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One important aspect of the biology of any species which is relevant to the success of any aquaculture operation is a knowledge of its food and feeding habit. The nature and amount of food the organism takes in, the time of feeding, the effect of various environmental factors on its feeding behavior and the relationship between feeding activity and the onset of gonadal maturation are some of the information needed to achieve optimum utilization of the food given to the organism being cultured. This paper describes the food of the prawn *P. monodon* collected from Makato, Aklan from September 1977 to January 1978 with preliminary observations on its feeding habit and rate of foregut clearance.

The food of *Penaeus monodon* Fabricius consisted mainly of crustacea (small crabs and shrimps) and mollusks making up 85% of ingested food. The remaining 15% consisted of fish, polychaetes, ophiuroids, debris, sand and silt. Results indicate that *Penaeus monodon* is more of a predator of slow moving benthic macroinvertebrates rather than a scavenger or detritus feeder. Feeding activity (determined from stomach fullness) of female prawns is significantly higher than that of males. No difference in diet composition was found between males and females and between monthly samples. The average dry weight of gut content was 0.0955 with inorganic components making up 61.46%. Average crude protein determined individually from 6 samples was 27.53% and is comparable to that obtained from the pooled sample taken from 21 specimens (20.56%).

Feeding behavior of *Penaeus monodon* appears to be associated with the tidal phase. A significantly higher mean gut fullness index indicative of increased feeding activity was noted when the tide is on the ebb. Feeding apparently takes place during the time when food organisms which may have been carried in by the tide are more abundant and when prey organisms such as small crabs and mollusks emerge from the substrate to similarly feed on the nutrient rich water swept downstream by the outgoing tide.

Preliminary experiments on foregut clearance revealed that clearance rate is rapid with 95% of food transported from the foregut 4 hours after feeding. This is comparable to that reported for *Metapenaeus bennettae* (Dall, 1967) and for *Scylla serrata* (Hill, 1976). In *M. bennettae* complete emptying

of the foregut took 6-12 hours and a marked decline in foregut (proventricular) contents occured 2-3 hours after feeding. In the present study no observations were made on time at which ingestion starts or the time needed for complete emptying of the foregut, but, from the data it is safe to assume that emptying could take place from 5-6 hours after feeding. The rapid rate of movement of food from the foregut should enable this prawn to feed continually or several times during the night.

Table 1. Frequency of occurence and proportion of total food of various foregut contents of *Penaeus monodon* Fabricius collected from Makato, Aklan.

Foregut contents	Frequency of occurrence	Percentage of total food (1)
CRUSTACEA – remains of unidentified species of crabs and small shrimps	78.63	55.08
MOLLUSCA – shells of unidentified gastropods and bivalves	76.34	31.00
FISH – fish scales, vertebrae eye lens, bones	20.61	5.88
POLYCHAETA – setae, jaws body fragments	3.05	0.69
ECHINODERMATA – ophiuroid ossicles	2.29	1.23
DEBRIS – decaying leaf fragments, wood particles, unrecognizable material	29.77	5.18
SILT AND SAND PARTICLES	15.27	0.94

1 Only specimens with a gut-fullness index of 5 and above were included in the data.

Table 2. Dry weights, percentage mineral, organic and crude protein nitrogen from individual and pooled samples of gut contents from *Penaeus monodon* Fabricius.

Sample No.	Undecalcified Dry Weight (g)	Decalcified Dry weight	Undecalcified-decalcified Dry Weight	Mineral Content *(%)*	Organic Content *(%)*	Crude Protein Nitrogen *(%)*
1	0.0812	0.0195	0.0617	75.93	24.02	
2	0.1562	0.0728	0.0834	53.39	46.61	
3	0.1279	0.0468	0.0811	63.41	36.59	
4	0.0324	0.0294	0.003	90.74	9.26	
5	0.0742	0.0137	0.0605	81.54	18.46	
6	0.1454	0.0586	0.0868	59.7	40.3	
7	0.1523	0.0775	0.0748	49.11	50.89	
8	0.0769	0.0395	0.0374	48.63	51.37	
9	0.1978	0.0437	0.1541	77.9	22.1	19.25
10	0.0384	0.020	0.0184	47.9	52.1	21.44
11	0.0909	0.0208	0.0701	77.1	22.9	1.28
12	0.0487	0.0196	0.0291	59.75	40.25	31.41
13	0.663	0.0057	0.0606	91.4	8.6	89.69
14	0.0492	0.0170	0.0322	65.4	34.6	2.13
Average of individual samples	0.0955	0.0346	0.0609	61.46	38.54	27.53
Pooled sample (N-21)	1.2865 (0.0613/ specimen)	0.2614 (0.0124/ specimen)	1.0251 (0.0488/ specimen)	79.68	20.32	20.56

Table 3. Foregut index in *P. monodon* collected during different phases of one tidal cycle.

