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On the Biology of the One-Stripe Spiny Eel, *Macrognathus aral* (Bloch and Schneider) from the Ponds in lower Krishna Irrigation System

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Abstract

Spiny eels (*Mastacembelidae*) form an important component of the Inland fishery in the lower Krishna irrigation system and also command good price. *Macrognathus aral* spawns during August-September months coinciding with the southwest monsoon in this region. Studies on the ova diameters of the intraovarian ova show that the individuals release all the ova in a single spawning act. 50% of the males attained maturity at total length of 16 cm, while 50% of the females attaining maturity at 17.5 cm TL. Egg fertility ranged between 1065 and 4961. Relationship between length and weight can be expressed by the formula Log W = -3.91 + 2.39 Log L for juveniles, and Log W = -6.31 + 3.2 Log L and Log W = -7.53 + 3.67 Log L for adult males and females, respectively. The fish primarily feeds on detritus of animal origin.

Key words: Biology, *Macrognathus aral*

Introduction

*Mastacembelids* form one of the important components of the Inland fisheries in India. They are inhabitants of fresh and brackishwaters (Jayaram, 1981; Talwar and Jhingran, 1991). Spiny eels of the Indian sub-continent belong to genera *Macrognathus* La Cepede and *Mastacembelus* Scopoli (Talwar and Jhingram, 1991). Of the five species included under the genus *Macrognathus*, *M. aral* is the most abundant in the species contributing to the fishery. In the present study some aspects of the biology of *M. aral* are presented. Excepting the study of Lazarus and Reddy (1986) on the length-weight relationship in *M. aculeatus* = (*M. aral*) from Thambaramur, Chennai, no detailed work on the biology of *M. aral* has been carried out in India.

Material and Methods

For the present study samples were collected from the fish landing centers at Tenali, Kuchipudi and Namburu of Guntur district, Andhra Pradesh. Spiny eels were captured by operating basket traps in the shallow irrigation channels. Sampling was done at fortnight intervals. Total length, body weight, gonad weight, sex and stages of maturation of fish were recorded in fresh condition. The specimens were preserved in 4% formalin for further observation in the laboratory. In the present study observations were made on the specimens with length range of 11-30 cm total length. For study of gut contents, length-weight relation, condition factor and spawning season, methods outlined by Ricker (1968) were followed.

Food and feeding

In *M. aral* the mouth is small, ventral in position, upper jaw is extended into a long fleshy rostrum supported by 19-25 paired tooth plates. The rostrum is curved with a ventral groove on its ventral side. The alimentary canal is long and coiled with two intestinal caeca.

The food, chiefly consisted of fine detritus. The detritus formed 80 per cent of the gut contents. Muscle tissues of the unidentified dead organisms formed 15 per cent of the diet, while minute scales of fish and parts of insect wings were encountered in some samples. No perceivable differences in gut contents between small sized and large-sized fish could be made out. It is presumed that detritus undergoes maceration while passing through the ventral concavity of the rostrum and thus appears as pulp. *M. aral* could be considered as a detrivore, feeding on the decaying organic matter and living in the bottom layers of the pond.

Length-weight relationship

Relationship between length and weight of fish in different sub-groups: juveniles, adult females and males was calculated using the following equation (Weatherly, 1972).

\[ W = a L^b \]

This relationship is expressed by the following equation in different sub-groups

**Juveniles:** \( \text{Log } W = -3.91 + 2.39 \text{ Log } L \)

**Adults**

- **Females:** \( \text{Log } W = -7.53 + 3.67 \text{ Log } L \)
- **Males:** \( \text{Log } W = -6.31 + 3.2 \text{ Log } L \)
Spawning biology

Studies on the different aspects of reproductive biology of *M. aral* were made on samples of fish collected from the landing center near Tenali. Samples collected were analysed for different reproductive biological data.

Cycle of maturation and spawning periodicity

Stages of maturation were determined on the basis of the monthly samples collected during June 1998- May 1999, length range of these individuals varies from 11-30 cm TL. Females with maturing gonads (stage-III) were encountered between March and May in the population. Females with stage-IV gonads are observed in June and July months and those with stage-V appeared from August to early September. Spent individuals were not encountered in the samples. From October to March females were not observed in the samples. This might be due to the females moving away immediately after spawning. Males show immature gonads (stage-I) from November to December. Males with stage-II gonads appeared from January to early March and stage-III gonads started appearing from middle of the March to May. Stage-IV males were observed from June to July. Ripe males with stage-V were observed in samples from August to middle September. Spent males were found from September to October.

Maturation of intra-ovarian ova

The progression of maturation of intra-ovarian ova shows that vitellogenesis starts in the ova when they measure 0.08 mm in size. The mature ova measured 1.2 mm in diameter. The frequency distribution of the intra-ovarian ova in a mature ovary showed that the most mature group of ova measure between 0.7 and 1.3 mm forming a single group, which spawned during the ensuing spawning season.

