REPRODUCTIVE BIOLOGY AND ITS PERIODIC VARIATION OF ENDANGERE
MUD EEL Monopterus cuchia (Hamilton) FROM MEGHALAYA, INDIA
BARISHA MARY KURBAH1, RABINDRA NATH BHUYAN2
1Assam Don Bosco University, Tapesia campus, Tapesia Gardens, Kamarkuchi, Sonapur-782402 Assam, India
2Department of Fishery Science, St. Anthony’s College, Shillong, Meghalaya, India
2Corresponding author email: rnbhuyan60@gmail.com

Abstract: Reproductive biology of an endangered freshwater, air breathing mud eel, Monopterus cuchia (Hamilton) was analyzed to identify its peak breeding season. The samples were collected from January 2016-February 2018. In males, highest GSI value of 3.4±0.8 was observed during the month of May and lowest value of 0.02±0.1 was observed during the month of September. Similarly in case of females, highest GSI value of 7.33±0.081 was observed during the month of May and the lowest GSI value of 0.27±0.089 was observed during the month of September. Thus this indicates the maturity of the species which corresponding to the breeding period. Monthly variation in the fecundity of female M. cuchia was also calculated and found out that the fecundity of female M. cuchia was highest during the month of May with a peak value of 924 eggs (length= 78cm, weight= 344 gms) and lowest during the month of September with a value of 150 eggs (length= 70cm, weight= 365 gms). Ova diameter was analyzed during breeding season and observed to vary from 0.0 to 4.0 mm during September to May. However, this analysis implies that highest GSI value in May is indicative of the fact that M. cuchia may have peak breeding season in May.

Keywords: Fecundity, Gonado-somatic Index, M. cuchia, Ova diameter, Reproductive biology.

I. INTRODUCTION

Mud Eel, Monopterus cuchia) is a fresh water fish belonging to Synbranchidae family of the order Synbranchiformes. It is a highly nutritious food fish with therapeutic value and it also has a high market demand in the North-Eastern states of India including Meghalaya. M. cuchia is locally known as Khabseïn in Khasi language (Meghalaya) and considered as highly palatable and nutritious fish as well as a valued remedy in oriental medicine. The fish can be cultured in backyard tank but non- availability of seed is a hindrance in culture. Hence, artificial propagation is important for smooth supply of seed to the fishers. Nevertheless it is important to know the duration of reproductive season and its peak breeding period. Analysis of reproductive biology in fishes is an important parameter in fish biology since it has its practical importance in solving fishery management questions such as the determination of spawning stock. The availability data based on reproductive parameters and environmental variation lead to a better understanding of observed fluctuation in reproductive output and enhances our ability to estimate recruitment (Kraus et al., 2002). Studies on the reproductive biology of any fish is essential for evaluating the commercial potentialities of its stock, life history, cultural practice and actual management of indigenous fishes (Lagler, 1956) (Doha and Hye, 1970). Reproductive strategies depend on the abiotic environment, food availability, pressure of predators and the habitat of parental fish (Wootton, 1990). The study of fecundity is useful in the estimation of population and productivity (Agbugui, 2013).
Reproductive potential of a population is one of the basic exigencies to designate the individuals of that population in respect to their gonadal conditions (Jhingran and Verma, 1972). Knowledge of gonad development and the spawning season of a species allow subsequent studies on spawning frequency of its population, which is very important for its management (Chakraborty, 2018).

Several workers have reported on the studies of biology, breeding behavior and biochemical composition of various fish species at different levels. However, no comprehensive report is available on reproductive biology of Monopterus cuchia in Meghalaya. Therefore, overall study of reproductive physiology will help in achieving basic information on breeding season, breeding potential, gonadal maturity and reproductive performance of the fish. Since this species has high economic and medicinal value, the study on reproductive biology and breeding behavior of fish will help in induced propagation of seed of the fish and development of large scale as well as backyard culture of the species.

The present study describes the Gonado-Somatic Index (GSI), ova diameter and fecundity study of Monopterus cuchia with the objectives to determine monthly variation in development of reproductive organs of both male and female to determine the peak reproductive season which eventually help in development of protocol for artificial breeding of the fish.

