

<http://www.pjbs.org>

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Study on Some Aspects of Biology of Prawns from North East and North West Regions of Bangladesh

¹A.S.M. Saifullah, ²Md. Sayedur Rahman, ¹Sardar M.A. Jabber, ¹Yusuf Sharif Ahmed Khan and ²Nazim Uddin

¹Department of Environmental Science and Resource Management,
Mawlana Bhashani Science and Technology University, Santosh, Tangail, Bangladesh

²Institute of Marine Sciences, Chittagong University, Chittagong, Bangladesh

Abstract: The present study reports the sex ratio and fecundity of four prawn species (*Macrobrachium lamarrei*, *Macrobrachium malcolmsonii*, *Macrobrachium dolichodactylus* and *Macrobrachium dayanus*) from the northeast (Sylhet, Maulavi Bazar and Sunamganj districts) and northwest (Pabna, Sirajganj and Natore districts) parts of Bangladesh. Females were more common than males in each species with male-female being 1:17.5, 1:1.1, 1:2.6 and 1:1.6, respectively, although this result was statistically significant only for the first species. Fecundity (mean±SD) of the studied species was found to be 228±69, 6234±2390, 2187±729 and 153±22 eggs per female, respectively. Fecundity in all the species was found directly related to total length, standard length and total weight.

Key words: Sex ratio, fecundity, prawn, Bangladesh

INTRODUCTION

Prawns and shrimps constitute an important part of Bangladesh fishery resources. Commercial shrimp culture expanded at a rapid rate driven by conducive policy environment within the country and emerging opportunity in the global market when the capture of wild shrimps was becoming more expensive and erratic. At the same time, there was a fall in production in some major shrimp producing countries in south east Asia, which pushed up the demand for Bangladeshi shrimp. Between 1990 and 1995 alone, shrimp production in Bangladesh registered a growth of about 60%^[1]. Some works have been done on the taxonomy and biology of different species of shrimps^[1-6] but it is insufficient for fisheries management.

The study of fecundity of any species is important to have a full understanding of its population dynamics. It must be known to assess the productive potential and to evaluate the commercial potentialities of a fish stock^[7] and to understand the diversity of reproductive strategy^[8].

Therefore, the present study was carried out in order to estimate the sex ratio and fecundity, and to establish a mathematical relationship of fecundity with total length, standard length and body weight for four

economically important prawn species during the study period (April-July, 1998).

Northeast (Sylhet, Maulavi Bazar and Sunamganj districts), influenced by Meghna basin with largest haor (wetland) area and northwest part (Pabna, Sirajganj and Natore districts) is influenced by Padma and Brahmaputra basin and their tributaries are very much potential for prawns and shrimps.

MATERIALS AND METHODS

Samples were collected from 20 sites of the northeast region (Sylhet, Maulavi Bazar and Sunamganj districts) and 30 sites of the northwest region (Pabna, Sirajganj and Natore districts) during April-July 1998 by the authority of FAP-17. Sampling was conducted in varying locations within each site and was collected in different times (day and night), dates and months within the stipulated period. Sampling for catching prawns at each site was done randomly using a seine net with 22 µm mesh size.

Prawns were stored in the laboratory, washed, cleaned and preserved in the plastic containers with 5% formalin. Then identification of the prawn species was done consulting available national and international

literatures for identification and systematic separation of species^[2,4,5,9-11].

The species were identified into male and female, based on the presence of appendix masculina at the second pairs of pleopods for the male and absence of it for female. Total length (TL) and standard length (SL) of a total 40 female prawns were measured to the nearest 0.01 mm. Total weight (TW) of each of the 40 female prawns was measured by means of a pan balance to the nearest 0.01 g after excess water was removed with blotting paper.

The eggs of each of the species were taken separately in clean petridishes with forceps. Then the eggs were washed with fresh water for several times. Initially water from eggs was removed by blotting paper and then it was dried at room temperature and sometimes, gentle heating under sunlight. Thus the eggs were ready for counting. Gravimetric method^[7] was followed in counting eggs.

