The fry patterns in the South American catfish genus *Corydoras*

(Pisces, Siluriformes, Callichthyidae)

Ian Fuller

ABSTRACT

The fry pattern of aquarium-bred species of the South-American catfish genus *Corydoras*, contribute to discriminate between species of the so-called 'acutus'- group, showing a greyish adult colour pattern.

INTRODUCTION

Identifying many of the *Corydoras* species can be extremely difficult and none more so than the long-snouted members in, the sosh adult colour patterns. Although there are about twenty species within this group, seven species were successfully bred under controlled aquarium conditions. It is demonstrated that the colour patterns change during the fry's three to four month period to adulthood and maturity. It was thought that juvenile colour patterns might be an additional character with which to differentiate between the different species. This was demonstrated earlier with two of the short-snouted species of *Corydoras*: *C. rabauti* (La Monte, 1941) and *C. zygatus* (Eigenmann & Allen, 1942). They were considered as one species by many authors, until breeding experiments by the author (Fuller, 1983a) revealed that these two species possessed totally different body colour patterns during their larval stages.

MATERIAL

The seven species involved are: *C. acutus* (Cope, 1872): 4 males-2 females, *C. blochi blochi* (Nijssen, 1971): 2 males-4 females, *C. septentrionalis* (Gosline, 1940): 3 males-2 females, *C. treitlii* (Steindachner, 1906): 2 males-2 females, *C. amapaensis* (Nijssen, 1972): 3 males-i female, *C. ellisae* (Gosline, 1940): 3 males-3 females, and *C. stenocephalus* (Eigenmann & Allen, 1942): 2 males-2 females, all obtained from aquarium fish importers. The fry colour patterns are recorded in line drawing form, and were made when the fry had reached the age seven days and twenty-eight days respectively, and at the time when they reached the pattern of an adult female.
The adult female pattern was chosen as the datum point at which fry are deemed to have reached their adult coloration. (Figs. 1-7).

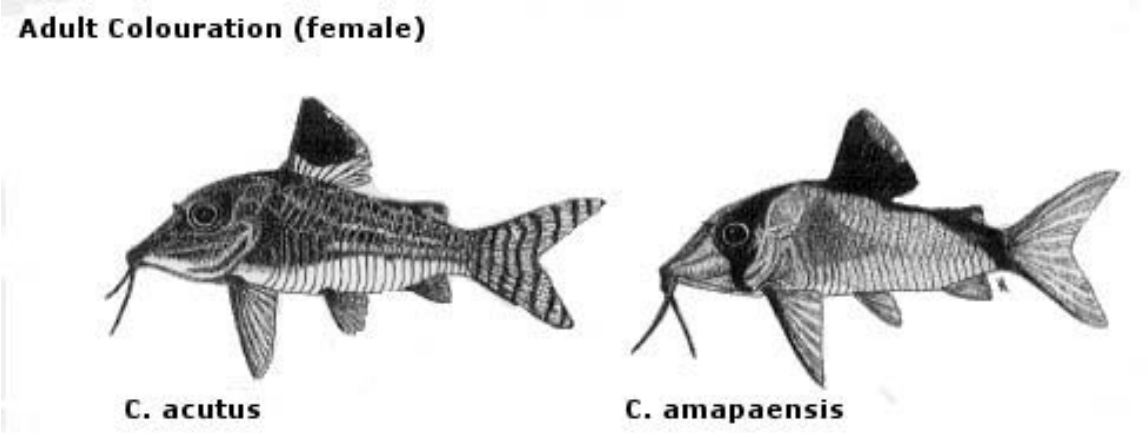
METHODS

All seven species were bred in aquariums of similar size (length 45cm, width 35cm, height 30cm), with similar furnishings. All seven species spawned in a very similar way following a pre-determined sequence of events.The sexual activity starts with a male of the species actively pursuing one of the females until she submits to his attentions, at which point she reverses rolls and pursues the male. The male then takes on a quivering arched sideways stance, allowing the female to push headfirst into the side of his body, at

a point just above and slightly in front of the ventral fins. At the moment of contact the male grips the female by clamping across her barbels with his pectoral fin spine, holding her firmly against the side of his body. The grip is maintained until the male has stopped quivering, this grip being referred to as the 'mating clinch'. Both fish then separate with the female actively cleaning various sites around the aquarium before depositing her eggs, the male being in close attendance all the time and ready to mate. During the mating clinch which may take place at all levels in the aquarium from the substrate, in amongst the plants and spawning mops to mid water, the female will deposit her eggs into a pouch made by pressing her ventral fins together. When a pair of fish mate in mid water and after the male has stopped quivering, they drift to the substrate where they may rest for several seconds before separating. No method has yet been devised to successfully determine how and at what point the eggs are fertilised.

