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# ARK - Arizona Rivulin Keepers

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## The Scheel Letters, No. 46

### West African Rivulins

*Aphyosemion (Fundulopanchax) cinnamomeum* Clausen 1963 by J.J. Scheel

(This article was prepared before the agreement mentioned on the page before was made)

In 1959 Stenholt Clausen returned from Nigeria bringing a small collection of *Aphyosemion* with him containing four species. In 1960 these species were placed in the tanks of Hans Klementsén, and in my tanks. The future *A. cinnamomeum* was taken over by Klementsén, whereas I took care of the *A. gulare* from SW Nigeria, the *A. filamentosum* from Ijebu Ode and an unidentified species from the Ndian River in northern Cameroon. The latter is still undescribed and will remain so until we have collected live material in southern Cameroon in 1964/65.

As Klementsén had no offspring of his species, he delivered the specimens to me. It was soon realized that the spawning normally takes place into the peat and because of this the eggs become "annual". We soon raised a fresh stock of this fish.

In March 1963 Stenholt Clausen described this species as *Aphyosemion cinnamomeum* and placed it into the subgenus *Fundulopanchax*. *Aphyosemion cinnamomeum* is known from the type locality only. This is a small stream in a low mountainous area 44 miles north of Kumba, northern Cameroon rainforest in an area of very high rainfall.

The male of this species differs rather much from the common *Aphyosemion* style not only by its strange coloration but also in the general appearance and in behavior. In some way it is rather "Nothobranchius-like" but one should not consider it as a "link" between these two genera. The mature and active male is a beauty indeed when fighting or flirting. However, normally its coloration is rather drab and nobody would consider it to be handsome. When active the body color is very dark all over. The brilliance seen on the body sides of most males of this genus is only present as very small spots reflecting a particular bluish violet glow. Besides this the whole area of deep blackish body color has a certain violet tinge except on the area next to the pectoral fins. These deeply orange colored fins stray their color into the body sides forming a broad cinnamon girdle all around the foremost part of the body. This girdle is more easily seen when the male does not become blackish and activated. No traces of red spots are seen on the body sides of both sexes. The ordinary "worm like" markings on gill covers of *Aphyosemion* here are transformed into a marbled area behind the eyes. The ordinary rather complicated throat pattern of male

Aphyosemion is not present and probably is not needed for identification as the male's throat when activated is colored by a deep blackish violet color. Under the microscope traces of the usual red pattern are seen below the eyes, at the corners of the mouth and also sometimes here and there along the line of side line pores behind the lower lip. Traces of red pigments are found below the gill covers.

The ventral, anal and caudal fins have like color patterns. Close to the body there is an even deep violet blue color that often turns into a nearly black color when not seen in incident light. Then follows an even darker line that has a somewhat reddish tinge. Then normally follows a very thin bluish line and the outmost part of the fin is brilliantly yellow. When compared with the corresponding edges of *A. nigerianum*, the "yellow variety", the color on *A. cinnamomeum* is warmer or more orange. In the hindmost part of the caudal fin the very dark "separation line" may not be quite unbroken and in such cases the bluish color (guanine) of the inner part of the fin may spread into the yellow area turning this into a brilliant green color. The color pattern of the caudal fin is not unlike that described for *A. meinkenii* and has also traits towards *Nothobranchius rachovi*. The dorsal fin is colored very much like the anal fin, however there is a certain marbled pattern of more or less brilliant areas. The separation line is narrow and the outmost part of the fin is normally without yellow color. However, on a few males one may notice a very weak yellow color.

The female's color is a nearly uniform olive brown that becomes lighter towards the belly. The unpaired fins and in particular the anal fin have a conspicuous lemon color when active. There are no traces of dark spots in its fins, however in incident light one may notice a certain marbled pattern in her dorsal and also her ventrals and the anterior edge of the anal have some bluish brilliance as most females within this genus.

