The Breeding of the Clown Fish

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Materials And Methods

The broodstock were bred with their symbiotic anemone (*Stichodactyla haddoni*) in a 2,000 l flow-through aquarium. The water temperature of 27°C is relatively stable all year long. The fish were fed twice daily to satiation with a variety of foods enriched with lipids. A vitamin A complex was added to this formula to help with the function of reproduction (Guillaume et al., 1999). The fish were monitored daily to determine the exact date of fertilization and deduce the moment of hatching. As soon as hatching was imminent the larvae were captured using a siphon system and immediately moved to a 100 l black cylindrical tank with a conical bottom, which was also an open flow system with a water flow rate of 10 l/hr, and kept in complete darkness for 24 hours. The feeding of the larvae started as soon as the second day with a mixture of rotifers (*Brachionus plicatilis*) and unicellular algae (*Platymonas* sp.). Starting on the fifth day some *Artemia* nauplii (*Artemia salinas*) were presented (Table 1). Special lighting of 120 lux (measured on the surface of the water) was used 13 hours a day. Further, the water was lightly circulated with a very gentle air flow.

Results

The time of the first sexual maturity under artificial conditions of these fish born in captivity was after 20 months. Usually at the end of the day the female deposits her eggs on the substrate at the foot of the anemone forming a intermittent circle. The male immediately fertilizes the eggs one after the other. This reproduction phase lasts about one hour. The incubation of the eggs lasts 8 days. The egg color changes from bright orange to dark brown and becomes silvery the day of the hatching (the eyes of the larvae are clearly visible). The color change starts one half hour after being in the dark and lasts from 1 to 2 hours. During the 12-month study, from September 2001 to September 2002, the pair of specimens gave birth 19 times at intervals of 16 to 24 days between each hatchings. Considering that the first hatchings consisted of only about 100 eggs which are usually aborted, the quantity of eggs was pretty consistent at about 400 +/- 50 eggs. The egg size was 2.9 plus or minus 0.1 mm at the end when the embryo is developed. The larvae at birth measures from 3.9 +/- 0.1mm. The metamorphosis takes between 12 and 33 days depending on each larva. At 18 to 22 mm in length the juveniles develop their characteristic white stripes.

Table 1: Feed Type and Density for *Amphiprion chrysogaster* larval over time since hatch (Days).

	Days 2-4	Days 5-12	After Day 12
Algae (cell/l)	20,000	0	0
Rotifers (individuals/ml)	5	5	0
Artemia nauplii (individuals/ml)	0	0.5	1

Table 2 : Comparison of the biological characteristics relating to the reproduction of several species of clown fish.

	A. chrysogaster Present Study	*A. ocellaris* Alayse (1982)	*A. ocellaris* Hoff (1996)	*A. clarkii* Hoff (1996)
Time to first maturity (months)	20		9 to 15	12 to 18
Time to hatch (days)	8	7	8	6
Number of eggs per spawn	400 ± 50	Several hundred		
Size of eggs (mm)	2.9 ± 0.1		2 to 2.4	
Frequency of spawn (days)	16 to 24	10 to 12	15 1	2
Size of larvae at day 0 (mm)	3.9 ± 0.1	3	2.36	6.68
Age at metamorphosis (days)	12 to 33	9 to 40		
Size at metamorphosis (mm)	18 to 22		9	
Survival rate during culture (%)	16	42	77	42
Growth rate from 0 to 30 days (mm/day)	0.5	0.4		

During this study the mortality rate ranged from 40 to 80% during the first 5 days after birth. The mortality rate during the metamorphosis varied from 0 to 50%. The juveniles are considered saved and little by little can be fed inert commercial fish food. As far as this study is concerned, the best survival rate experienced was 16%.

Discussion – Conclusion

Globally, the information acquired during this study showed that there is very little difference between *A. chrysogaster* and other clown fish species normally bred in captivity (Table 2). The end results, specifically the survival rate of less than 16% leads us to believe that the conditions were less than optimal (the aspiration larvae recuperation technique used in this study could be replaced by something less traumatic which would probably initially raise the survival rate). Or perhaps we are dealing with a more fragile species than *A. ocellaris* or *A. clarkii* which have shown a much higher survival rate.

The breeding of coral fishes in the last few years reveals potential economic benefits due to the development of the tropical marine aquaculture and of the important market that it represents. Dufour (1998) shows that many millions of fish are 'caught' worldwide and that the export of 100,000 ornamental fish would bring approximately 200,000 U.S. dollars in business. Even if at the moment this type of marginal breeding represents a small quantity, it could eventually prove very profitable. There are still few domesticated coral fish species like *Amphiprion ocellaris*, *Hippocampus kuda* or *Pterapogon kaudemi*, where we have some control over the cycle and depend only on the specimens bred in captivity. Much breeding still relies on the capture in the coastal waters of young fish (larvae or juveniles) who are then moved to special containers where they can grow. Most of the exported species come from being caught on the reefs and generally the methods used to capture them is destructive. Consequently, it is very important to keep in mind that in an attempt to preserve coral reefs, we must promote studies on the 'complete' breeding cycle, especially of the most popular or in-demand

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Photo by Patrick Durville

Adult Amphiprion chrysogaster in the wild with symbiotic anemones