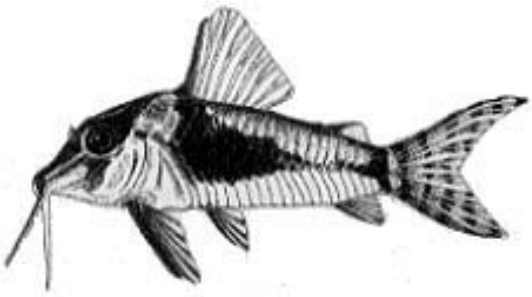
In each of the seven species spawning activities the none participating fish were left in the aquariums with the spawning pairs and in all seven cases the none participating females showed no interest at all. The males however persisted with their attempts to mate with the active female, in all seven cases the first male selected by the female made sure that he was always between her and the other pursuing males. With all seven species after spawning activity had ceased the adult fish were removed.

Figs. 1 - 7. Adult females of seven long-snouted species of *Corydoras: C. acutus, C. blochi blochi, C. septentrionalis, C. treitlii, C. amapaensis, C. ellisae, C. stenocephalus*.



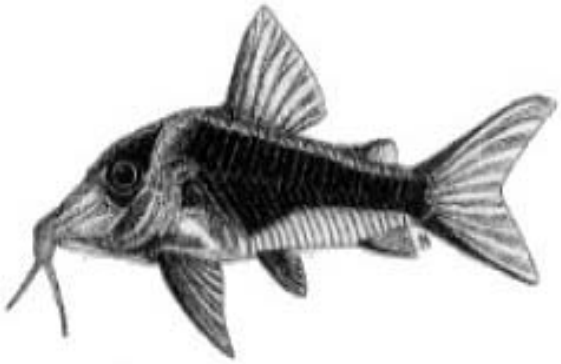
C. blochi blochi

C. ellisae



C. septentrionalis

C. stenocephalus



C. treitlii

Table I.
Water conditions of the tanks during the time of spawning of seven *Corydoras* species.
pH (Pondus hydrogenii) = acidity! alkalinity; neutral measurement = 7.
GH (General hardness = total hardness, measured in degrees dH) is a measure of all dissolved salts. 0-5 = soft, 6–10 = medium, 11-20 = medium hard = medium hard.
KR (Carbonate hardness) a measure of (bi)carbonates.
Temperature recorded in degrees Celsius

	pH	GH (dH)	KH	Temp
Corydoras acutus	7.2	12	2	21.1
Corydoras amapaensis	7.4	14	1	23.3
Corydoras blochi blochi	6.8	10	3	25.5
Corydoras ellisae	7.0	9	1	23.3
Corydoras septentrionalis	7.4	8	1	23.8
Corydoras stenocephalus	6.8	10	3	25.5
Corydoras treitlii	7.4	12	2	22.2

CONDITIONS

None of the seven species (Table I) showed preference as to the level at which to deposit their eggs, with eggs being deposited close to the substrate and to within twenty millimetres of the surface.

The fry of all seven species take from between eighty-five to one hundred hours to hatch (Table II) depending on the water temperature. Although the temperature is not a controlling factor it does have a slight bearing on the developing embryos. For example, *C. acutus* that spawned at 21,1 deg C. and took between ninety and one hundred hours for all of the fry to emerge. When spawned at 23,9 deg C. they would hatch in eighty-five to ninety five hours, but at 26,5 deg C. they still take between eighty-five and ninety five hours to hatch.

Of the seven species bred five, - # *C. acutus, C. ellisae, C. septentrionalis, C. stenocephalus*, and *C. treitiii*, # preferred to deposit their eggs in either Java Moss or the woollen spawning mops. The remaining two, *C. amapaensis*, and *C. blochi blochi* divided their eggs evenly between the tank sides and the clumps of Java Moss.

The growth rates shown in the following table are an average taken from ten specimens to the nearest 0.5 mm.

By the seventh day after hatching the fry of all the seven species have developed their own distinctive colour patterns. (Figs. 8-14). Five of the species (C. acutus, C. amapaensis, C. blochi blochi C. septentrionalis and C. stenocephalus) show patterns that are rather similar to each other. C. ellisae and C. treitili have exactly the same patterns as each other, differing from the other live species by having no markings along the sides of the body.

As the fry of the seven species grow and develop, their colour patterns are constantly changing and reach a maximum intensity by the time they are four to six weeks old. The pigmentation forms into irregular markings that cover most of the fishes body, giving all seven species a dark blotchy appearance especially when viewed from above, as shown in Figs. 15-21. From six weeks onward the ever changing colour patterns of the fry, start to develop into the more recognisable patterns of the adult female.