Length and first maturity

Minimum length at which 50% of the individuals become mature during spawning season is considered as the length at first maturity. The present study was based on 515 specimens collected during the period June 1998-May 1999 of which 114 are females and 401 were males. Females and males with maturing and mature gonads (stage-IV and stage-V) were considered to spawn during the ensuing spawning season. The smallest mature specimen among males and females measured 12 cm TL. In *M. aral* 50% of the males in the present locality attained maturity at a length of 16 cm TL, while the 50% of the females attaining maturity at 17.5 cm TL (Fig. 1). In *M. aral* minimum size at spawning was observed to be less in males than in females.

Sex-ratio

During the study period 515 specimens were observed, of which 114 were females and 401 were males. The sex-ratio of females to males was 1:3.5. Analysis of the sex-ratio in the monthly samples (Table 1) by chi-square test (Snedecor and Cochran, 1967) shows that this ratio is significant from September to February, when only males were encountered in samples. The largest male obtained measured 26 cm TL and the female 30 cm TL.

![Graph](image)

Fig. 1. Percentage frequency distribution of mature males and females in each centimeter length group.

<table>
<thead>
<tr>
<th>Month</th>
<th>Total number</th>
<th>Female</th>
<th>Males</th>
<th>D.F.</th>
<th>Chi-square</th>
<th>Remarks</th>
</tr>
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<tr>
<td>June</td>
<td>21</td>
<td>7</td>
<td>14</td>
<td>1</td>
<td>1.16</td>
<td>NS</td>
</tr>
<tr>
<td>July</td>
<td>54</td>
<td>22</td>
<td>32</td>
<td>1</td>
<td>0.92</td>
<td>NS</td>
</tr>
<tr>
<td>August</td>
<td>75</td>
<td>30</td>
<td>45</td>
<td>1</td>
<td>0.3</td>
<td>NS</td>
</tr>
<tr>
<td>September</td>
<td>36</td>
<td>3</td>
<td>33</td>
<td>1</td>
<td>12.5</td>
<td>S</td>
</tr>
<tr>
<td>October</td>
<td>38</td>
<td>-</td>
<td>38</td>
<td>1</td>
<td>19</td>
<td>S</td>
</tr>
<tr>
<td>November</td>
<td>36</td>
<td>-</td>
<td>36</td>
<td>1</td>
<td>18</td>
<td>S</td>
</tr>
<tr>
<td>December</td>
<td>45</td>
<td>-</td>
<td>45</td>
<td>1</td>
<td>22.5</td>
<td>S</td>
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<tr>
<td>January</td>
<td>37</td>
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<td>1</td>
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<td>S</td>
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<td>-</td>
<td>40</td>
<td>1</td>
<td>20</td>
<td>S</td>
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<tr>
<td>March</td>
<td>38</td>
<td>14</td>
<td>24</td>
<td>1</td>
<td>1.31</td>
<td>NS</td>
</tr>
<tr>
<td>April</td>
<td>18</td>
<td>5</td>
<td>13</td>
<td>1</td>
<td>2.77</td>
<td>NS</td>
</tr>
<tr>
<td>May</td>
<td>78</td>
<td>33</td>
<td>45</td>
<td>1</td>
<td>0.92</td>
<td>NS</td>
</tr>
</tbody>
</table>

D.F.= Degree of freedom; NS=Non significant; S= Significant at 0.05% probability.
**Fecundity**

The ova diameter studies indicate the presence of a single group of mature ova in the gonad which were released during the spawning season. The absolute fecundity in individuals measuring 16-27 cm TL ranges from 1,065 to 4,961.

**Discussion**

Studies on the gut contents of *M. aral* show that the species is chiefly a bottom living and detritus feeder. Samples collected all around the year does not reveal any seasonal differences in feeding intensity.

A comparison of the length-weight relationship in males and females of *M. aral* reported in the present study with that of Lazarus and Reddy (1986) from Chennai, shows that the coefficient value is higher in both males and females in the present area of study indicating better growth in terms of weight.

Studies on progression of intra-ovarian ova to maturation show that a single batch of ova undergo maturation, to be spawned during the spawning season. The spawning in *M. aral* extends from September to October in this locality, as in a majority of freshwater fishes of Indian region (Qasim and Qayyum, 1961; Prabhu, 1956). Observations on minimum size at spawning show that males become mature at a relatively smaller size than females. The maximum size attained by females is larger than the males. In the populations of *M. aral*, living in the lower Krishna irrigation system, the males are more abundant.

Data on the biology of *M. aral* from any other locality in India are not available for comparison with the present observations.

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**References**