**II. MATERIALS AND METHODS**

Monopterus cuchia were brought from different areas of Meghalaya and the studies were conducted for a period of January 2016-February 2018 and collected specimens were stocked and reared in the hatchery complex of the Department of Fishery Science, St. Anthony’s College Shillong. For analyzing the development of gonads, random sampling of one hundred fishes i.e. fifty (50) males and fifty (50) females were selected and sampled every month during this study. Seasonal variation in the condition of gonads is important biological parameters in analyzing the reproductive biology as well as establishing the stages of maturity of the species under study. Fish body weight and gonads weight give the overall Gonado-Somatic Index (GSI). In general, Gonado-Somatic Index is helpful in identifying days and seasons of spawning, as the ovaries of gravid females increase swiftly in size just prior to spawning. The length of the samples collected was done using measuring tape and a ruler and the weight of the fish was determined by using an electronic balance. The samples were weighed and the abdominal region was dissected out to determine the sex of the fish. Sex of fish was done by visual examination of the gonads. After the samples have been dissected, gonads were taken out and placed in a petridish and weighed. The proportion of the two sexes relative to one another was used to calculate the sex ratio. These parameters were recorded on a data collected sheet. The Gonado-Somatic Index (GSI) was calculated as per Nikolsky (1963) method using the formula:

\[
GSI = \frac{\text{Weight of the Gonad (g)}}{\text{Weight of the fish (g)}} \times 100
\]

The ovary was carefully removed and the moisture was blotted using a blotting paper. Fecundity was determined based on the method proposed by Bagenal (1978). Moreover, eggs were counted by spreading on the tray for confirmation of results. The weight of the extracted ovary was recorded in grams, ova diameter was measured by using slide-calipers, age at first maturity was adopted by Biswas (1993) and the collected data were statistically analyzed using MS Excel.

**III. RESULTS**

During this period of analysis, it was found out that the mean Gonado-Somatic Index (GSI) values for males ranged from 0.02±0.1 to 3.4±0.8 whereas in case of females the mean GSI values ranged from 0.27±0.089 to 7.33±0.081. In case of males, highest GSI value of 3.4±0.8 was observed during the month of May and lowest value of 0.02±0.1 was observed during the month of September. Similarly in case of females, highest GSI value of 7.33±0.081 was observed during the month of May and the lowest GSI value of 0.27±0.089 was observed during the month of September. Thus this indicates the maturity of the species which corresponding to the breeding period.

The results obtained for the monthly variation in mean GSI values of both male and female M. cuchia were presented in TABLE-1, TABLE-2 and Fig-1 respectively.
**TABLE-1: Monthly variation of male body weight, gonad weight and GSI of *M. cuchia*.**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Months</th>
<th>Fish examined</th>
<th>Mean Body Weight (gm) ± SD</th>
<th>Mean Testis Weight (gm) ± SD</th>
<th>GSI (%) ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>January</td>
<td>4</td>
<td>411±8.60</td>
<td>0.187±0.01</td>
<td>0.045±0.5</td>
</tr>
<tr>
<td>2</td>
<td>February</td>
<td>4</td>
<td>658±6.16</td>
<td>0.510±0.03</td>
<td>0.077±0.4</td>
</tr>
<tr>
<td>3</td>
<td>March</td>
<td>4</td>
<td>430±2.16</td>
<td>7.03±0.02</td>
<td>1.634±0.2</td>
</tr>
<tr>
<td>4</td>
<td>April</td>
<td>4</td>
<td>204±2.16</td>
<td>6.098±0.08</td>
<td>2.989±0.2</td>
</tr>
<tr>
<td>5</td>
<td>May</td>
<td>4</td>
<td>204±2.16</td>
<td>7.00±0.40</td>
<td>3.4±0.8</td>
</tr>
<tr>
<td>6</td>
<td>June</td>
<td>4</td>
<td>400±3.74</td>
<td>0.379±0.08</td>
<td>0.947±0.66</td>
</tr>
<tr>
<td>7</td>
<td>July</td>
<td>4</td>
<td>215±4.08</td>
<td>0.207±0.01</td>
<td>0.096±0.14</td>
</tr>
<tr>
<td>8</td>
<td>August</td>
<td>4</td>
<td>236±4.54</td>
<td>0.207±0.04</td>
<td>0.0877±0.6</td>
</tr>
<tr>
<td>9</td>
<td>September</td>
<td>6</td>
<td>400±2.09</td>
<td>0.111±0.01</td>
<td>0.02±0.1</td>
</tr>
<tr>
<td>10</td>
<td>October</td>
<td>4</td>
<td>215±4.08</td>
<td>0.207±0.01</td>
<td>0.096±0.14</td>
</tr>
<tr>
<td>11</td>
<td>November</td>
<td>4</td>
<td>179±0.81</td>
<td>0.20±0.01</td>
<td>0.111±0.8</td>
</tr>
<tr>
<td>12</td>
<td>December</td>
<td>4</td>
<td>351±1.41</td>
<td>0.214±0.05</td>
<td>0.060±0.14</td>
</tr>
</tbody>
</table>

