

Observations of Flame Chub Spawning, Egg and Larva Development

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In the spring of 2011 Philip Kukulski gave me a number of eggs from a spawn of Flame Chubs, *Hemitremia flammea* (Fig. 1). Philip had collected 10 fish from Michigan's French Mill Creek in January and these eggs were from his first spawn. I had been working on taking photographs of fish eggs and larvae for some time and was beginning to have good success, and he felt we should try to get some good photos of these eggs. Within a few days I also received about half of the Flame Chubs; if the fish were in two locations there would be less chance of an accident causing the loss of all of the fish. The eggs were a great subject, as they were large, 1.6 mm in diameter, and non-adhesive. Most of the eggs of other species I have been photographing were mildly adhesive and this caused a large amount of foreign matter to stick to them. When you are taking photos of items this small, it is hard enough to limit the dust particles without having them stick by the hundreds to your subject. The Flame Chub eggs were perfect clear spheres with little attached dust.

I selected a 10 gallon aquarium for spawning. In the bottom I placed an egg catcher, and on top of this I placed a pile of 15-30 mm pebbles and a cluster of artificial plants made of acrylic yarn as spawning media (Fig. 2). The aquarium was set on blocks so that a light could be placed below; this lights up the clear eggs, making it

easy to see that spawning has occurred. All of the spawnings occurred under the artificial plants, never over the pebbles. The eggs were gathered, counted and placed in small glass bowls with a few drops of MarOxy as a fungicide. Plastic wrap was used to cover the bowl with the date of the spawning marked on it. The eggs hatched in 5-6 days at 20° C (68 F). The larvae were 6.5 mm long. The larvae showed no inclination to attach themselves to the aquarium walls and were active swimmers immediately, able to eat brine shrimp nauplii within a day or two. The fish were 16 mm long at 16 weeks (Fig. 3) and 30 mm at 6 months. Multiple spawns occurred for both Philip and I (Table 1). Flame Chubs were extremely easy to breed and raise.

The number of eggs in each spawn and the multiple spawns gave me enough eggs to take a considerable amount of photographs. Figures 4-10 show egg development and figures 11-13, the larvae. The time frame from a single cell at fertilization to a cluster of thousands of cells is very short, therefore when a spawn is found most of the eggs generally look like Figure 7. With the number of egg available from the multiple spawns I was fortunate enough to find earlier development at the cleavage stage of four cells (Fig. 4). Figures 5-11 are from the same spawn, therefore, a time can be determined for the changes. Figure 5 has maybe one hundred cells at an early blastocyst stage, and Figure 6 possibly thousands of cells in early



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Fig. 1.
An adult male Flame Chub (*Hemitremia flammea*).



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Fig. 2.

Artificial plants and small pebbles that served as Flame Chub spawning media. The plants are made from acrylic yarn.

gastrulation. The time between these stages can be a matter of minutes. In Figure 7, 15 hours later, the cluster of cells on the yolk in late gastrulation has formed into a tube body wrapping around the yolk. Figure 8 is 23 hours later; the head and eyes have started to develop in early nerulation. Seven more hours and considerable muscle growth has occurred and the tail is beginning to grow away from the yolk as nerulation proceeds (Figure 9). In another 13 hours in the late nerula stage, the eyes are well developed and the tail moves, spinning the embryo inside the egg and the heart can be seen beating (Figure 10). Figure 11 is a very late nerula ready to hatch; the heat from the photo lamps causes rapid movement within the egg. In most of the eggs from fishes I have spawned, the eyes are heavily pigmented by the time they hatch. The Flame Chub eggs only had a hint of pigment in the eye and the body of the fish is clear at the time of hatching. I managed to get a very lucky shot when taking a photograph of late egg development, it hatched and became a yolk-sac larva (Figure 12). Normally when this occurs the larva is thrashing so much a photograph is impossible. Within 12 hours into the yolk-sac stage the pigment in the eyes darkens significantly (Figure 13). Within a few days the larva develops a pattern of dark pigment along the dorsal edge and a mid-body stripe appeared as it became a feeding larva (Figure 14).

Flame Chubs are an easy fish to spawn and raise. Their extended spawning period and the number of egg per spawn, make it possible to produce a large number of fish with a very small set up. Hopefully the need for captive propagation to maintain this species will not be needed, but it would seem to not be an insurmountable task.

Acknowledgements

I would like to thank Bruce Stallsmith for adding the proper scientific designations on the egg and larva stages. 

Flame Chub Two Spawning Groups		
Date	Egg Quantity	Spawning Group
2-27	100+	A
3-9	200	B
3-15	105	B
3-20	138	A
3-29	153	B
3-31	141	A
4-11	132	A
4-22	70	A
4-22	206	B
5-3	44	A
5-24	40	A
5-30	79	A
6-4	40	A

Table 1.

Group A: Philip Kukulski, Group B: Bob Muller. Some mortality occurred and fish were passed back and forth to maintain good breeding groups. Sex ratios were not recorded. After 4-22 all fish were returned to Group A



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Fig. 3.

A juvenile Flame Chub at 16 weeks. It measured 16 mm.
The brood reached 40-45 mm at 10 months.

Full color photos detailing the development of Bob's Flame Chubs can be found on page 15.

