RESEARCH COMMUNICATIONS


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Induced spawning and establishment of a captive population for an endangered fish, *Ompok bimaculatus* in India

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*Ompok bimaculatus* is an endangered fish species of high commercial value. Over the last few decades its wild population is declining rapidly (> 50%). This fish was induced to spawn by a single intramuscular injection of ovaprim (dosage 0.5 ml/kg body weight). Spawning was observed 5–6 h after injection. An average of 4012 ± 100 eggs were spawned by each female. Hatching occurred 24 h after spawning. Hatchlings were reared up to fingerling size after which they were released into an earthen pond and cultured for 6 months. Induced breeding of this fish enabled us for the first time to produce a captive population of 548 individuals.

*Ompok bimaculatus* popularly known as the butter fish is a freshwater teleost native to South-east Asia1. In India its current distribution is the plains and submontane regions. It is a piscivorous and carnivorous fish inhabiting the lakes, ponds and rivers from an elevation of 100 to 2500 m. Over the last 10 years, its wild population has undergone a steady decline (> 50%) mainly due to over exploitation, loss of habitat, disease, pollution, siltation, poisoning, dynamite and other destructive fishing, due to which it is listed among the 91 endangered species of India according to IUCN status2. With a view to re-establishing the population in wild and to develop breeders for stock management programme, induced breeding of this fish was attempted.

Spawners (Figure 1) were collected (2 ♀; 3 ♂) from Tamiraparani riverian associated wetlands around Tirunelveli (8.15°N; 77.45°E), Tamil Nadu, during April 1997 and were stocked in an earthen pond (7.5 × 5 × 1.5 m) at the Centre for Aquaculture Research and Extension (CARE) for six months after which they were induced to spawn by a single intramuscular injection of ovaprim (Syndel laboratory, Canada) at a dosage of 0.5 ml/kg body weight to both males and females. After injections at 17.30 h, the breeding set consisting of two males and a single female was released into a cement tank (capacity 1500 l). Aquatic macrophytes like *Hydrilla verticillata* and *Eichhornia crassipes* were introduced into the tank for hiding purposes. The results of induced breeding experiments are summarized in Table 1.

![Figure 1. Breeders of Ompok bimaculatus. a. Male; b. Female.](image1)

![Figure 2. 10-h-old embryo of O. bimaculatus.](image2)
Table 1. Induced breeding in *O. bimaculatus* using ovaprim

<table>
<thead>
<tr>
<th>Date of experiment</th>
<th>Weight of female fish (g)</th>
<th>Weight of male fish (g)</th>
<th>Hormone dosage (ml/kg bw)</th>
<th>Time taken for response (h)</th>
<th>Number of eggs spawned</th>
<th>Fertilization (%)</th>
<th>Survival at hatching (%)</th>
</tr>
</thead>
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<td>310</td>
<td>250</td>
<td>0.5</td>
<td>5</td>
<td>4150</td>
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<td>55</td>
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<td>06.11.1997</td>
<td>325</td>
<td>210</td>
<td>0.5</td>
<td>6</td>
<td>3874</td>
<td>75</td>
<td>60</td>
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</tbody>
</table>

![Figure 3. Two-day-old prolarvae of *O. bimaculatus* (bar = 1 mm).](image3)

![Figure 5. Thirty-day-old juvenile *O. bimaculatus*.](image5)

![Figure 4. Eight-day-old post larvae of *O. bimaculatus* (bar = 1 mm).](image4)

![Figure 6. *O. bimaculatus* sampled after six months of culture.](image6)

Spawning occurred 5 to 6 h after injection. After spawning, fertilized eggs were collected, counted and the percentage of fertilization was determined. The number of eggs spawned varied from 3874 to 4150 during the experiment. The eggs (Figure 2) were transparent, adhesive and were found attached to the sand bed of the tank. The egg diameter was 1.22 ± 0.03 mm and the fertilization rate was 75%. Hatching was preceded by intensive agitation of the larva inside the egg shell. Hatching occurred 24–25 h after spawning and the hatchlings were light yellow in colour. The survival at hatching varied from 55 to 60%.