**TABLE-2: Monthly variation of female body weight, gonad weight and GSI of *M. cuchia*.**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Months</th>
<th>Fish Examined</th>
<th>Mean Body Weight (gm) ± SD</th>
<th>Mean Ovary Weight (gm) ± SD</th>
<th>GSI (%) ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>January</td>
<td>4</td>
<td>260±1.60</td>
<td>0.838±0.02</td>
<td>0.322±0.02</td>
</tr>
<tr>
<td>2</td>
<td>February</td>
<td>4</td>
<td>215±3.36</td>
<td>0.972±0.08</td>
<td>0.452±0.05</td>
</tr>
<tr>
<td>3</td>
<td>March</td>
<td>4</td>
<td>363±0.80</td>
<td>3.075±0.01</td>
<td>0.847±0.01</td>
</tr>
<tr>
<td>4</td>
<td>April</td>
<td>4</td>
<td>344±0.50</td>
<td>23.0±0.05</td>
<td>6.686±0.05</td>
</tr>
<tr>
<td>5</td>
<td>May</td>
<td>4</td>
<td>450±1.15</td>
<td>33.0±0.81</td>
<td>7.33±0.081</td>
</tr>
<tr>
<td>6</td>
<td>June</td>
<td>4</td>
<td>482±0.8</td>
<td>3.74±0.04</td>
<td>0.775±0.08</td>
</tr>
<tr>
<td>7</td>
<td>July</td>
<td>4</td>
<td>299±8.04</td>
<td>1.710±0.03</td>
<td>0.571±0.08</td>
</tr>
<tr>
<td>8</td>
<td>August</td>
<td>4</td>
<td>210±8.16</td>
<td>0.953±0.02</td>
<td>0.453±0.01</td>
</tr>
<tr>
<td>9</td>
<td>September</td>
<td>6</td>
<td>127±6.26</td>
<td>0.343±0.06</td>
<td>0.27±0.089</td>
</tr>
<tr>
<td>10</td>
<td>October</td>
<td>4</td>
<td>299±8.04</td>
<td>1.710±0.03</td>
<td>0.571±0.08</td>
</tr>
<tr>
<td>11</td>
<td>November</td>
<td>4</td>
<td>271±2.16</td>
<td>1.875±0.02</td>
<td>0.691±0.08</td>
</tr>
<tr>
<td>12</td>
<td>December</td>
<td>4</td>
<td>253±3.55</td>
<td>0.916±0.01</td>
<td>0.362±0.02</td>
</tr>
</tbody>
</table>

**Fig-1:** Cylinder chart showing monthly variation of Gonado-Somatic Index (GSI) of both male and female species.
Knowledge of fecundity is an important factor in fisheries stock management and it is also used to describe fishes which are spawning for their first time. Moreover, fecundity is necessary to evaluate the reproductive potential of individual fish species and the monthly variation in the fecundity of this species was ranged from 150-924 eggs. During this course of study, it was found out that the fecundity of female *M. cuchia* was highest during the month of May with a peak value of 924 eggs (length= 78cm, weight= 344 gms) and lowest during the month of September with a value of 150 eggs (length= 70cm, weight= 365 gms) and the ova diameter was also calculated and this is as shown in TABLE-3. Fig-2 and Fig-3 respectively.

**TABLE-3: Monthly fluctuations in the fecundity and ova diameter of female *M. cuchia*.**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Months</th>
<th>Fecundity (Eggs)</th>
<th>Ova Diameter (in mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>January</td>
<td>200</td>
<td>0.29</td>
</tr>
<tr>
<td>2</td>
<td>February</td>
<td>398</td>
<td>1.22</td>
</tr>
<tr>
<td>3</td>
<td>March</td>
<td>668</td>
<td>3.00</td>
</tr>
<tr>
<td>4</td>
<td>April</td>
<td>752</td>
<td>3.50</td>
</tr>
<tr>
<td>5</td>
<td>May</td>
<td>924</td>
<td>4.00</td>
</tr>
<tr>
<td>6</td>
<td>June</td>
<td>505</td>
<td>2.50</td>
</tr>
<tr>
<td>7</td>
<td>July</td>
<td>455</td>
<td>0.00</td>
</tr>
<tr>
<td>8</td>
<td>August</td>
<td>401</td>
<td>0.00</td>
</tr>
<tr>
<td>9</td>
<td>September</td>
<td>150</td>
<td>0.00</td>
</tr>
<tr>
<td>10</td>
<td>October</td>
<td>455</td>
<td>0.00</td>
</tr>
<tr>
<td>11</td>
<td>November</td>
<td>530</td>
<td>1.70</td>
</tr>
<tr>
<td>12</td>
<td>December</td>
<td>351</td>
<td>0.85</td>
</tr>
</tbody>
</table>

