Induced breeding of the Indian medium carp, Kuri (Labeo gonius) (Ham.) was conducted using synthetic hormone, Ovaprim at three dose levels of 0.7, 0.5 and 0.3 ml/kg to female and 0.3, 0.2 and 0.1 ml/kg to male body weight, respectively. The brooders were injected and left to spawn in the breeding hapa at a sex ratio of 2:1 (male: female). It was found that all the doses of Ovaprim could induce the fishes to breed, whereas no breeding was observed in control set. The latency period was found to be 8-9 hours. The egg output/female was highest at a dose of 0.5 ml/kg of female and 0.2 ml/kg of male body weight. The relative fecundity of the species ranged between 90-110 eggs/gram body weight of female. Fertilization and hatching rate was found to be 89.3±2.50 and 85.2±2.30%, respectively with Ovaprim dose of 0.5 ml/kg of female and 0.2 ml/kg of male body weight.

INTRODUCTION

Mass propagation coupled with rearing is considered as the logical approach for recruitment and conservation of fish population. Indian medium carp, Kuri (Labeo gonius Ham.) is one such species that needs urgent attention for conservation, as the population of this commercially important species is declining from nature (CAMP Report, 2008). This species is found to be compatible in composite fish farming (Mohanta et al., 2008). Therefore, L. gonius is considered as one of the potential candidate fish species for captive breeding and aquaculture. Further, Imphal, Manipur is situated at an altitude of 790m above mean sea level (MSL), where the temperature remains lower throughout the year in comparison to other parts of the country. The role of temperature on sexual maturation and breeding of fish has been studied by several investigators (Chaudhuri, 1960; Hora, 1945). Clemens (1968) stated that hormonal injection can bypass the effect of environmental variables like temperature and light to some extent. In this backdrop, the present study was carried out to standardize the dose of synthetic hormone Ovaprim for induced breeding of L. gonius in Manipur state.
MATERIALS AND METHODS

Broodstock collection and maintenance

The captive breeding experiment was conducted at ICAR Manipur Centre Fish Farm located at Imphal, Manipur (24.44 N; 93.58 E and altitude 790 m). Both male and female (n=24) broodfishes of *L. gonius* were collected from farmers’ ponds in Nombol (Bishnupur district of Manipur) during January-February, 2005. The broodfishes were transported in oxygenated polythene bags. The fishes were treated with potassium permanganate (1 mg/l) for 2 minutes before stocking in broodfish ponds. The fishes were maintained in earthen ponds (0.02 ha, average depth 120-130 cm) at ICAR Manipur Centre Fish Farm. The fishes were fed with a formulated diet (fish meal based diet containing 30% crude protein) twice a day at an average rate of 5% of body weight per day. No mortality was noticed during the stocking period.

Brood selection

The fishes attained maturity after one year. The broodfishes (male and female) were selected based on their external characteristics, such as the bulging abdomen, soft ventral abdominal region, comparatively larger size and smooth pectoral fin with reddish colour in case of females and, normal abdomen and oozing of milt with gentle pressure on the abdomen for males.

Breeding performance

Brooders were selected for induced spawning experiment during June, 2006. The broodstock were collected from the earthen pond by repeated netting followed by dewatering and transferred into nylon hapa (1.5 × 2.5 × 3.0 m) for acclimatization. Males and females were segregated 5-6 hours before Ovaprim injection. The experiment was conducted with the female broodstocks of body weight varying from 560 to 585 gm and male broodstocks of body weight varying from 470 to 490 gm. Three sets of experiments were conducted for three different doses. Group A was induced with 0.3 ml/kg of female and 0.1 ml/kg of male, group B with 0.5 ml/kg of female and 0.2 ml/kg of male and group C with 0.7 ml/kg of female and 0.3 ml/kg of male body weight in separate nylon hapas. A control was also maintained where no hormone was administered. Healthy and sexually matured brooders were selected. Free oozing males and ripe females were taken in the ratio of 2:1, respectively for breeding. All females and males were injected with Ovaprim intramuscularly. Immediately after administering the hormone, the brooders were released into the breeding hapas.

