Jimoh *et al.* (2011) for *M. vollenhovenii.* All these reports including the results of the present study indicate that palaemonid prawns are omnivorous scavengers, feeding on a wide variety of benthic organisms including different groups of algae, zooplankton, parts of other plant and animal matter, large quantities of organic detritus or amorphous mass, sand and silt. Amorphous mass formed the dominant content in the guts of all individuals irrespective of size, sex and season. Large amounts of organic debris observed in the gut content of prawns may be attributed to their bottom feeding habit (Roy and Singh, 1997). Organic debris perhaps complements when other ideal food items are insufficient.

Although *M. lar* feeds on a wide variety of plant matter, the species showed slight preference to animal food. This habit could be related to the prawn's high protein requisite which needs to be raised to an optimal level for better growth and feeding efficiency (Balazs *et al.,* 1973). Similar observations have been reported in the other species of freshwater prawns including *Macrobrachium carcinus* (Lewis *et al.,*1966), *M. rosenbergii* (Costa and Wanninayake, 1986), *M. vollenhovenii* (Bello-Olusoji *et al.,*1995; 2006), *M. vollenhovenii* and *Macrobrachium macrobrachion* (Bello-Olusoji *et al.,*2006). But in case of many other species of *Macrobrachium,* plant matter has been reported to be preferred over animal matter (Murthy and Rajagopal, 1990; Roy and Singh, 1997; Collins and Paggi, 1998; Sharma and Subba, 2005; Jimoh *et al.*, 2011). Non-selective opportunistic type of feeding habit has been reported for *M. vollenhovenii* (Jimoh *et al.,* 2011) and *M. macrobrachion* in the Nigerian waters (Bello-Olusoji *et al.,* 2006). The presence of significant amount of a variety of plant matter in the stomach content of *M. lar* throughout the study period confirmed that these may more often visit the upper water column to fulfill their dietary requirements as in case of *Metapenaeus monoceros* (Rao,1988) and *Macrobrachium choprai* (Roy and Singh,1997).

Owing to the complex nature and relatively large quantity of amorphous mass among the food items, it was difficult to ascertain the preferential food item of this species. Although *M. lar* exhibited slight preference to animal matter among the categorised groups, no preference to any particular type of item among the animal food was observed. The present study showed that there were no marked differences between the food habits of *M. lar* of various size groups as all size groups feed on a wide variety of food items. It was however, observed that the smaller individuals of both sexes consumed relatively large amount of detritus which indicated that smaller size groups are more of scavengers, while larger size groups showing slight preference to animal foods appear to be predators of slow moving benthic forms.

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