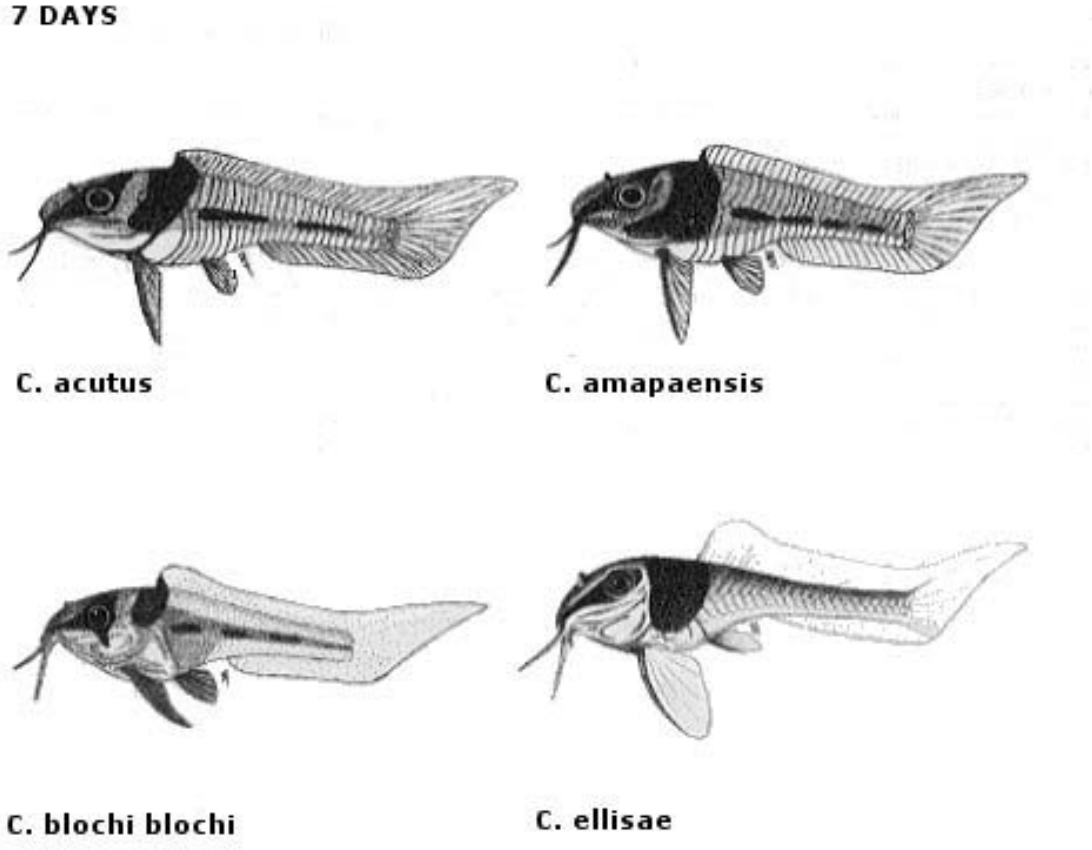
By the time the fry of all seven species are aged between eight and ten weeks old, they will all have attained the colour pattern shown by adult females, as demonstrated in Figs. 1-7.

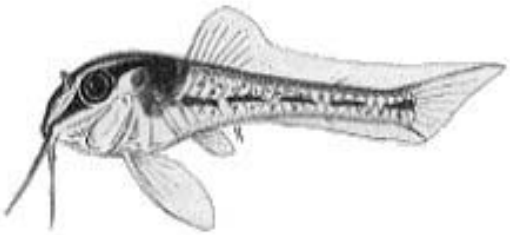
The effect of water temperature on all the fry's growth rates, is very much the same as on egg development. More importantly water quality does have a positive effect on growth rates. Water quality that had been allowed to deteriorate through contamination from excess build up of the fry's waste matter effectively retarded growth, it is thought that permanent growth damage would occur if conditions were allowed to prevail for any length of time. To maintain maximum fry growth rates daily 30% water changes were made.

DISCUSSION

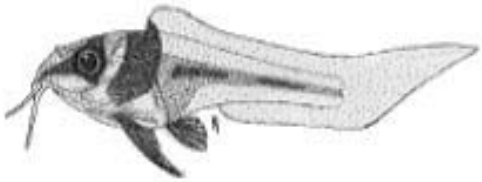
Adult female coloration was chosen as the time at which fry were deemed to have reached adulthood. This was because with other species of *Corydoras* e.g. *C. barbatus* (Quoy & Gaimard, 1824) that have been bred - where there are known colour differences between the sexes - the males of some of these species can take a further eight or even as long as twelve weeks to mature and develop their adult colours. (Fuller, 1983b).