Foregut Index	TIDAL PHASE I Freq.	I %	II Freq.	II %	III Freq.	III %	IV Freq.	IV %
0	14	30.43	11	55	15	25	5	12.19
1	2	4.34	2	10	12	20	2	4.88
2	4	8.69	0	0	7	11.66	2	4.88
3	8	17.39	3	15	8	13.33	2	4.88
4	0	0	0	0	3	5	0	0
5	3	6.52	2	10	3	5	6	14.63
6	0	0	0	0	4	6.66	1	2.43
7	1	2.17	0	0	2	3.33	3	7.32
8	6	13.04	0	0	1	1.66	4	9.76
9	0	0	1	5	1	1.66	1	2.43
10	8	17.39	1	5	4	6.66	15	36.59
Total	46		20		60		41	
Mean	4		2		2.86		6.34	

[1] x^2 = 38.6, x^2 tab (10.01, 3 d.f.) = 1.34

[2] y = 10.78, F 0.01 (3,166) = 3.78

1. Chi-square test to determine significance in the number of prawns with full guts (foregut index = 10) caught during the 4 tidal phase.
2. F-test to determine significance between foregut index means in prawns caught during the 4 tidal phases.

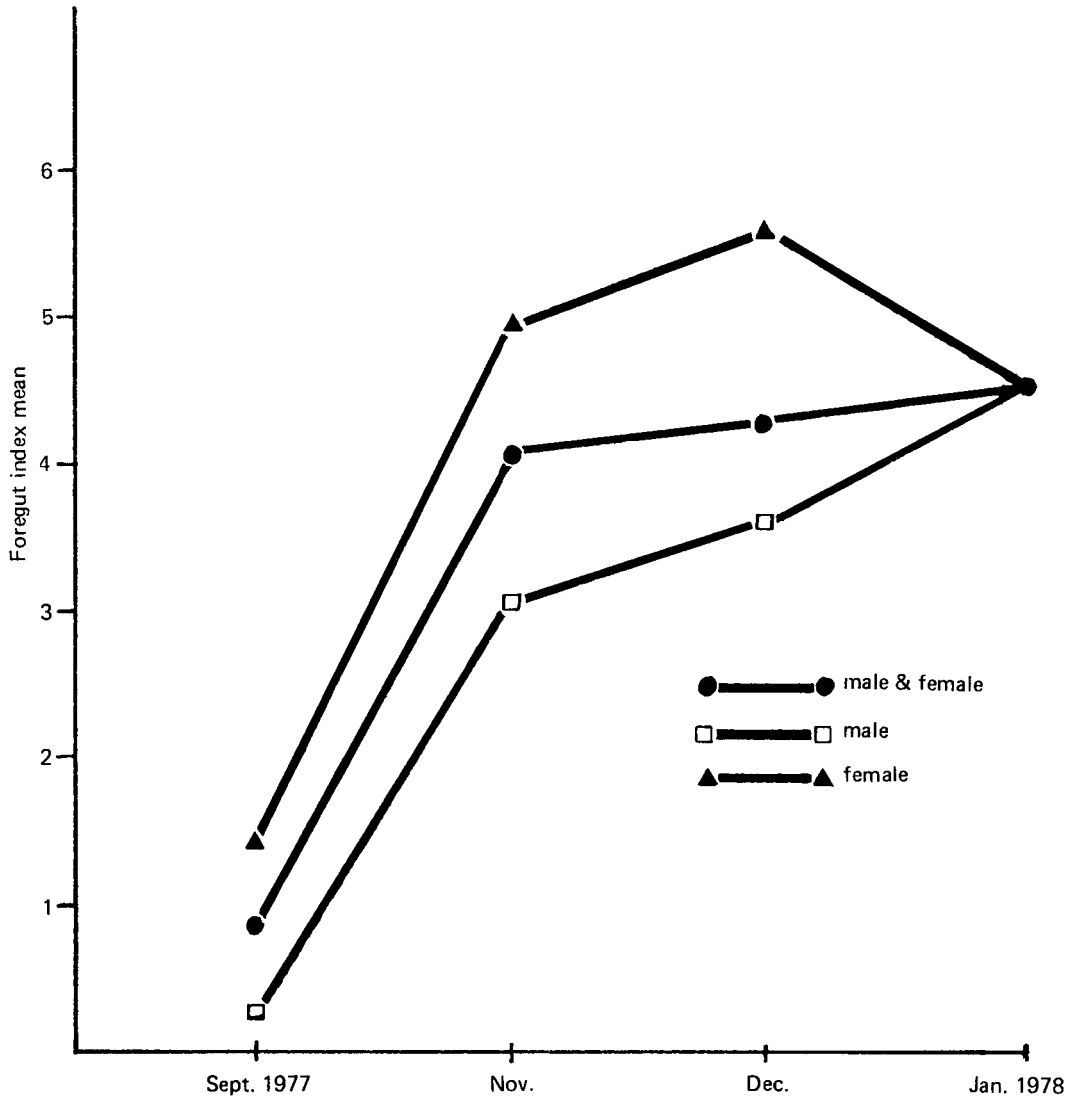

Fig. 1. **Mean gut index of male and female *Penaeus monodon* collected from September 1977 to January 1978.**