After spawning, effective fecundity of each female was determined by random sampling of eggs in a 10 ml graduated measuring tube from the total eggs released by the female. The total number of eggs in 1 ml were counted and multiplied with total volume of eggs released. The fertilization rate was determined by randomly taking a sample of
100 eggs from the total eggs in a petri dish. Fertilized eggs having intact nucleus were only considered for calculating percentage of fertilization. The ova diameter was measured by keeping approximately 20 eggs in a row along the measuring scale under dissecting microscope. The total lengths of eggs were divided by numbers of eggs to obtain mean diameter of each egg. The 1-day old hatchlings were maintained in circular FRP tanks. Aeration was provided in the FRP tanks and water was exchanged daily. The water quality parameters of broodstock pond and breeding pond were analyzed as per APHA (1998) (Table 1).

Table 1. Physico-chemical parameters of broodstock pond and breeding pond

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Broodstock pond</th>
<th>Breeding pond</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air temperature (°C)</td>
<td>27.0±1.12</td>
<td>27.0±1.12</td>
</tr>
<tr>
<td>Water temperature (°C)</td>
<td>28.1±1.64</td>
<td>28.3±1.20</td>
</tr>
<tr>
<td>pH</td>
<td>7.6±0.35</td>
<td>7.8±0.32</td>
</tr>
<tr>
<td>Dissolved oxygen (ppm)</td>
<td>6.2±1.60</td>
<td>6.5±1.30</td>
</tr>
<tr>
<td>Free CO₂ (ppm)</td>
<td>2.7±0.40</td>
<td>2.9±0.30</td>
</tr>
</tbody>
</table>

RESULTS

Brooders of *L. gonius* were found matured during June, 2006. A varied degree of response of inducing agent was observed at different doses. Fertilization rate, latency period, egg output and hatching rate were observed and recorded (Table 2). In the present study, out of nine females selected for induced breeding in three experiment sets, six responded positively and produced viable eggs. In control set no breeding behaviour was observed.

Table 2. Results of the captive breeding experiments of *Labeo gonius* by Ovaprim

<table>
<thead>
<tr>
<th>Groups</th>
<th>Size of female (g)</th>
<th>Ovaprim dosage to female (ml/kg body weight)</th>
<th>Size of male (g)</th>
<th>Ovaprim dosage to male (ml/kg body weight)</th>
<th>Latency period (h)</th>
<th>Egg output/female</th>
<th>Fertilization (%)</th>
<th>Hatching (%)</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>563±2.32</td>
<td>0.3</td>
<td>474±3.21</td>
<td>0.1</td>
<td>15</td>
<td>24,450</td>
<td>46.3±3.12</td>
<td>44.5±3.14</td>
<td>Partial spawning</td>
</tr>
<tr>
<td>B</td>
<td>582±3.26</td>
<td>0.5</td>
<td>487±2.25</td>
<td>0.2</td>
<td>8</td>
<td>64,020</td>
<td>89.3±2.50</td>
<td>85.2±2.30</td>
<td>Complete spawning</td>
</tr>
<tr>
<td>C</td>
<td>567±3.21</td>
<td>0.7</td>
<td>475±3.42</td>
<td>0.3</td>
<td>9</td>
<td>45,680</td>
<td>76.8±3.21</td>
<td>72.3±2.23</td>
<td>Complete spawning</td>
</tr>
<tr>
<td>Control</td>
<td>572±3.21</td>
<td>-</td>
<td>485±3.75</td>
<td>-</td>
<td>-</td>
<td>No breeding</td>
<td>Nil</td>
<td>Nil</td>
<td>No spawning</td>
</tr>
</tbody>
</table>
Brooders showed chasing behaviour after 5-6 hours of Ovaprim administration in groups B and C. However, in group A, breeding behaviour was seen after 12 hours of injection. Each female was found to be paired with two males. It was observed that male rubbed its body with female and released its milt and eggs were fertilized externally. Spawning occurred 8-9 hours after the Ovaprim injection. The fertilized eggs were spherical, translucent and demersal measuring 2.6±0.03 mm in diameter and non-adhesive. Unfertilized eggs were translucent with milky colour. The relative fecundity of the species ranged between 90-110 eggs per gram body weight of female. The fertilization percentage in the present experiment was estimated as 46.3, 89.3 and 76.8% at the hormonal doses of 0.3, 0.5 and 0.7 ml/kg body weight of female, respectively.