**Monthly Variation in Fecundity of Female *M. cuchia***

- **January:** 3%
- **February:** 7%
- **March:** 11%
- **April:** 13%
- **May:** 16%
- **June:** 9%
- **July:** 8%
- **August:** 7%
- **September:** 3%
- **October:** 8%
- **November:** 9%
- **December:** 6%

**Fig-2: Pie-chart showing month-wise changes in the fecundity of *M. cuchia***

**Ova Diameter of Female *M. cuchia***

- **January:** 0.29
- **February:** 1.22
- **March:** 3
- **April:** 3.5
- **May:** 2.5
- **June:** 0
- **July:** 0
- **August:** 0
- **September:** 0
- **October:** 1.7
- **November:** 0.85

**Fig-3: Cone-chart showing monthly fluctuations in the ova diameter of female *M. cuchia***
In order to gain a successful fish culture, it is necessary to analyzed and assessed the monthly variation of breeding cycle of the target species. During this period of analysis, the Gonado-Somatic Index, Fecundity and egg diameter was calculated and this is as shown in Fig-4 respectively.

IV. DISCUSSION

The Gonado-Somatic Index (GSI) is the calculation of the gonad mass as a proportion of the total body mass (Anderson and Gutreuter, 1983). According to (Dadzie and Wangila, 1980), Gonado-Somatic Index (GSI) which is an index of gonad size relative to fish size is a good indicator of gonadal development in fish. Moreover, the Gonado-Somatic Index increases with the maturation of fish, being highest during the period of peak maturity and declining abruptly thereafter.
when the fish become spent (Le Cren, 1951). According to (King, 1996), Gonado-Somatic Index (GSI) is the measure of the relative weight of the gonad with respect to total or somatic weight. Gonadosomatic index (GSI) is also defined as the relative portion of which the ovaries constitute of the total weight (Gundersen et al., 1998).

It is important of know the reproductive physiological factors of a fish such as fecundity, gonado-somatic index (GSI), gonad developmental stages etc. to develop artificial breeding technique (Mithu et al., 2013). In general, Gonado-Somatic Index is usually important for both male and female and in addition to this; (De Vlaming et al., 1982) had also discussed the utility of GSI as indicator of the reproductive activity of a stock. According to (Mithu et al., 2013), Gonado-Somatic Index is the indicator of the state of maturity, gonadal development and onset of spawning season and at the same time it helps to know the breeding biology and breeding season of a species. To determine the breeding season, it is necessary to know the condition of the female, its ovaries and eggs size (Islam and Das, 2006).

Gonado-Somatic Index also determined the percentage of fish body weight that is used for egg production. GSI is also applied frequently since it determines the spawning frequency of many fishes. Monthly variation in the mean GSI values of both male and female species of *M. cuchia* were presented in TABLE-1 and TABLE-2 respectively. Mean Gonado-Somatic Index of *M. cuchia* was found to increase as the fish reaches the maturity stage and decreases gradually after the spawning stage. In case of male, the weight of the testes gradually increases from December with a peak value during the month of May. Highest GSI value (3.4±0.8) was recorded during the month of May and the GSI values began to fall gently from June (0.947±0.66) to November (0.111±0.8). In case of female, the weight of the ovary gradually increased from December with a peak value during the month of May. Highest GSI value (7.33±0.081) was recorded in the month of May and the GSI values began to fall gently from June (0.775±0.08) to November (0.691±0.08). Similar finding was also reported by (Chakraborty, 2018). Therefore the overall GSI value ranged from 0.02±0.1 to 3.4±0.8 for males and from 0.27±0.089 to 7.33±0.081 for female was presented in the Fig-1.

