

Broodstock Management and Larval Rearing of Gouramis

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Introduction

Gouramis are anabantids where they have both ornamental and foodfish values. Basically, genus *Trichogaster* consist of four main species namely *Trichogaster trichopterus* (Three spot gourami), *Trichogaster leeri* (Pearl Gourami), *Trichogaster pectoralis* (Snakeskin gourami) and *Trichogaster microlepis* (Moonlight gourami). These species are relatively smaller, peaceful, more colourful and attractive compared to the giant gourami (*Osphronemus goramy*). The Snakeskin gouramis are also well known for its market value of preserved and salted fish such as 'ikan pekasam'. At present, most aquaculturist and commercial producers cultured them in rice fields, aquariums, and cement or fiberglass tanks. Presently, very limited research were carried out *Trichogaster* species and thus, more trials and experiments are required to enhance the progress on the present knowledge and information on the reproductive biology, feeding regimes, rearing method, inter-breeding and the genetic variations of this fish. The information obtained from this project could specifically contribute to the development of the ornamental and food fish industry in general and to government agencies, the private sector, farmers, researchers and commercial ornamental fish producers.

Materials and Methods

A study on the reproductive biology of snakeskin gourami (*T. pectoralis*) was carried out using histological methods of the fish gonads (ovaries and testis). Data such as gonad stages and mean gonadosomatic index (GSI) were recorded and discussed. Intensive breeding of selected gouramis species was conducted. Delayed feeding test and first feeding of gouramis larvae was also conducted for duration of 10 days using different artificial feed upon the larval survival and specific growth rate (SGR). 120 gourami larvae were stocked into five separate 50L treatment tanks with each consist of three replicate filled with dechlorinated tap water. Delayed feeding test of 4 days after hatching (4dAH) to 8 days (8dAH) were carried out. Effects of different artificial diets were also conducted where 100 larvae and 200 larvae for survival test and growth test were counted and stocked into 6 separate 50L tanks. Diets such as probiotic bacteria (PB), artificial plankton (AP), capsulated micropellet (MP) and combination of AP and PB, MP and PB and mixture of all the diets were given twice daily. Survival and SGR were determined after 10 days of rearing. Larval rearing media such as peat water, green water, tap water and probiotic bacteria-added-water was applied to examine the effects towards larval growth and survival. Breeding, reciprocal crossing and cross-compatibility of selected strains and gouramis species (particularly in *Trichogaster spp*) was also conducted. Molecular genetic studies using PCR-RAPD assay was carried out for the determination of genetic variation and traits of cultivated *Trichogaster spp*.

Results and Discussion

Based on the histology results, female snakeskin gouramis attained sexual maturity at the standard length of 13.34 ± 0.60 cm and at the total length of 16.44 ± 0.94 cm. Male snakeskin gouramis would reached maturity at 13.60 ± 0.56 cm and 16.85 ± 0.91 cm respectively. This indicates that females achieved sexual maturity earlier than males. Sperm are found in the semiferous tubules of the testes where five main structurally different stages of germinal cells have been observed in the maturation of the testes. Statistical analysis showed that hatching rate was higher in peat water respectively for all gouramis followed by tap water and green water. From the experiments, black water extract prepared from dried leaves of 'Ketapang' tree (*Terminalia cattapa*) ranged at pH 6.0 to pH 6.8 could act as a pH buffer and is most suitable for the incubation of gouramis eggs thus creating a slightly lower pH and soft water condition. Results from the delayed feeding test on Pearl gourami (*Trichogaster leeri*) indicated that larval first feeding that commenced on the fifth day after hatching (5DAH) showed better overall larval survival and growth ($P < 0.05$). The suitability of food items and diets were considered another important aspect in fish larviculture. Higher survival and growth rates were significantly recorded when gouramis larvae were fed with a food mixture consisting artificial plankton, capsulated micropellet and probiotic bacteria. This experiment significantly showed that early larvae could be successfully fed with artificial diets as a whole or partial replacement or supplement to live feeds. Larval survival and growth rate were slightly lower when single usage of the mentioned food items was applied. The usage of artificial plankton as starter feed is more suitable as compared to capsulated micropellet and mixture of probiotic bacteria could enhance the growth and larval survival ($P < 0.05$). Based on the results, it can be suggested that the commercial products with probiotic bacteria can promote the survival and growth rates of gourami larvae. Data from the experiment reveals that