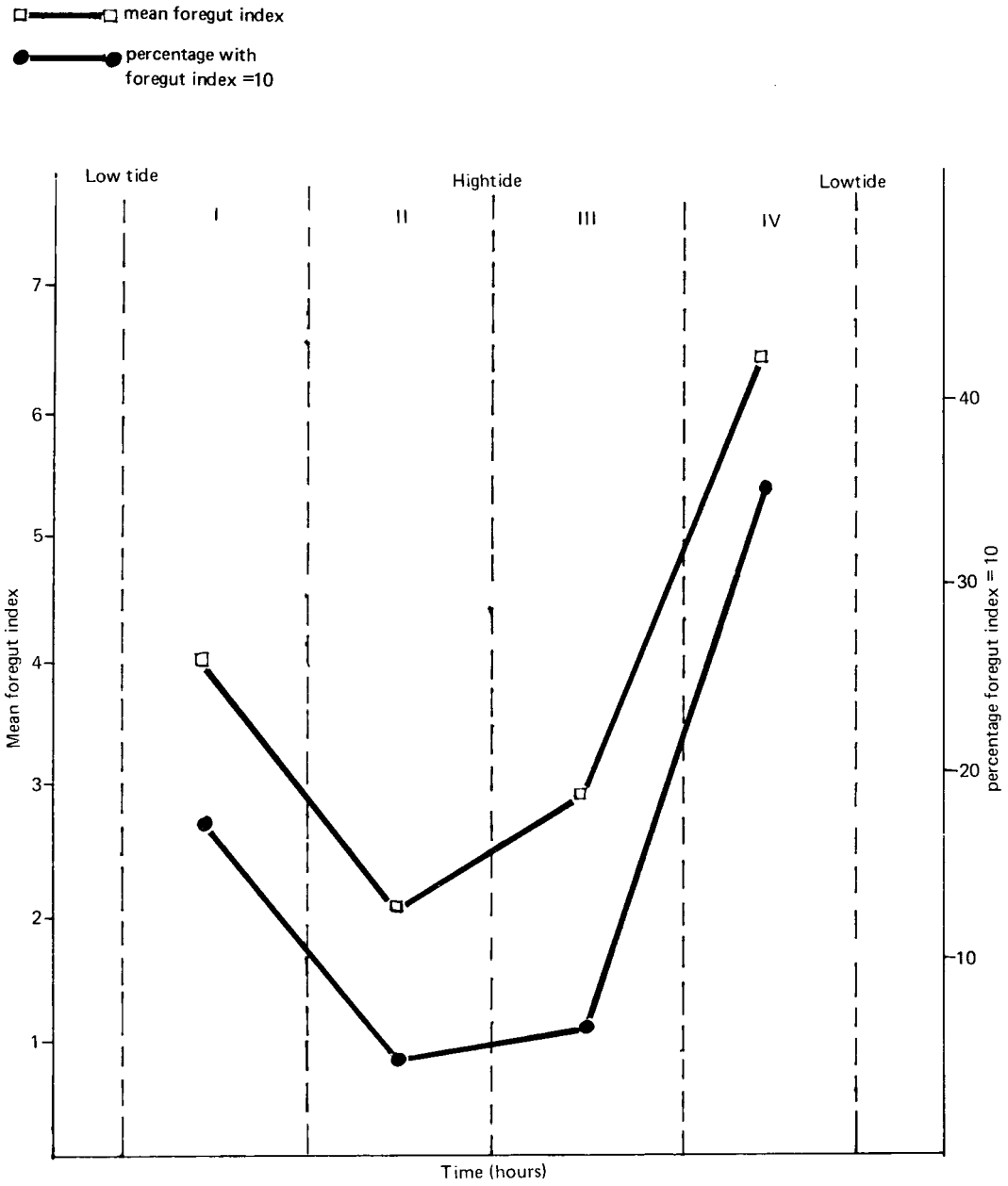

Fig. 2. Graph showing feeding activity of prawns during 4 designated phases of one tidal cycle.

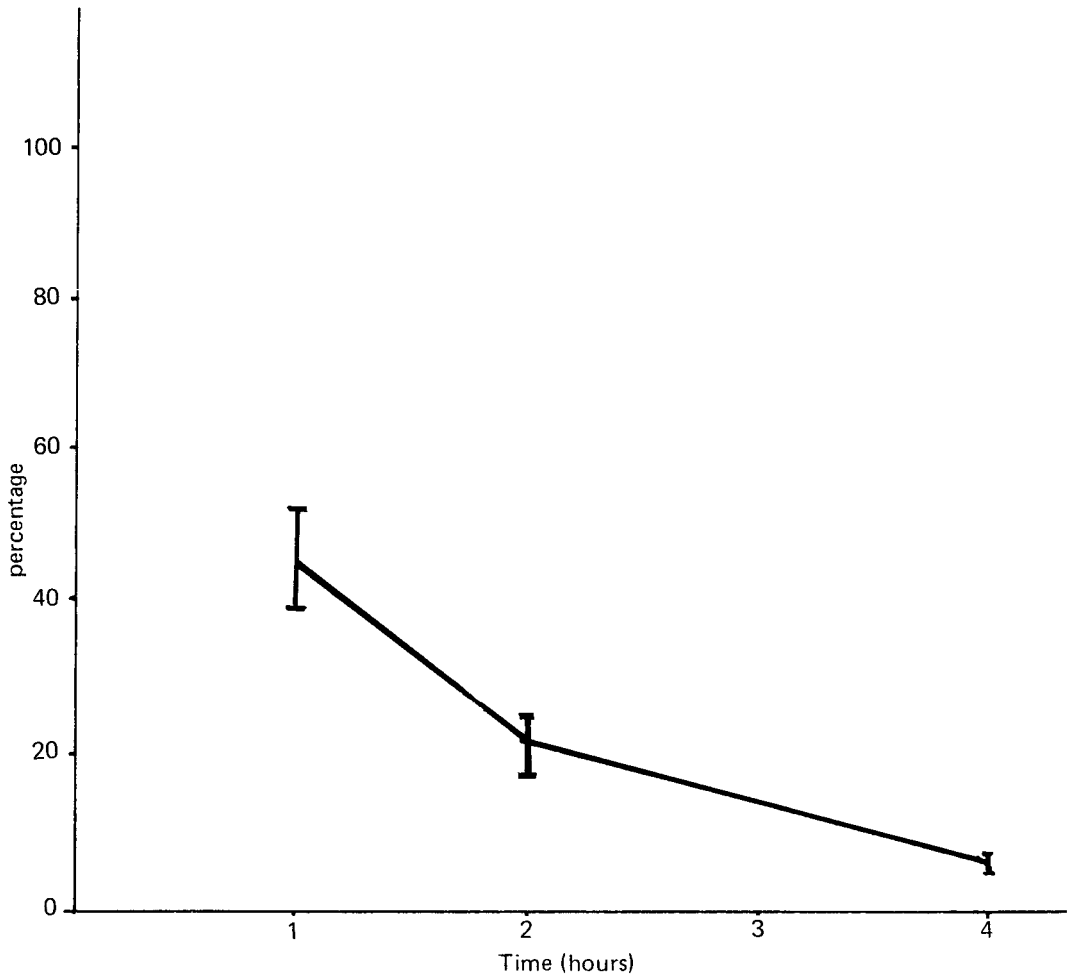

Fig. 3. Amount of food remaining in foregut expressed as percentage of weight of food apparently eaten. Points are means, vertical bars indicate 2 standard error n = 6 at 2 and 4 hrs n = 5 at 1 hr.