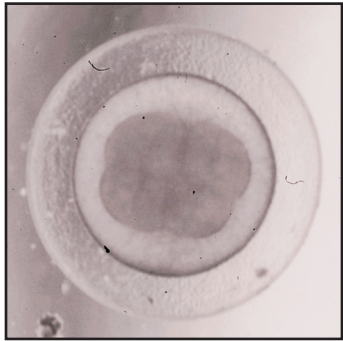


Fig. 4.
Cleavage at the 4-cell stage.

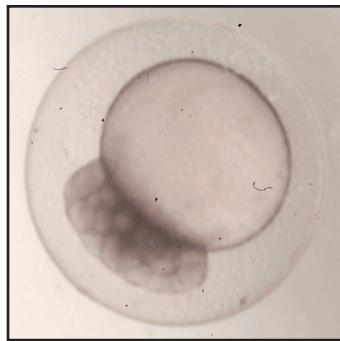


Fig. 5.
Early blastocyst.

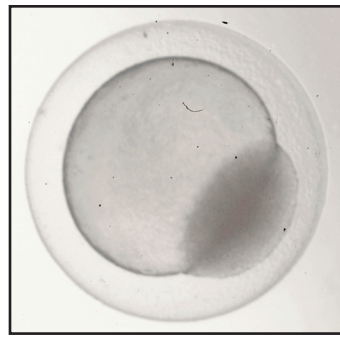


Fig. 6.
Early gastrula.



Fig. 7.
Late gastrula 15 hours after Fig. 6.



Fig. 8.
Early neurula 23 hours after Fig. 7

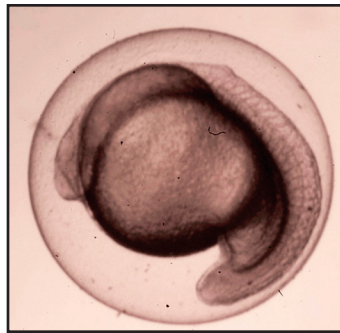


Fig. 9.
Early neurula 7 hours after Fig. 8

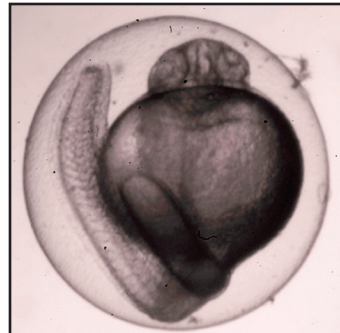


Fig. 10
Late neurula 13 hours after Fig. 9

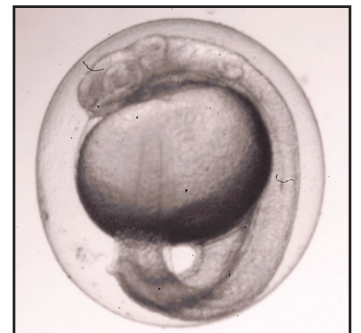


Fig. 11
Late neurula.

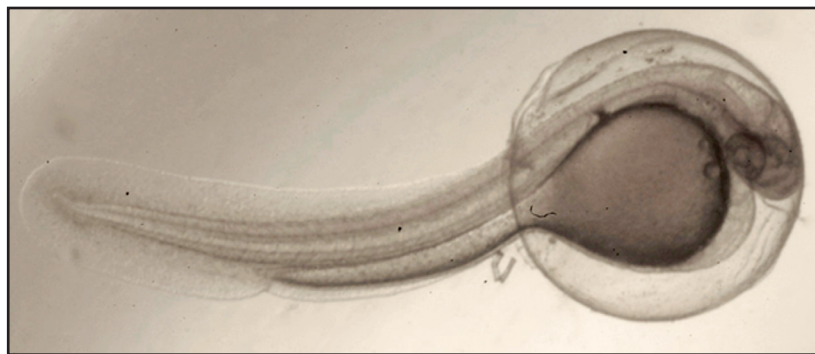


Fig. 12.
Yolk sac larva.

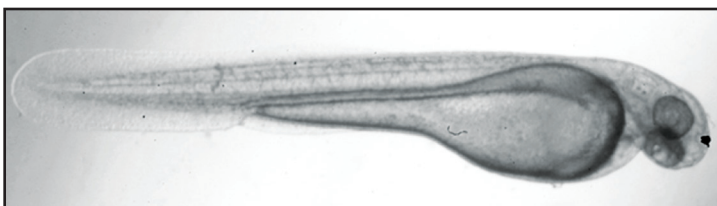


Fig. 13.
Later yolk sac larva 12 hours after Fig. 12.

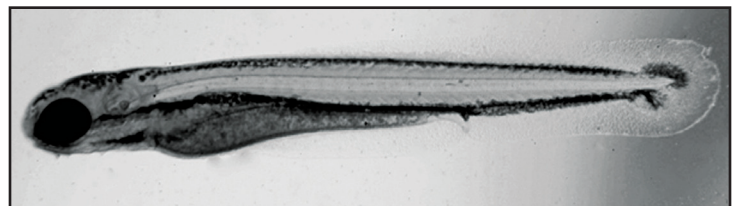


Fig. 14.
Larva a few days later.