highest larval survival was observed in probiotic bacteria-added-water and followed by the usage of tap water, green water and peat water ($P < 0.05$). This generally showed that the usage of probiotic bacteria (PSB) could enhance the larval survival in gouramis due to bacteria's capability in eliminating harmful nutrients in water such as unionized ammonia, nitrate and nitrite. The results obtained from all breeding attempts of gouramis showed that inter-breeding of blue strain gouramis produced relatively higher percentage of blue three spot gouramis and lower number of opaline gouramis. Intra-breeding of yellow strain gouramis produced all yellow gouramis and results were similar for pearl gouramis where 100% of pearl gouramis were produced in all breeding attempts. Cross-breeding of blue strain gouramis and yellow gouramis were successful in all breeding attempts but produced a lower percentage of blue three spot gouramis. However, a large portion of lavender gouramis, which looks similar as the wild form were produced at a higher number. Crossbreeding of pearl gouramis with other varieties was not successful in all breeding attempts. Genetic variation of four species and three varieties of gouramis from the genus *Trichogaster* determined using PCR-RAPD techniques with the associate OPA-11 and OPA 12 primers indicated that no polymorphism was detected in blue, lavender and cosby gouramis individuals. The SI between the species and varieties of gouramis were ranged from 0.1063 to 0.5917. RAPD analysis successfully showed that blue, lavender, cosby and yellow gouramis (Three spot gouramis) were the closest. However, pearl gouramis were shown to be far from the varieties in the three spot gouramis, moonlight gouramis and the snakeskin gouramis. This indicates that the attempt of hybridization of pearl with other varieties of gouramis would fail as the genetic distances varied greatly between the species.

Conclusions

Females gouramis achieved sexual maturity earlier than males. Hatching rate was higher in peat water followed by tap water and green water. Larval first feeding that commenced on the fifth day after hatching (5DAH) showed better overall larval survival and growth. Better larval survival and growth were observed with the usage of probiotic bacteria added to the rearing media and fed with a mixture of artificial plankton and capsulated micropellet. Inter-breeding of blue strain gouramis produced relatively higher percentage of blue three spot and lower number of opaline. Inter-breeding of yellow and pearl gouramis produced offsprings of its own kind. Cross-breeding of blue and yellow gouramis produced a lower percentage of blue three spot and a large portion of lavender gouramis. Crossbreeding of pearl gouramis with other varieties was not possible in all breeding attempts. RAPD analysis successfully showed that pearl gouramis were shown to be far from three spot gouramis, moonlight gouramis and the snakeskin gouramis.

Benefits from the study

The information obtained from this project could specifically contribute to the development of the ornamental and food fish industry in general and to government agencies, the private sector, farmers, researchers and commercial ornamental fish producers in relation to breeding management, feeding and larval rearing techniques. Data obtained from molecular studies produced genetic information and genetic distance of varieties and species in the genus of *Trichogaster spp.*

Patent(s), if applicable:

Nil

Stage of Commercialization, if applicable:

Nil

Project Publications in Refereed Journals:

Nil

Project Publications in Conference Proceedings

- Yeong Y. S., Abol-Munafi, A. B., Hasan, S. M. Z., and Shazili, N. A. M. A Study on the Genetic Variation of Gouramis (*Trichogaster spp.*) Using PCR-RAPD Techniques. 2003. IN: Challenges to Sustainable Fisheries Development in the Next Decade (National Agriculture Policy III). Proceedings of the National Fisheries Symposium. (18 February – 20 February 2003). Kelantan, Malaysia. Department of Fisheries Malaysia. (In Press)
- Yeong, Y. S., Abol-Munafi, A.B., Ang K. H., Shazili, N. A. M., and Hasan S. M. Z. (2002). A study on the first feeding of gourami (*Trichogaster spp.*) larvae by using different artificial diets and probiotic bacteria combinations. IN: Research and Development Findings Towards Excellence in Science and Technology. Proceedings of the Malaysian Science and Technology Congress 2002, Symposium C: Life Sciences, (12-14 December 2002) Kuching, Malaysia. Confederation of Scientific and Technological Associations in Malaysia (COSTAM). 665pp.
- Yeong, Y. S., Abol-Munafi, A.B., Shazili, N. A. M., and Hasan S. M. Z. (2002). Hatching, survival and growth of gouramis (*Trichogaster spp.*) in different rearing media. IN: Research and Development Findings Towards Excellence in Science and Technology. Proceedings of the Malaysian Science and Technology Congress 2002, Symposium C: Life Sciences, (12-14 December 2002) Kuching, Malaysia. Confederation of Scientific and Technological Associations in Malaysia (COSTAM). 665pp.

Graduate Research

Name of Graduate	Research Topic	Field of Expertise	Degree Awarded	Graduation Year
1. Yeong Yik Sung	A study on the genetic variation, cross-compatibility and larval rearing of gouramis, <i>Trichogaster spp.</i>	Biotechnology (Aquaculture)	M. Sc.	2003
2. Adrina Sim Siaw Kiang	A study on the reproductive biology of snakeskin gourami (<i>Trichogaster pectoralis</i>)	Agrotechnology (Aquaculture)	B. Sc	2003
3. Soh Kah Li	A study on the genetic variation of giant gourami (<i>Osphronemus spp</i>) using PCR-RAPD techniques	Agrotechnology (Aquaculture)	B. Sc	2003

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