Monthly variation of Gonado-Somatic Index reflects the ovarian activity of the species. Moreover, the results of the present investigation indicated that the Gonado-Somatic Index of *Monopterus cuchia* was high during the month of May when the fish reached the maturing stage. The increasing GSI of *M. cuchia* suggests that the ovary harbours percentage of yolk laden ripe eggs in May which is more or less similar to (Dewan, 1973), (Chakraborty, 2010), (Chakraborty et al., 2007) and (Chakraborty, 2018).

During this period of analysis, highest GSI value in the month of May indicates the fact that *M. cuchia* may have a peak breeding season during the month of May. This result is very similar to those obtained by (Rahman, 2007). On the other hand, (Alam, 2012) also reported that the peak breeding season *M. cuchia* is from late April to mid-May. Moreover from this study it implies that the variation in GSI of *Monopterus cuchia* only occurred in mature fishes, which would be indicative of the peak period of spawning which is very similar as reported by (Narejo et al., 2003). From this analysis it implies that Gonado-Somatic Index of the fish is an important parameter to verify the breeding season of the species.

It is evident from the present study that Gonado Somatic Index (GSI) and fecundity is helpful to identify accurate spawning cycle of *M. cuchia* (Chakraborty et al., 2013). Similar findings were also reported by (Al-Ogaily and Hussain, 1990) for high values of GSI in case of trout sweet lip grunt *Plectrohynchus pictus*. From the experiment conducted it was found out that prior to spawning, *Monopterus cuchia* undergoes an increase in gonad weight. Similar findings as reported by (Fedorov, 1968) on Greenland halibut.

An important aspect of reproductive biology in fish is the fecundity, which gives information on the number of eggs in the ovary before the next spawning season (Bagenal, 1978). Studies on fecundity of fish species are pertinent and useful for systematic in racial studies related to total population estimation and productivity (Adebiyi, 2013). Fish fecundity is described as seasonal spawning potential and alternatively is defined as the number of eggs ripening between current and next spawning period in a female (Bagenal and Teshc, 1978). Moreover, fecundity is the number of ova that are likely to be laid by a fish during spawning season. Number of eggs produced by a fish differs in different species and it also depends on the size and age of the species (Lucy Towers, 2014). In general, fecundity which is defined as the number of vitellogenic oocytes developing in each female prior to the spawning season is important for understanding spawning-stock recruitment relationships (Gundersen et al., 1998).

The study of fecundity is useful in the estimation of population and productivity (Agbugui, 2013). (Lagler et al., 1967) reported that the number of eggs produced by an individual female was dependent on various factor like size, age and
condition of the species. It was also observed in some cases that the fecundity of some larger fishes was much less than that of some smaller fish. This type of variation was also reported by (Ahmed et al., 1979). Fecundity is an important parameter to assess the reproductive potential of the species as reported by (Bora and Borah, 2008).

(Kiran and Puttaiah, 2003) indicated that ovary weight is a better index of fecundity than the total length and total weight for *Chela antrahi*. Moreover, gonadal development and fecundity also depends on food quality and quantity (Bielsa et al., 2003). In the natural environment, food conditions are subjected to seasonal variations. Fish adaptation capacity to environmental fluctuations will be determining for both survival and reproductive success (Adams, 1998).

Fecundity is one of the most important aspects of fish biology that explains variations in the level of production, success of induced breeding etc., it also help to explain the breeding cycle (Hunter et al., 1992). Generally, fecundity of the fish is found to vary from species to species, depending on age, length, weight and environmental condition (Biswas, 1982).

High fecundity is often correlated with small egg size (Rath, 2000) and vice versa. Increase in fecundity with the increase in body weight was also reported in various fishes notably, *Mastacembelus pancalus* by (Karim and Hossain, 1972), *Puntius sarana* (Mustafa et al., 1983) and *Sarotherodon nilotica* (Mian and Dewan, 1984).

In this case, fecundity was determined based on the method proposed by (Bagena, 1978). From the experiment conducted, it was found out that fecundity increased with the increase in total length of the species. Similar results were obtained in *Heteropneustes fossilis* (Azadi and Siddique, 1986) and (Das et al., 1989). In the present case, it was observed that the egg diameter of *M. cuchia* is much larger which may be a reason for less number of eggs, accommodating to the snake like slender body cavity of the fish. This result is very similar to those obtained by (Bora and Borah, 2008). Moreover, (Nasar, 1989) also calculated the fecundity of *M. cuchia* and revealed that fecundity of this species ranged from 118-687 eggs. As shown in TABLE-3 and Fig-2, the fecundity in the present study is much higher than the estimated fecundity given by (Nasar, 1989). The fecundity also varied with the seasons, climatic conditions and environmental habitat, nutritional status and genetic potential (Bromage et al., 1992). It was observed during this present investigation that the fecundity increases with the increase in body weight and gonad weight of the species.