Data from all samples were plotted within each month for statistical analysis. Multiple regression analysis was carried out for finding the mode of affects of TL, SL and TW on fecundity, where fecundity was treated as the dependent variable and TL, SL and TW were as independent variables. SPSS/PC+ programs were used for the statistical analysis.

RESULTS AND DISCUSSION

Sex ratio: Out of total 1274 individuals of *M. lamarrei*, 69 (5.4%) were male and the rest 1205 (94.6%) were female giving a ratio of 1:17.5. A total of 254 individuals of *M. malcolmsonii* were identified out of which 119 (46.9%) were male and the rest 135 (53.1%) were female giving a ratio of 1:1.1. A total of 141 individuals of *M. dolichodactylus* species were identified out of which 39 (27.7%) were male and the rest 102 (72.3%) were female giving a ratio of 1:2.6. A total of 325 individuals of *M. dayanus* were identified out of which 126 (38.8%) were male and the rest 199 (61.2%) were female giving a ratio of 1:1.6. The ratio in the natural population was statistically significantly different for *M. lamarrei* but not for the other three species (Table 1).

Most work on the sex ratio of both penaeid and caridean shrimp have found females to be more common. George and Rao^[12] observed a predominance of females in most months while studying the distribution of sex ratios of penaeid prawns in the trawl fishery of Cochin. Menon^[13] reported great predominance of females among the prawns over 100 mm but dominance of males in smaller sized group of prawns from the commercial catches from the sea and brackish water of Narakkal. Shaikh Mahmud and Tembe^[14] recorded a predominance of females for six

months, from January to June, in Bombay waters. Kibria and Ahmed^[15] found a male female ratio of 66:35 in *M. malcolmsonii*. Shafi and Quddus^[6] observed a male female ratio of 53:47 in *M. villosimanus*.

In explaining the monthly fluctuation of male and female population of *M. rosenbergii*, Patra^[16] reported two factors, spawning migration and physico-chemical conditions of water, which might have some influence in the variation of abundance of male and female populations. Castello and Allen^[17] have also made similar explanation on shrimp and prawn. Though monthly variation in sex ratio of the presently studied four species showed variation from the natural ratio of 50:50 (only exception in case of *M. malcolmsonii* in June), but the difference in between the two sexes showed insignificant values of χ^2 for all the species other than *M. lamarrei*. So in the light of the above discussion it may be opined that the fluctuation in the sex ratio and dominance of female prawns, especially during the breeding season might be due to the aggregation of the ripe females at the surface for laying.

Fecundity: Fecundity of the individuals of *M. lamarrei*, *M. malcolmsonii*, *M. dolichodactylus* and *M. dayanus* varied from 141 to 328, 2642 to 9831, 940 to 3224 and 120 to 186 eggs per individuals with the mean of 228±69, 6234±2390, 2187±729 and 153±22, respectively (Table 2). Variation in fecundity was also observed in the prawns of same size. The fluctuation of fecundity with respect to TL, SL and TW was common. The multiple regression analysis of fecundity on TL, SL and TW of the individuals was found 0.99, 0.99, 0.98 and 0.98, respectively while the relationship of fecundity on TL, SL and TW was found statistically significant in both the terms of T-test and F-test (Table 3).

Shafi and Quddus^[6] reported the fecundity of *M. lamarrei*, *M. malcolmsonii*, *M. villosimanus*, *M. rudis*, *M. dayanus*, *M. birmanicus*, *M. dolichodactylus* and *M. mirabilis* as 2250-16300, 2000-10000, 7000-15000, 145-300, 2500-17000, 100-150 and 600-2500, respectively. In the present investigation, the fecundity of *M. lamarrei* ranged from 141 to 328, in *M. malcolmsonii* it was found to range from 2642 to 9831, in *M. danayas* it was from 120 to 186 and in *M. dolichodactylus* it was observed from 940 to 3224. So it is clear from the above discussion that the present investigation is in close agreement with the fecundity of *M. lamarrei* and *M. dayanus* reported by Shafi and Quddus^[6] and for *M. malcolmsonii* reported by Kibria and Ahmed^[15], but disagrees with the fecundity of *M. dolichodactylus* reported by Kibria and Ahmed^[15].

