ON THE BIOLOGY AND FISHERY OF THE GIANT FRESHWATER PRAWN MACROBRACHUH ROSENBERGU (DE MAN) IN THE NORTHERN BOLGODA LAKE, SRI LANKA

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ABSTRACT

In the northern Bolgoda lake, Sri Lanka, the salinity and the temperature of the bottom water are consistently higher than those of the surface. Both the salinity and temperature are influenced by the local monsoon rains.

The giant freshwater prawn (Macrobrachium rosenbergii) occurs in the lake throughout the year except March and September. Considerable numbers of them are caught from April to June and again from November to January. The carapace length of male prawns range from 5 cm to 12 cm (mean 8.2 + 1.4 cm) and that of females from 5 cm to 11 cm (mean 7.2 + 0.9 cm). The mean length of the prawns caught increases from 6.6 cm in April to 7.9 cm in June and from 7.1 cm in November to 7.6 cm in January. The observations indicate that M. rosenbergii migrates into the lake, obviously from the nearby freshwater streams, twice during the year.

The seasonal distribution of the berried females shows two peaks corresponding to the above two periods, indicating that there are two spawning seasons for M. rosenbergii in the lake during a year.

The fecundity of the berried females varies from 82,000 to 170,000 (mean 113,300 + 30,985). The males in general weigh more than the females. The catch per unit effort varies from 0 to 2.25 prawns per net per day. The fishery for M. rosenbergii in the lake coincides with its two spawning immigrations.

INTRODUCTION

The northern Bolgoda lake is a part of the Bolgoda lagoon in Sri Lanka (5.8° N-9.8° N and 79.8° E-81.8° E). The lagoon is made up of the Panadura Ganga, the Veras Ganga, the northern Bolgoda lake, the Bolgoda Ganga and the southern Bolgoda lake.

A fishery for penaeid prawns is in existence in this lagoon. In the northern Bolgoda lake, about 95% of the penaeid prawns are caught at night, using light traps called "Ja"kotu", made of bamboo. The remaining 5% of the penaeid prawns are caught in seines. It is in these seines that giant freshwater prawns
(Macrobrachium rosenbergii) are generally caught. However, in the traps, which are operated by laying them at regular intervals along the entire length of the lagoon, juveniles are occasionally caught.

Costa and Starmuhlner (1973) and Weninger (1973) have recorded about fourteen physico-chemical characteristics of some of the water bodies in Sri Lanka where different species of freshwater prawns were being caught. Costa (1979) has described the taxonomic features and the distribution of freshwater prawns in some of the lagoons and rivers of Sri Lanka. He has also recorded (1980) the growth rates of juvenile *M. rosenbergii* when they were fed on African snail. Ling (1969a, 1969b) has described the general biology, development, rearing and culturing methods of *M. rosenbergii*.

Recently, private and public sector organizations have initiated culture of *M. rosenbergii* in Sri Lanka. The present study has been carried out in this context to determine some relevant biological aspects such as length-weight relationship, spawning periodicity and fecundity of the species in the northern Bolgoda lake, where it forms a minor fishery.

**MATERIAL AND METHODS**

Samplings were carried out from the catches of four seines, which were being operated in the northern Bolgoda lake, the heart of the fishing area, from 1981 to 1983. The seines were in operation for a period of about 20 days each month, with the primary purpose of catching penaeid prawns. The daily prawn catches were landed every morning at the prawn auction centre at Deltara (Fig. 1), where the samplings were done. The number of giant freshwater prawns caught per day per net was counted twice a month. Their carapace lengths (from the base of the eye stalk to the posterior edge) and weights were recorded, separately for the sexes. From each sample, one or two mature berried female prawns were taken to the laboratory for fecundity studies. Their eggs were carefully removed and the fecundity was estimated using the water-displacement method. Water samples from the surface and the bottom of the lake were collected using a Rutner sampler, on the days on which the samples were taken. The temperature of the water was measured at the site. Salinity was determined by the McLusky (1971) method at the laboratory. The total number of prawns caught each day during the years 1981 to 1983 was obtained from the records of the prawn auction centre. Rainfall data for the area were obtained from the Meteorological Department, Colombo, Sri Lanka.

**OBSERVATIONS AND DISCUSSION**

The Bolgoda lagoon is situated in the southwestern sector of Sri Lanka, where the rainy seasons are from April to June and from October to December.
(Fig. 2). Of these two seasons, the stronger one is that which lasts from April to June. These two rainy seasons correspond roughly to the two 'intra-monsoonal' periods dealt with in the paper.