From Klements, I received 3 males and a number of matured females. The males were of equal size, but only one male had the contrasting yellow edges of ventrals, anal and caudal. First I thought that there may be two sorts of males as we find it within *A. nigerianum*. The two unimpressive males were placed into a big tank together with many specimens of *Aphyosemion*, *Epiplatys* etc., whereas the handsome colored male was used as a breeding male. Klements had had all individuals in a 4-gallon tank and inside this they all were raised to maturity. For many months the two "intersexed" males were kept under control and they did not develop any yellow color, but suddenly they were just like the breeding male. Their age at that time probably was more than 12 months. I think that we may explain this like that:

If you raise a brood of *Colisa lalia* in one tank you will realize that some individuals will grow more rapidly than others. At a certain time one big male will start blowing bubbles and he will develop the beautiful colors of the matured male. Once so colored he will keep these colors for his whole life. Normally only one male will mature like this. If you remove the mature male, its place will soon be taken over by another male which develops its mature colors.

*Elassoma evergladei* from Florida, USA, has a like system. In a brood of young specimens that are kept in a small tank normally only one male shows the deep velvet black colors of a mature male. The other males are colored mostly like females, however here and there on their bodies black spots are seen. Now and then one of these males within seconds develops the matured colors of a breeding male and a fight may take place between the two black males. The loser after the fight will develop the female-like

coloration.

In my opinion a similar system works inside populations of *A. cinnamomeum*. Breeders of killifish know that one male normally will be able to serve several females forming a breeding team. I myself have used up to five females to each male of different species without getting more infertile eggs as usual. In nature it may be important that only a few males develop into breeding males that govern a certain territory and that the surplus of males do not develop at once into matured males but are kept as reserves. A mature male is rather conspicuous compared with females and unmatured males. It is more easily seen and taken by birds and predators. If the breeding male inside a certain territory is lost, another male will take its place and keep the "immatured" males from developing the yellow edges of the fins. If you place two mature males of this species in one tank, a fight very soon will take place. According to my own observations, the males of this species do not make "scissor-like" movements of dorsal, anal and caudal fin (see draft for article on *A. nigerianum*) and the movements of the males before and during the fight are more like the *Nothobranchius*: "stretching of fins and attack". The attacks are often described towards the brilliant yellow edges of the anal and caudal fins. The looser very often does not show but traces of his previous proud yellow. If the loser is not removed from the tank and if he survives the battle the remains of its yellow color will be very weakly colored and his body color will be very close to that of females. As mentioned in the draft on *A. nigerianum*, the combination of the yellow edges of male's fins and the contrasting blue body color makes the matured male very conspicuous in particular when the fins are spread. If the breeding male of *A. cinnamomeum* did not possess the yellow fin edges, it certainly would be very difficult to discover and females will be in difficulties when they are ready to spawn. On the other hand, predators also more easily can take him. Perhaps the lack of yellow color in the dorsal fin is a sort of a compromise between these two opposing forces because a reduction of the conspicuous pattern just in this fin will decrease the vulnerability towards birds whereas such reduction does not interfere much with the possibility for females to discover him. An even more pronounced reduction of the yellow fin edges is seen inside the *Aphyosemion roloffii-calabaricus* group where the yellow color has been lost in both anal and dorsal fins.

As Barlow has pointed out for *Cyprinodon macularius*, the colored pectoral fins of this species stand in perfect contrast to the blue body color of matured males of this species. This combination of colors probably works in just the same way as the "throat signal patterns" which we are studying among species of *Epiplatys* and less developed also among *Aphyosemion*. *A. cinnamomeum* has no conspicuous throat pattern. The differences between males and females are only the difference in the dark pigmentation. Mature male = dark throat, female and immature males = light throat. It is likely that the brilliantly colored pectoral fins and maybe also the yellow edge of the caudal fin play the role of the throat pattern when seen in contrast to the nearly black body color. *A. australe* and *A. cognatum* both have highly colored pectoral fins. Both have a highly reduced brilliance on body sides, just like *A. cinnamomeum*. There is no conspicuous throat pattern on specimens of *A. australe* and during fight and spawning the male develops a very black throat colour. This primitive system is found mostly among *Epiplatys*. *E. senegalensis*, *E. fasciolatus* and, in some ways, *E. sheljuzhkoii* are examples. The throat pattern of *A. cognatum* does not differ much between the two sexes. However, the male does not develop a black or dark violet throat color during a fight and spawning. It might be so that colored pectoral fins within *Aphyosemion* play a somewhat different role when compared with *Cyprinodon macularius*.