Monthly variation in the fecundity of *M. cuchia* ranged from 150-924 eggs. Highest fecundity with a peak value of 924 eggs (length= 78cm, weight= 344 gms) was recorded during the month of May and the lowest fecundity value of 150 eggs (length= 70cm, weight= 365 gms) was recorded during the month of September. During this period of analysis, fecundity was found to increase with the increase of gonad weight of *M. cuchia*; similar relationship was also reported in *Puntius stigma* (Shafi and Quddus, 1974).

For analysis of reproductive biology in any fish species, it is necessary to have a clear concept on the spawning season of the species of interest. Moreover, spawning season can be predicted by analyzing the period of maturation as well as by measuring the ova diameter. During this course of study, it was found out that the fecundity of the fish was inversely proportional to the ova diameter i.e. the fecundity increases with the decrease in ova diameter. (Pathak and Jhingran, 1977), (Nabi and Hossain, 1996), (Narejo et al., 1998) and (Afroz et al., 1990) have reported higher fecundity with small ova diameter. Similarly fecundity decreases with the increase in ova diameter and this was reported by (Das et al., 1989), (Faruq et al., 1998), (Shaima et al., 1992) and (Faruq et al., 1996).

Month-wise changes in the ova diameter of Mud Eel ranged from 0.0 to 4.0mm. The highest ova diameter of 4.0 mm was found in month of May and lowest ova diameter of 0.0 mm was observed during the months of July, August, September and October. All the ova of an individual were found to have same diameter. In case of *Monopterus albus*, ova diameter was found out to be 3 to 4 mm and eggs were not uniform (Khanh and Ngan, 2010). The ova diameter in *Monopterus albus* is close to *Monopterus cuchia* but they differ in uniformity of egg size. The above findings are similar as obtained in the present study. Therefore, from the above findings it was assumed that the fish spawned once a year with one spawning peak in the month of May as indicated by the values of both ova diameter (4.0 mm in May) and Gonado-Somatic Index (GSI of males= 3.4±0.8 and GSI of females= 7.33±0.081) respectively. (Singh et al., 1989) described the spawning season of *M. cuchia* in summer i.e. from May to June and the above findings are similar as obtained in the present study. Monthly fluctuations in the ova diameter of female *M. cuchia* were shown in TABLE-3 and Fig-3 respectively. During this period of analysis, it was found out that the ova diameter ranged from 0.0 mm to 4.0 mm during September to May. (Singh et al., 1989) reported that the ova diameter in *M. cuchia* ranging from 3–4.0 mm, which is nearer to the present results. All the ova were found to be spherical and having a uniform diameter, which indicates that the eggs were shed in a single batch during the period of spawning. Moreover, no ova were observed during the month of
July to October. (Nabi and Hossain, 1996) have published similar observations in the spiny eel, *Macrognathus aculeatus*. Relationships between ovary weight and mean ova diameter indicated that ova diameter increased with the increase in gonad weight. Similar findings were also reported by (Mithu *et al.*, 2013). First maturity of this species was found to attain at 25.2 cm in total length and both the stages of maturity and cycle of maturation of ovaries indicated that this species spawn only once a year.

V. CONCLUSION

Gonado-Somatic Index is an important parameter to determine the maturity stages in fishes. Mean Gonado-Somatic Index of *Monopterus cuchia* was found to increase as the fish reaches the maturity stage and decreases gradually after the spawning stage. The fecundity of *M. cuchia* is very low in comparison to other cultivable fish species and this may be the main reason for declining trend in natural population of the species. In the present analysis, high values of GSI and ova diameter denoted the attainment of peak maturity of the gonads. The breeding season for the species is from April to June with peak in the month of May. The species was found to breed only once a year.

ACKNOWLEDGEMENT

Financial support from the Department of Fisheries, Government of Meghalaya India is duly acknowledged.

REFERENCES


[22] Rahman, M.M. 2007. Reproductive Biology and fry rearing of freshwater eels Monopterus cuchia (Hamilton) and Mastacembelus armatus (Lacep.) of Mymensingh, Bangladesh. PhD Dissertation, Department of Fisheries Management, Bangladesh Agricultural University, Mymensingh, Bangladesh, pp. 173.