REFERENCES

1. Dall, W. (1967). The functional anatomy of the digestive tract of a shrimp *Metapenaeus bennettae* Racek and Dall (Crustacea: Decapoda: Penaeidae). Aust. J. Zool. 15:699-714.

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

3. Eldred, B., R. M. Ingle, K. D. Woodburn, R. F. Hutton and H. Jones (1961). Biological observations on the commercial shrimps, *Penaeus duorarum* Burkenroadi in Florida waters. Prof. Papers Ser. Mar-Lab. Fla. (3): 139 p.

4. Ennis, G. P. (1973). Food, feeding and condition of lobsters, *Homarus americanus,* throughout the seasonal cycle in Bonavista Bay, New Foundland. J. Fish. Res. Board Can. 30: 1905-1909.

5. Gopalakrishnan, V. (1952). Cited by K. H. Mohammed (1967). Synopsis of biological data on the Indian prawn *Penaeus indicus* H. Milne Edwards. Proc. World Sc. Conference on the biology and culture of prawns, Mexico City. M. N. Mistakidis. Ed. 4:1267-1288.

6. Hall, D. N. F. (1962). Cited by K. H. Mohammed (1967). Synopsis of biological data on the jumbo tiger prawn *Penaeus monodon* Fabricius. 1975 Proc. World Sc. Conference on the biology and culture of shrimps and prawns, Mexico City. M. N. Mistakidis. Ed. 4:1251-1266.

7. Hill, B. J. (1976). Natural food, foregut clearance-rate and activity of the crab *Scylla serrata.* Mar. Biology. 34:109-116.

8. Hughes, D. A. (1968). Factors controlling emergence of pink shrimp (*Penaeus duorarum*) from the substrate. Biol. Bull. Mar. Biol. Lab. Woods Hole., 134(1): 48-59.

9. Mitchell, H. (1972). Protein Nitrogen determination. J. of Assoc. of Off. Anal. Chemist. 55(1):1-3.

10. New, M. B. (1976). A review of shrimp and prawn nutrition. In Proc. Seventh Ann. Meeting, World Mariculture Society, San Diego, California. (Louisiana State Univ.): 277-287.

11. Pillay, T. V. R. (1952). A Critique of the methods of study of food of fishes. J. Zool. Soc. India 4(2): 185-200.

12. George, M. J. (1967). Synopsis of biological data on the penaeid prawn *Metapenaeus monoceros* (Fabricius). Proc. World Scientific Conference on the biology and culture of shrimps and prawns, Mexico City. M. N. Mistakidis Ed. 4:1539-1558.

13. Rodriguez, G. and E. Naylor (1972). Behavioural rhythms in littoral prawns. J. Mar. Biol. Ass. U. K. 52:81-95.

14. Thomas, M. M. (1973). Food and feeding of *Penaeus monodon* Fabricius from Korapuzha estuary. Indian J. Fish 19:202-204.

15. Tiews, K., S. A. Bravo and I. A. Ronquillo (1976). On the food and feeding habits of some Philippine shrimps in Manila Bay and San Miguel Bay. Phil. J. Fisheries. 14(2): 204-213.

16. Warren, P. J. and R. W. Sheldon (1967). Feeding and migration patterns of the pink shrimp, *Pandalus montagui,* in the estuary of the River Crouch, Essex, England. J. Fish Res. Bd. Canada, 24(3):569-588.

17. Williams, A. B. (1955). Cited by H. L. Cook and M. J. Lindner (1967). Synopsis of biological data on the brown shrimp *Penaeus aztecus.* Proc. World Sc. Conference on the biology and culture of shrimps and prawns, Mexico City. M. N. Mistakidis, Ed. 4:1471-1498.