The larval development was classified based on the standards described by Pan Joinghua and Zheng Wenbiao. One day post hatching, the prolarvae were 2.4–2.6 mm total length (TL) (Figure 3). They swam very fast and rested on their lateral side due to their heavy yolk content. The prolarvae were reared in a glass aquarium (50 l; 100 larvae/aquarium). Three days after hatching, the mouth was completely formed and the larvae began to ingest exogenous feed consisting of cooked egg yolk from day 4 post hatching besides utilizing their endogenous yolk. This mixed nourishing period ensues the post-larval stage (Figure 4). The post larvae
schooled under the weeds in the aquarium and came out only to feed. The post larvae were fed on chopped chironomus larvae from 8 days post hatching. The post larvæ were 8–12 mm TL at 12 day post hatching. The post larval stage continued till 15 day post hatching after which they underwent a transformation to resemble the adult. At this stage, they were termed juveniles. The juveniles were transferred to a cement tank (capacity 1500 l) and fed with finely chopped beef liver. 30 days post hatching juveniles were 18–22 mm TL and resembled the adult with respect to all external characteristics indicating the end of the juvenile period (Figure 5).

Sixty days post hatching (length = 3.2 ± 0.2 cm; weight = 1.75 ± 0.25 g) fingerlings of *O. bimaculatus* were released into the earthen pond (8 × 12 × 1.5 m) and fed with finely-chopped chicken intestine at the rate of 15% of their body weight. After three months of culture, they attained a length of 7 ± 0.5 cm and weight of 30 ± 2.5 g. After six months of culture, the fish showed an average length of 14.5 ± 1.5 cm and weight of 100 ± 10 g (Figure 6).

Ovaprim is effective in inducing ovulation in *O. bimaculatus*. The time taken for response (5–6 h) is the lowest recorded for any catfish. The fertilization rate in the present experiment (75%; Table 1) is comparable to earlier reports in *Heteropneustes fossilis* (50% and above) using D-Lys6sGnRH-A, *Clarias macrocephalus* (60–80%) using LHRHa + PMSF, *Silurus asotus* (81.5–98.0%) T, *Ictalurus punctatus* (78.6%) and *Mystus punctatus* (85%) using dried carp pituitary extract. The present dosage of 0.5 ml/kg body weight of ovaprim may be used as a standard in future breeding of *O. bimaculatus*.

The Conservation Assessment and Management Plan (CAMP) recommended a captive breeding programme for this fish and also stated that at present there is no existing captive population of *O. bimaculatus*. Keeping their recommendations in mind, induced breeding of *O. bimaculatus* was successfully accomplished and a captive population of 548 individuals are being maintained at CARE.


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**Female heterogamy in Indian populations of *Polypedilum nubifer* (Diptera: Chironomidae)**

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A considerable number of larvae of *Polypedilum nubifer* from two different geographic localities in India were analysed for the first time for male and female heterogamic system of sex determination. The results revealed a consistent occurrence of female heterogamy in Indian populations, the female being heterozygous for 41c-d region at the tip of chromosome IV, while male was always homozygous for this region. A comparative study of female specific region between Indian and Australian populations of this species suggests that Indian populations of *P. nubifer* have distinctly diverged, genetically.

In most groups of bisexual animals it is the male sex which is heterogamic. However, in some major groups such as Lepidoptera and birds and in a few Diptera, Crustacea, fishes, amphibians and reptiles the situation is reversed, the female being heterogamic. Chironomids (Diptera) are well known for not having morphologically differentiated sex chromosomes. There are, however, considerable evidences that in this group of nematoceran insect sex is determined by one or more translocatable genes as also found in simulids, house flies, frogs and in certain lizards which may or may not be associated with any transposable element. In some species of Chironomus the linkage of these sex-associated genes has been demonstrated to an inversion or some other chromosomal aberrations, but more rarely by a small differentiated heterochromatinized segment on the chromosome. Further, the results of many studies have demonstrated that in Chironomidae the males are the heterogamic sex and the genetic basis of this lies in the presence of a dominant male specific factor in association with a cytologically demonstrable inversion and heterochromatic band.

There are also instances of divergent evolution of male and female heterogamy. Bush described a case of similar evolution of female heterogamy among...