Figs. 8 – 14

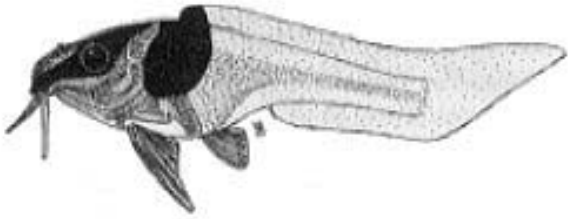




C. septentrionalis



C. stenocephalus



C. treitlii

Table II.
Details of egg production of seven *Corydoras* species. Per column: total number of eggs, diameter, number of eggs laid at a time, adhesion, and time to hatch. The adhesion (how well they stick) is a value of personal rating out of 10.

	Number per female	Diameter in mm	Number laid at a time	adhesion	Time to hatch
C. acutus	40	1.5mm	2 - 4	4	4 days/90-100hrs
C. amapaensis	150	1.5mm	3 - 8	5	4 days/90-100hrs
C. blochi blochi	50	1.3mm	2 - 4	7	4 days/90-100hrs
C. ellisae	65	1.0mm	2 - 5	3	3-4 days/85-100hrs
C. septentrionalis	110	1.6mm	2 - 4	4	3-4 days/85-100hrs
C. stenocephalus	60	1.3mm	3 - 5	7	4 days/90-100hrs
C. treitlii	55	1.3mm	2 - 5	5	3-4 days/85-95hrs

Table 111.
Fry growth rates of seven *Corydoras* species, showing their total lengths per period of time.

	7 days	1 month	2 months	3 months	Adult colour reached in
C. acutus	4.0mm	7.0mm	14.0mm	22.0mm	8-10 weeks
C. amapaensis	4.5mm	8.0mm	15.0mm	22.0mm	10-12 weeks
C. blochi blochi	5.0mm	9.0mm	16.0mm	23.0mm	7-8 weeks
C. ellisae	4.5mm	8.5mm	15.5mm	23.0mm	8-9 weeks
C. septentrionalis	5.0mm	9.0mm	14.5mm	21.5mm	10-12 weeks
C. stenocephalus	5.5mm	9.5mm	15.0mm	20.5mm	8-10 weeks
C. treitlii	4.5mm	8.5mm	15.0mm	22.0mm	9-10 weeks

With the seven species so far bred from the 'acutus' group there were no discerning colour differences between the sexes that could be readily recognised. The first visual signs of maturing males are in the fin spines, the pectoral and ventral fins being the most prominent; becoming thicker and more elongated. In mature males of the seven species spawned the ventral fins are possibly the most reliable indicator of sex, as these become elongated and pointed compared to the rounded tan shaped fins of the temales.

As with most animals, growth rates can vary tremendously. *Corydoras* fry are no exception, and caused some concern when one or two of the faster growing quicker developing males became dominant and were observed chasing and bullying smaller less mature specimens. The aggression became so intense preventing the smaller fry from feeding altogether.

To further assist and improve the survival rate of the smaller male fry, large clumps of Java Moss were placed in all the fry rearing tanks. This had the effect of giving all the fry a secure refuge, and enabled the smaller males to avoid the bullying by the larger ones. It also had the effect of reducing the amount of squabbling between males of equal size, enabling the majority to reach adulthood (between sixty and seventy percent of the fry of all seven species reached adulthood).

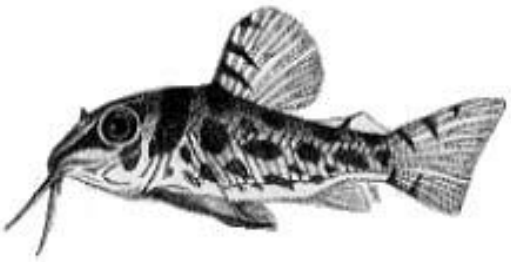
Long-term observations have shown that female *Corydoras* fry grow at a faster rate than males, as twenty percent. With the seven species bred from the 'acutus' group there is a difference of between ten and fifteen percent in standard length after ten months. Despite growth variation within each of the sexes, after ten to twelve week's males and females can be separated with relative ease:

28 DAYS

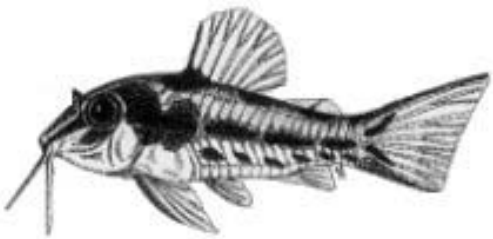
C. acutus

C. amapaensis

C. blochi blochi



C. ellisae



C. septentrionalis

C. stenocephalus

C. treilii

REFERENCES

Fuller, I. 1983a. Lookalikes unmasked. Practical Fishkeeping January: 32-33.
Fuller, I. 1983b. Spawning Corydoras barbatus. Freshwater and marine aquarium 6 (12): 24-25, 67-68.
Nijssen, H. & I.J.H. lsbrücker, 1980. A review of the genus Corydoras Lacepede, 1803 (Pisces, Siluriformes, Callichthyidae) Bijdr. Dierk. 50(1): 190-220.