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Breeding of Guppy, *Lebistes reticulata* Peters, 1859 Under Laboratory Condition

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Abstract

Breeding experiment of guppy, *Lebistes reticulate,* one of the popular aquarium fish, was conducted at Aquatic Laboratory of Zoology Department, University of Mandalay. Three colour varieties of guppy were obtained from the local aquarium shop and they were inbreeded to determine the number of offspring, survival rate and sex ratio in each batches and generations. The results showed that mean gestation periods were 23, 27 and 27.33 days in dark yellow, red and pale yellow variety respectively. The highest number of young borne was found in dark yellow variety (29.33), followed by pale yellow variety (22) and red variety (16). Mean survival rate was found in a range of 85.08 % (pale yellow variety) to 93.48% (dark yellow variety). The analysis on sex ratio revealed that the number of males were significantly less in every batch, generation and variety. The data in this work would be useful in producing the desired colour patterns and kind of sex in fish understudy.

Keywords: Breeding, guppy, *Lebistes reticulata*.

Introduction

In the world's ornamental fish trade, freshwater ornamental fishes represent about 90 % while marine aquarium fishes contribute only about 10 %. While breeding and production of freshwater ornamental fishes in captivity in ASEAN region is already mature. Singapore has become one of the major centers for exporting ornamental fishes in the ASEAN region, making the country as the ornamental fish capital of the world, with more than 24 % share of the global export market.

Poeciliidae is a family of freshwater fish which are live-bearing aquarium fish (they give birth to live young). They belong to the order Cyprinodontiformes, tooth-carps, and include well-known aquarium fish such as the guppy, molly, platy, and swordtail. The original distribution of the family was the southeastern United States to north of Rio de la Plata, Argentina, and central and southern Africa, including Madagascar. However,

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due to release of aquarium specimens and the widespread use of species of the genera *Poecilia* and *Gambusia* for mosquito control, poecillids can today be found in all tropical and subtropical areas of the world (Wikipedia, 2011).

The guppy (*Poecilia reticulata*), also known as the millionfish, is one of the most popular freshwater aquarium fish species in the world. It is a small member of the Poeciliidae family, and the females measure in length of 4-6 cm and the males 2.5-3.5 cm. Like all other members of the family, it is a live-bearer (Britannica, 2007).

The wild, original guppy is native to Central America, as well as Trinidad and northern South America. Today, many guppies are found in Asia, especially Singapore, where many fancy strains are bred in large fish farms, and shipped to pet stores all over the world (Guppy Place Tripod).

This paper describes the breeding and production of young in guppy, under laboratory condition.

Materials and Methods

This experiment was conducted at Aquatic Laboratory of Zoology Department, University of Mandalay.

Collection of specimens

About three to four months old adult guppy fishes were obtained from local aquarium shop of Mandalay. These fishes with different color varieties were reared separately in aquarium store where the samples were taken. These fishes were brought in a plastic bag filled with oxygen to the Zoology Department, University of Mandalay.

Study period

The duration of study lasted about eight months commenced from June 2011 to February 2012.

Maintenance of fishes

Fishes were kept in glass tank aquaria ($30 \times 30 \times 30$ cm) filled with 25 liters tap water. Each color varieties were maintained separately. Aeration was also provided for sufficient oxygen supply and water circulation. Each tank was inspected daily for various conditions. About 20-30% of water was changed every two days. Then an equal volume of tap water was added as replacement to keep water quality as good as possible. Water was completely changed once a week (Plate 1).

Feeding procedure

Feeding was generally done twice a day with commercial small pellets (Tokyu, Japan) for mature fishes. Fry were fed with powder of pellets.

Breeding design

Males measuring 2.5-3.5 cm in length and females measuring 4-6 cm in length at the age of three to four month old were used as parental stocks. The breeding pairs were stocked at a ratio of 2 males to 3 females. Three varieties of color such as dark yellow, red and pale yellow were used in this work (Plate 2, 3 and 4). These fishes were paired in well-planted breeding tank (30 × 30 ×30 cm) filled with 25 liters tap water. Aerator was installed with air stones to provide adequate oxygen and water circulation. Breeding tank was provided with the floating plants for hiding places of fry to avoid being eaten by their parents. One month later, these fishes were allowed to bear offspring. The female was removed to another aquarium after giving birth. The number of broods and young produced were recorded. The F_1 offspring were obtained from each mate. At the end of six weeks, the fry begin to sexually develop into male and female guppies. At the age of two months, they become sexually active. This breeding procedure was maintained for all varieties and generations under study. The experimental conditions were maintained the same for breeding of all varieties.

6

Results

Systematic position

Phylum	- Chordata
Class	- Actinopterygii
Order	- Cyprinodontiformes
Family	- Poeciliidae
Genus	- *Lebistes*
Species	- *Lebistes reticulata* Peters, 1859
Common name	- Guppy (million fish)
Vernacular name	- Daung Nga, Daung mee kwet

Three colour varieties of guppy were used in this breeding experiment; dark yellow, red and pale yellow. The numbers of offspring produced were taken into account in each of four batches in each of three generations. The

gestation period, number of young produced, their survival rate and sex ratio of guppy in various generations for dark yellow, red and pale yellow varieties are presented in Table 1, 2 and 3 respectively.