Patra^[18] found linear relationship between fecundity and TL, carapace length and TW of *M. rosenbergii*. In the

Table 1: Monthly sex ratio of *M. lamarrei*, *M. malcolmsonii*, *M. dolichodactylus*, *M. dayanus* and their χ^2 values

Species	Sex	Month				Grand Total	χ^2 Value
		April	May	June	July		
<i>M. lamarrei</i>	Male	13 (10.6%)	16 (6.2%)	13 (2.8%)	27 (6.3%)	69 (5.4%)	13.48
	Female	110 (89.4%)	244 (93.8%)	450 (97.2%)	401 (93.7%)	1205 (94.6%)	
	Ratio	1:8.5	1:15.3	1:34.6	1:14.9	1:17.5	
<i>M. malcolmsonii</i>	Male	20 (42.5%)	59 (46.1%)	29 (52.7%)	11 (45.8%)	119 (46.9%)	1.15
	Female	27 (57.5%)	69 (53.9%)	26 (47.3%)	13 (54.2%)	135 (53.1%)	
	Ratio	1:1.4	1:1.2	1:0.9	1:1.2	1:1.1	
<i>M. dolichodactylus</i>	Male	3 (33.3%)	22 (31.4%)	9 (21.9%)	5 (23.8%)	39 (27.7%)	1.47
	Female	6 (66.7%)	48 (68.6%)	32 (78.1%)	16 (76.2%)	102 (72.3%)	
	Ratio	1:2	1:2.2	1:3.4	1:3.2	1:2.6	
<i>M. dayanus</i>	Male	26 (36.1%)	61 (42.7%)	21 (42.0%)	18 (30.0%)	126 (38.8%)	6.81
	Female	46 (63.9%)	82 (57.3%)	29 (58.0%)	42 (70.0%)	199 (61.2%)	
	Ratio	1:1.8	1:1.3	1:1.4	1:2.3	1:1.6	

Table 2: Mean total length, standard length, total weight and fecundity of *M. lamarrei*, *M. malcolmsonii*, *M. dolichodactylus* and *M. dayanus*

Species	Mean total length in mm (Range)	Mean standard length in mm (Range)	Mean total weight in mm (Range)	Mean fecundity (Range)
<i>M. lamarrei</i>	55.60±5.45 (29.74-67.48)	43.71±5.42 (20.76-54.69)	1.42±0.38 (1.19-1.85)	228±69 (141-328)
<i>M. malcolmsonii</i>	82.91±8.09 (29.32-101.26)	66.09±7.26 (22.41-82.26)	5.44±1.45 (3.31-7.61)	6234±2390 (2642-9831)
<i>M. dolichodactylus</i>	51.53±4.40 (27.29-63.15)	44.44±4.42 (23.81-53.96)	2.01±0.37 (1.02-1.72)	2187±729 (940-3224)
<i>M. dayanus</i>	56.53±4.18 (19.60-68.15)	45.73±3.77 (14.93-50.91)	1.92±0.46 (0.72-2.37)	153±22 (120-186)

Table 3: Multiple regression analysis of fecundity on SL, TL and TW of *M. lamarrei*, *M. malcolmsonii*, *M. dolichodactylus* and *M. dayanus*

Species	Variable	Coefficient (B)	Constant (A)	Beta	T	Sig. T	Multiple R	Adjusted R ²	R ²	F3,5
<i>M. lamarrei</i>	TW	50.35		0.29	0.30	0.78				
	SL	17.28	-144.86	1.36	2.43	0.06	0.99	0.96	0.98	66.94*
	TL	-8.25		-0.65	-0.81	0.46				
<i>M. malcolmsonii</i>	TW	-212.01		-0.13	-0.38	0.72				
	SL	109.51	-19252.75	0.33	0.90	0.41	0.99	0.99	0.99	229.78*
	TL	234.04		0.79	2.04	0.10				
<i>M. dolichodactylus</i>	TW	834.25		0.42	0.25	0.82				
	SL	-3.47	-4217.15	-0.02	-0.02	0.98	0.98	0.90	0.95	19.32*
	TL	94.77		0.57	0.34	0.76				
<i>M. dayanus</i>	TW	-5.91		-0.13	-0.26	0.81				
	SL	-0.06	-152.98	-0.01	-0.01	0.99	0.98	0.94	0.97	29.84*
	TL	5.67		1.12	0.94	0.42				

present study it was also found that the number of eggs increase linearly with the increase of TL, SL and TW (Table 2) and these relationships were statistically significant (Table 3). So the present study also agrees with the findings of Patra^[18].