The distributions of the monthly salinity of the surface and the bottom waters are shown in Figure 2. Owing to the intra-monsoonal rains, the surface salinity from November to January was about 0.05 %, and the bottom salinity was about 0.01 % without a clear salt wedge. From May to July, the surface salinity was 2 %, and the bottom salinity was 3 % with a weak salt wedge. During the rest of the year, the surface salinity was above 10 % and the bottom salinity was above 13 % with a deep salt wedge. This salt wedge extended as far south as the southern Bolgoda lake (Denipitiya and Jinadasa 1980). This clear stratification was due to the low rainfall and to the influx of sea water.

The monthly distributions of the water temperature at the surface and the bottom are shown in Figure 2. The bottom temperature was always higher than the surface temperature owing to the presence of warmer sea water along
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During November to January, the surface temperature remained almost 28° C; during May to July it remained at 29° C; during the rest of the year it was about 30° C to 31.5° C. During November to January the bottom temperature was very nearly equal to that of the surface, remaining about 28.5° C; during May to July it was 30.5° C; and during the rest of the year it was 32.5° C.

FIG. 2. The mean monthly distribution of the rainfall, salinity and water temperature of the northern Bolgoda lake for 1981 to 1983 (the value at each point is the average for the period).

The percentage-frequency distribution of the carapace length for 1981-82 and 1982-83 is shown in Figure 3. The carapace lengths of the female varied from 5 cm to 11 cm (mean 7.2 ± 0.95 cm) and that of males from 5 to 11 cm (mean 8.4 ± 1.4 cm). The larger males and females appeared in the catches in May and June, and again in November and December. The number of females caught was always higher than that of the males. The average length of females was 6.6 cm (S.D. 0.77 cm) in April, 7.4 cm (S.D. 0.66 cm) in May and 7.9 cm (S.D. 0.96 cm) in June. Again the average length of female was 7.1 cm (S.D. 0.74 cm) in November and 7.6 cm (S.D. 1.57 cm) in December. At the same time, there was also a shift noticed in the modal length from April to July and from November to January. The modal lengths show that relatively larger females were abundant in the northern Bolgoda lake from
April to July and from November to January. The complete absence of prawns in March and September indicates that they probably do not spawn during these two months since it is evidently for the purpose of spawning that they immigrate into the lake.

The seasonal distribution of the berried females is shown in Figure 4. Of the females caught between April and July, 100% and of those caught between November and January, 60% were berried. During the rest of the year (except in March and September when there were no prawns) there were only 10% berried females. This clearly shows that in the Bolgoda lake *M. rosenbergii*, though spawns throughout the year (except in March and September), has two peak spawning seasons, a major one from May to July and a minor one from November to January.
The relationship between the fecundity and the carapace length is shown in Figure 5. The fecundity of the prawns with carapace length varying from 5.5 cm to 9.0 cm correspondingly varied from an estimated 82,000 to 170,000 (mean, 113,300; S.D. 30,985) showing a direct relationship between these two parameters. Similar results have also been obtained by Pandian and Balasubramanian (1980) for *M. nobilii*, in which species, however, the number of eggs produced had varied from 9,100 to 30,000. The smallest berried female prawn in the present study had a carapace length of 4.0 cm and the largest had 10.0 cm.

The mean weights of males and females of identical carapace lengths are tabulated below for comparison:

<table>
<thead>
<tr>
<th>Mean carapace length (cm)</th>
<th>Mean weight (g)</th>
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<tbody>
<tr>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>4</td>
<td>120</td>
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<tr>
<td>5</td>
<td>170</td>
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<tr>
<td>10</td>
<td>490</td>
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<td>11</td>
<td>545</td>
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From this table it is evident that males weighed more than females, as it had earlier been observed by Motoh (1980).

The distribution of the catch per unit effort, measured in number of prawns per net per day, is shown in Figure 6. It is seen that the catch per unit effort varies from 0 to 2.25 prawns per net per day. The higher catch rates were during April to December, corresponding to the two spawning periods.

![Graph showing monthly distribution of catch per unit effort (CUE) from 1981 to 1983.](image)

From the foregoing observations it is clear that in the Bolgoda lake the giant freshwater prawn, *M. rosenbergii*, enters in considerable numbers, obviously for spawning, twice a year, during May-June and November-January, when the two corresponding monsoonal rains lower both the salinity and temperature of the lake and that the fishery of this prawn in the lake is mainly supported by these spawning stocks.

ACKNOWLEDGEMENTS

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REFERENCES