Dark yellow variety

In this variety, the gestation period ranged from 17-29 days with a mean 23 days in different generations. Mean number of young produced was 29.33 with a range of 12-45. Mean survival rate was found to be 93.48% with a range of 93.33-100%. Mean sex ratio (M:F) revealed to be 0.15: 1 (Table 1).

Red variety

Regarding red variety in three generations, the mean gestation period lasted 27 days with a range of 20-38 days. A range for young borne was noted 6-32 with a mean of 16. The survival rate showed 89.03% (mean) with a range of 83.33-93.75%. Mean sex ratio (M:F) was evaluated 0.08:1 (Table 2).

Pale yellow variety

The gestation period ranged from 24-32 days with a mean of 27.33 days in pale yellow variety. The produced offspring was noted in a range of 9-35 with a mean of 22. Mean survival rate among three generations was 85.08% (a range of 80.00-88.89%). Mean sex ration was calculated 0.04:1 (M:F) with a range of 0.00:1-0.12:1 (Table 3).

Table 1. Mean gestation period, offspring, survival rate and sex ratio of guppy in various generations in the cross between dark yellow × dark yellow varieties

Generation	No. of batches	Gestation period (days)	No. of young produced	No. of young alive		Survival rate (%)	Sex ratio (M:F)
				Male	Female		
1st	4	17	12	1	11	100	0.09:1
2nd	4	23	45	7	35	93.33	0.2:1
3rd	4	29	31	4	23	87.1	0.17:1
	Mean	23	29.33	4	23	93.48	0.15:1

Figures are given in mean value

Table 2. Mean gestation period, offspring, survival rate and sex ration of guppy in various generations in the cross between red × red varieties

Generation	No. of batches	Gestation period (days)	No. of young produced	No. of young alive		Survival rate (%)	Sex ratio (M:F)
				Male	Female		
1st	4	20	10	1	8	90	0.13:1
2nd	4	23	32	3	27	93.75	0.11:1
3rd	4	38	6	-	5	83.33	0.00:1
	Mean	27	16	1.33	13.33	89.03	0.08:1

Figures are given in mean value

Table 3. Mean gestation period, offspring, survival rate and sex ration of guppy in various generations in the cross between pale yellow × pale yellow varieties

Generation	No. of batches	Gestation period (days)	No. of young produced	No. of young alive		Survival rate (%)	Sex ratio (M:F)
				Male	Female		
1st	4	26	9	-	8	88.89	0.00:1
2nd	4	32	35	3	25	80	0.12:1
3rd	4	24	22	-	19	86.36	0.00:1
	Mean	27.33	22	1	17.33	85.08	0.04:1

Figures are given in mean value

Plate 1. Breeding experiment of guppy under laboratory condition

Plate 2. A pair of guppy (dark yellow variety)

Plate 3. A pair of guppy (red variety)

Plate 4. A pair of guppy (pale yellow variety)

Discussion

Among all aquarium fishes, livebearers are the easiest to breed. All that needed is a male and a female, together in one aquarium. After a series of movements alongside the female, darting, forming S-shapes with his body and back-ups, the male will introduce sperm into the female's reproductive tract with gonopodium. The fertilization itself is very quick, the gonopodium is directed at the vent then the sperm is forcibly directed at it.

Guppy is one of the most popular aquarium fish species. This is due to their hardy nature, colorful appearance and because they are so easy to breed with. It is also very easy to get them as most fish stores keep them and they usually do not carry a very heavy price tag.

Guppies have been selectively bred to produce a variety of colors and patterns. In the wild, male guppies are dull black or brown in colour, with some coloured spots while females are fully dull grey. The wild guppies that showed the most colours in each generation were bred to produce the "fancy guppies" seen in pet stores and guppy shows today.

In this work, three colour varieties of guppy were used in order to investigate the inheritance of colour pattern and number of offspring produced (male and female) in each of batches and generations. The results clearly indicated that the same color pattern varieties were expressed in batches of every generation. This revealed the homozygosis of the strains used in this research.

Guppies are highly prolific livebearers. The gestation period of a guppy is 21-30 days, with an average of 28 days, varying according to water temperature.

In this work, mean gestation period lasted 23 days in dark yellow variety, 27 days in red variety and 27.33 days in pale yellow variety.

Regarding number of fries borne, mean lowest number was found in red variety (16) and highest number in dark yellow variety (29.33).

The highest survival rate was represented by dark yellow variety (93.48%) and the lowest rate in pale yellow variety (85.08%).

Among the produced young, the number of males is significantly lower than females in all generations and varieties under study.

Guppies are highly prolific livebearers. After giving birth, the female is ready for conception again within only a few hours. Guppies have the ability to store sperm up to a year, so the females can give birth many times without depending of the presence of a male. From the moment of birth, each fry is fully capable of swimming, eating, and avoiding danger. If not kept separate, the older, mature guppies will eat the fry, so the use of a breeder box, net breeder, or a separate 20-40 liters (4-9 imp gal; 5-11 US gal) tank is recommended. Live plants may be used as hiding places for the fry. Guppy generally matures at about three months.

In conclusion, the data included in this work would be useful in production of desired colour pattern and sex of fish under study.

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References

Britannica, 2007. “Guppy”. Available from *(http://www.britannica.com).* (Accessed 28 December 2011).

Guppy Place Tripod. Breeding guppies. Available from: *http://guppyplace.tripod.com/ Breeding.html*. (Accessed 21 October 2011).

Wikipedia. Poeciliidae. Available from: *http:"en/wikipedia.org* (Accessed 17 November 2011).