If only the usual geological counts and measurements are compared, *A. cinnamomeum* cannot be separated from *A. nigerianum*. The study of the coloration system however separates these two forms from one another. This cross is very easy to establish as usually inside this genus. There were no fertile eggs with abnormal development of the embryo. The hybrids were very viable and both sexes were present. There were 8 males and 5 females. No individual had intersex characters. At an age of 2 1/2 months males started maturing. The yellow color first developed in the anal fin, then in the lower part of the caudal fin. First the color is lemon, then it gradually changes into the more orange coloration. This means that one particular male may become orange in the anal fin and lemon in the caudal fin. At this age the young males have no red dots on body sides except for the particular area (see *A. nigerianum*) just behind the pectoral fins. The brilliance of the body sides is not a uniform one, as on *A. nigerianum*, but more marbled as in *A. cinnamomeum*.

Female characters were intermediate. The yellow color of the unpaired fins was weak. The dots on body sides were present but the number of dots was low and the dots were very small. They spawned but with their brothers and with male *A. nigerianum*, all eggs were sterile. The size of their eggs varied between 1.60 and 1.75 mm. Egg size of *A. nigerianum* (Akure stock) is approximately 1.0 mm and that of *A. cinnamomeum* is 1.5 mm. The egg surface had a marked reticulated pattern as eggs of *A. cinnamomeum*. Eggs of *A. nigerianum* normally have only a very weak reticulated pattern. Variation of egg size is known also from some other Aphyosemion hybrids.

Hybrid males were very brilliantly colored and belong to the most handsome Aphyosemion hybrids produced in our tanks. When fully matured and developed, the brilliance of the body sides was not marbled but quite uniform. The color is just like *A. nigerianum*. The development of the red dots differed somewhat forming a more marbled pattern than *A. nigerianum*. All hybrid males had yellow edges on all fins. The pattern of the caudal fin was more or less a compromise between the crossing species. Most males did not develop an unbroken separation line all along the edge of the fin as in *A. cinnamomeum*, but in all the upper and lower "lyre pattern" formed by these lines did not turn up and down as in *A. nigerianum* (and most Aphyosemion possessing this pattern) but turned towards the center of the hindmost edge of the caudal fin. Only one male at an age of more than 15 months developed an unbroken red line all along the caudal fin. The yellow color of the hindmost edge of the caudal fin was not a pure yellow when the red line was not completely closed, but merely a yellowish green. The pectoral fins were colored as *A. nigerianum*, however there was more yellow color near the edge as normally seen within yellow males of *A. nigerianum*. The outmost edge was pale red.

The throat pattern also was very much like *A. nigerianum* and males' throat did not develop a blackish color during fight and spawning. The caudal fin of *A. nigerianum* does not develop long streamers as many male Aphyosemion. That fin of *A. cinnamomeum* is said to be rounded and so it is normally. However, old aquarium-kept males often develop some prolongation of the upper and lower rays and approximate the shape of *A. nigerianum*. The hybrid male when old is intermediate. It might be of some importance that the *A. nigerianum* male used for this crossing belongs to the Wokocha River, near Port Harcourt, eastern Niger Delta area and not to the usual Akure population. The hybrids did not differ from the parent species in their haemoglobine spectrals.

The female *A. cinnamomeum* was also crossed to the genotype of *Aphyosemion*, *A. christyi*. Only a few fertile eggs were harvested. The embryo did not develop normally. The length did not exceed 90 degrees on the equator of the yolk. The development of the blood system was poor. One embryo lived inside its egg for 5 weeks before it died but it did not approach reaching the full development of organs. I do not think that viable embryos could be had from this cross.