Hatching took place 25-27 hours after spawning and the hatching percentage was estimated as 44.5±3.14, 85.2±2.30 and 72.3±2.23% at the hormonal doses of 0.3, 0.5 and 0.7 ml/kg of body weight of female respectively at 28 °C. The freshly hatched larvae measured 4.4±0.3 mm in length and 1.8±0.2 mg in weight. The 1-day old hatchlings were maintained in nylon hapas and plastic troughs simultaneously. Movement of hatchlings was very fast, air bladder was prominently visible with regular fanning of pectoral fins. After 2-3 days, mouth was developed and they started taking external feed after 72 hours. The yolk sac was fully absorbed by 3rd day and hatchlings grew to 6.7±0.4 mm in length and 2.8±0.3 mg in weight. After 4 days of incubation, the spawns were released into well aerated nursery tanks and fed with zooplankton and, soaked rice bran and mustard oil cake in 1:1 ratio at a rate of 5% of the body weight up to 15 days. After that, the larvae were transferred to rearing tanks.

DISCUSSION

In the present study, optimal spawning of *L. gonius* occurred after administration of Ovaprim at the dose of 0.5 and 0.2 ml/kg body weight of female and male respectively. The dose of hormone possibly affected the percentage of fertilization, egg output, hatching rate and spawn production. The dosage of synthetic hormones like Ovaprim and Ovatide in tropical fishes has been experimented by several authors. Inducing agent, Ovaprim at a dose of 0.3-0.5 ml/kg body weight of fish was found to be effective in bringing out ovulation in *Puntius sarana* (Borah et al., 1999). Pandey et al. (2002a) successfully conducted breeding of Indian major carp, *L. rohita* using Ovatide at the dose of 0.4 ml/kg of female and 0.1 ml/kg of male body weight. Behera et al. (2007) reported the egg output/female, fertilization rate and hatching rate to be the highest with Ovaprim at a dose of 0.5 ml/kg of female and 0.2 ml/kg of male body weight and with Ovatide at a dose of 0.4 ml/kg of female and 0.2 ml/kg of male body weight in *L. bata*.

In our study, difference in latency period was noticed. Higher latency period was observed in group A, compared to groups B and C, which indicates difference in the
mode of action of the hormone. Similar observation was reported by Habibi et al. (1989) in Carassius auratus. Longer latency period in low dose of synthetic hormone, Ovatide was reported by Pandey et al. (2002b). Behera et al. (2007) also observed the same during their study on induced breeding of L. bata in Manipur. According to Billiard et al. (1984) and Peter et al. (1987), differences in dose requirement may be attributed to varied level of dopamine activity in different species of fish.

The relative fecundity of the species ranged between 90-110 eggs/gram body weight of female. The maximum hatching rate was observed at the dose of 0.5 ml and 0.2 ml/kg of body weight for female and male respectively. Based on the present experiment the Ovaprim dose of 0.5 ml and 0.2 ml/kg of body weight for female and male can be recommended for induced breeding. It can be concluded that, the commercial scale seed production of L. gonius could be achieved in captivity through induced breeding technique using Ovaprim. This technique would be useful in conservation and aquaculture of Kuri (L. gonius) in Manipur through commercial scale seed production.

ACKNOWLEDGEMENTS

The authors are grateful to Dr. S. V. Ngachan, Director, ICAR Research Complex for N.E.H. Region, Umiam for providing the fund and facilities to carry out this research. The authors thank farm staff for extending their help in the execution of the work.

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