REFERENCES

- Director of Fisheries, 1995. Fisheries resource survey. People's Report on Bangladesh Environment, 2001.
- Ahmed, N., 1957. Prawn and Prawn Fishery of East Pakistan. Directorate of East Pakistan, Dacca, East Pakistan, pp: 31.
- Khandaker, N.A. and R.W. Patra, 1971. Commercial caridean prawns of East Pakistan. Pak. J. Sci., 23: 195-201.
- Shafi, M., M.M.A. Quddus and M.M. Islam, 1975. Bangladesher Matshya Sampad (Fishery Resources of Bangladesh). Bangla Academy Biggan Patrika, Magh-Chaitra, Ditia Barsha, Chaturtha Shankhya, 1382 (Bengali), pp: 11-23.
- Howlader, M.S., 1976. Taxonomic account of Penaeid shrimp of Bangladesh. Bd. J. Sci. Ind. Res., 91-94: 128-138.
- Shafi, M. and M.M.A. Quddus, 1982. Bangladesher Matshya Sampad (Fishery Resources of Bangladesh). Bangla Academy, Dhaka, pp: 444.

7. Lagler, K.F., 1956. Freshwater Fishery Biology (2nd Edn.). W.M.C. Bown Co. Publisher, Debulque, pp: 109-110.
8. Nazari, E.M., M.S. Simões-Costa, Y.M.R. Müller, D. Ammar and M. Dias, 2003. Comparisons of fecundity, egg size, and egg mass volume of the freshwater prawns *Macrobrachium potiuna* and *Macrobrachium olfersi* (decapoda, palaemonidae). *J. Crustacean Biol.*, 23: 862-868.
9. Alcock, A., 1906. The Prawns of the *Penaeus* Group. In: Catalogue of the Indian Decapod Crustacea in the Collection of the Indian Museum. Indian Museum, Part 3, Macrura, Fasc., pp: 155.
10. George, M.J., 1969. Prawn fisheries of India, 2 systematics: Taxonomic consideration and general distribution. *Bull. Cent. Mar. Fish. Res. Inst.*, 14: 5-48.
11. Kurian, C.V. and V.O. Sebastin, 1976. Prawn and Prawn Fisheries of India. Hindustan Publishing Corp. Delhi, pp: 397.
12. George, M.J. and P.V. Rao, 1967. Distribution of sex ratios of penaeid prawns in the trawl fishery of Cochin. *Symp. Ser. Mar. Biol. Ass. India*, 2: 698-700.
13. Menon, M.K., 1957. Contributions of the biology of penaeid prawns of the southwest coast of India, I: sex ratio and movements. *Indian J. Fish.*, 4: 62-74.
14. Shaikh Mahmud, F.S. and V.B. Tembe, 1960. Study of Bombay prawns: the seasonal fluctuation and variation in abundance of the commercial important species of Bombay prawns with a brief note on their size, state of maturity and sex ratio. *Ind. J. Fish.*, 7: 69-81.
15. Kibria, G. and M.K. Ahmed, 1983. Prawn Fisheries Research in Bangladesh. Proceedings of a seminar organized by BARC, 22-23 Dec., 1983.
16. Patra, R.W.R., 1977. Seasonal abundance and the sex ratio of the natural population of *Macrobrachium rosenbergii* De Man, *Bangladesh J. Zool.*, 5: 101-106.
17. Costello, T.J. and D.M. Allen, 1970. Synopsis of biological data on the pink shrimp *Penaeus duorarum* Burkenroad 1539. *FAO Fish. Rep.*, 57: 1499-1537.
18. Patra, R.W.R., 1976. The fecundity of *Macrobrachium rosenbergii* De Man. *Bangladesh J. Zool.*, 4: 1-9.