The same female was crossed to a male *A. labarrei* - 14 fertile eggs. The development of the embryos was normal. After hatching the hybrids were very feeble and some were bad swimmers whereas others "lost the air" and rested at the bottom. All died before maturing.

Once more the female was crossed to the form which has been kept as an aquarium fish, first under the name *A. striatum*, then (USA) *A. lujae*, then *A. cameronense* and at present again *A. striatum*. It comes from the Congo River north of Leopoldville. Morphologically it seems to be close to *A. cameronense* and *A. striatum*. Only 3 eggs. 2 eggs developed and hatched. But the fry did not grow. At an age of 6 weeks it only measured 8 to 10 mm. After some time the two fry died.

Then the female *A. cinnamomeum* was crossed to the unidentified *Aphyosemion* from the Ndiain River, North Cameroon. Morphologically, also this form is close to *A. cameronense* and it is not possible to separate these two forms. It may stand rather close to *A. nigerianum*. I had 31 eggs, 22 eggs were fertile. Normal development and hatching. Also these hybrids were rather feeble and were difficult to raise to maturity. At the time of maturity they developed different colorations. Some were weakly colored males, whereas others developed mostly towards females but with more colors than normal within this genus. Later on, they turned into a more and more male appearance. After maturing their coloration the hybrids were more hardy and most lived for more than one year. Some hybrids of male type had yellow edges of unpaired fins, others had no yellow.

At present it is very difficult to place *A. cinnamomeum* in the right place inside the genus *Aphyosemion*. From what could be seen from the crossings, the behavior, the color patterns etc., we probably have to place this form as a "blind off-shoot" from some form close to *A. nigerianum*.

*A. cinnamomeum* is a bottom living form. It takes time to train this fish to come to the surface to take fruit flies. In such situations the fish rushes to the surface, catches the fly and rushes down again. Compared with *A. nigerianum* this species is more peaceful but mature males will fight violently. Unfortunately it is not a robust fish like *A. nigerianum* and tuberculosis and *Oodinium* may kill your stock if you are not careful. We have kept this species in slightly acidic water of zero hardness and in our ordinary tap water which is alkaline and has 15-20 German degrees of hardness. In the water type first mentioned the fish will spawn and eggs will develop, but diseases may be a problem. In the water type last mentioned the eggs normally will be ruined but the control of diseases is much better. We always use peat as a bottom layer. 68-78 F. Dim light.

Spawning normally takes place at the surface of the peat. However, if you separate the two sexes for a week or so and then form your breeding team, spawning mostly will take place all over the tank at any water level and even in the *Riccia* at the water surface. The percentage of fertile eggs is rather often low when breeding this species. The reason for this seems to be found in the water type used. Calcium ions

probably should not be present not even when the water is acidic. Peat-loaded water seems to improve the results. As the percentage of fertile eggs often is higher in the crossings when female *A. cinnamomeum* is used, it may be the sperm that does not like the water type. Several males suffered from struma and became sterile. I used iodine bromide without result.

Eggs measure 1.5 mm and have a very conspicuous reticulated surface pattern. When taken out for development in small glasses they normally do not show any delay of development. However, normally eggs do not hatch when ripe and it is often difficult to force the fry to hatch. Drying up of the bottom peat for 4-6 weeks gave the best results so far. One egg receiver in 1963, Mr. Johannes Franz, Dresden, raised 3 males and 4 females. Maturing started at an age of 4 months and 35 mm. Spawning took place at an age of 5 months, but even at that time the males were not able to fertilize the eggs. At last, at an age of 6 months, fertile eggs were harvested. Most eggs were "resting eggs", that is to say that the development stopped just after the fertilization. The delay of development was more than 8 weeks. Franz used a water of 6 German degrees of hardness. Best result gave 70% of fertile eggs. My own females gave up to 80 eggs per spawning and per female after one week of heavy feeding.

D 13/14, A 16/17, sq. long. 30-31, sq trans. 9-10. Maximum length (without caudal fin) approximately 40 mm (male)