

Identification of a small Collection of *Aphyosemion* from Zaïre in the Munich Museum (Z.S.M.), with further Comments on the Validity of the known Components of the *elegans* Superspecies Part 1

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Abstract:

Four series of specimens belonging to the genus *Aphyosemion* are studied based on four localities and collected by Uli Schliewen in the Bandundu Province in central Zaïre (today Democratic Republic of Congo): on the basis of colour pattern of living male, two of them are provisionally identified as *A. elegans* and the two others as *A. sp.* Kisangani-like (identical to topotypes of *castaneum* and today provisionally named *christyi*). Following DNA evidence and recent live collections in upper Zaïre between Kinangani and Bafwasené, in northwestern Congo and southwestern Centrafrique, the validity of the 18 known components of the *elegans* superspecies is discussed, pending a full review by another researcher: 6 taxa are seen as valid and well defined and diagnosed (including *A. plagitaenium* from northeastern Congo, a new species described in a separate publication), 5 taxa are seen as well diagnosed but insufficiently defined probably valid names, 7 taxa are seen as very insufficiently defined or diagnosed and may be either valid or junior synonyms; finally, *lujae* and *ferranti* are tentatively re-defined and the status of the un-named aquarium populations is discussed.

Résumé:

Quatre lots de spécimens appartenant au genre *Aphyosemion* sont étudiés de quatre localités, tout pêchés par Uli Schliewen dans la Province de Bandundu au Zaïre central (aujourd'hui République Démocratique du Congo): d'après

le patron de coloration du mâle vivant, 2 d'entre elles sont provisoirement identifiées comme *A. sp.* type Kisangani (identiques à des topotypes de *castaneum* et nommés provisoirement aujourd'hui *christyi*). Suite aux travaux de biologiste moléculaire et aux récentes récoltes vivantes du Haut Zaïre, du Congo nord-occidental, et du Centrafrique sud-occidental, la validité des 18 composants connus de la superespèce *elegans* est discutée, dans l'attente d'une revue complète par un autre chercheur: 6 taxa sont considérés comme valides et bien définis et diagnostiqués (y compris *A. plagitaenium* du Congo nord-occidental, une nouvelle espèce décrite dans une publication séparée), 5 taxa sont considérés comme bien diagnostiqués mais insuffisamment définis et probablement valides, 7 taxa sont considérés comme très insuffisamment définis ou diagnostiqués et pour ront être soit valides, soit des synonymes juniors; enfin, *lujae* et *ferranti* sont hypothétiquement re-définis et le statut des populations d'aquarium encore non-nommées est discuté.

1 INTRODUCTION

The killifish species of the *elegans* superspecies belonging to the genus *Aphyosemion* (Cyprinodontiformes: Aplocheilidae) and living in the Congo cuvette and its belts are the most difficult to study overall, together with those belonging to the genus *Rivulus* in the Amazon cuvette in South America, probably

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for similar eco-palaeogeographical reasons (Huber, 1998) and for parallel historical reasons:

biogeographically speaking, their biotopes have been changing during the past million years from semi-desertic isolated remnant pools to a huge over flooded "lake" with a boundary of over 5000km; consequently, within the the present cuvette of immediate status, this today produces a patchwork of species with standard distribution, intricated with often genetically isolated "spotty" populations that replace each other with little rationale.

historically speaking, many taxa have been described since long ago, between 1899 and 1924 and are still unknown as live fish, with possible misidentifications based on aquarium strains, collected away from the type localities.

Besides, the low numbers of collecting spots of live material since 20 years ago (political instability in that part of the world being the major reason) does not help to uphold those difficulties: hence, the new series of populations hereby recorded do bring a small but valuable contribution to that unsatisfactory situation.

Indeed, the major constraint in the systematics of the *elegans* superspecies is palaeogeographical. Like the Amazon basin, the Congo basin is a cuvette that experienced climatic hiccups during its history and notably since the Pleistocene (2.5 million years ago): the landscape varied from dried savannahs with few aquatic remaining waters (except in refugia where speciation is high, like near lake YTumba, not far from Bikoro, a type locality of *A. elegans*!) to a fully flooded forest ("the hypothetic gigantic lake"). This explains why only the belts (the plateau) of the cuvette encompass species with rational distribution pattern and standard vicariance speciation. In the cuvette itself (the lowlands), the situation is opposite and complex with apparently little

rational distribution and the occurrence, sometimes sympatrically, of "spotty" distinct phenotypes inline with the big "reshuffles" of the climatic hiccups that endured the fishes (and it is not known with our present limited collections whether this un-rational distribution is a consequence of the mixing of populations due to climatic variations or the consequence of the major generic drifts and of local speciation).

This translates into a very complex puzzle for the systematic researcher and thus our present identifications of the phenotypes of the *elegans* superspecies tend to be limited to the colour pattern of the living male. This is only practical because the biological complexity is even greater and the results of karyotypes have shown that live colour patterns do not always correspond with named species phenotypes. Finally, the number of valuable diagnostic characters is declining and tend to be limited today to that of male unpaired fins, notably for phenotypes with red spots on sides: for example in Scheel's time (1950's to 1970's), the number of red spots on malesides was thought as diagnostic; however, this is far from certain and allopatric populations of *lamberti* and of *congicum* have been collected with either many or few spots. If this is correct, then the differences in observations between Wildekamp (1993: many spots) and Huber & Scheel (1981: few spots) or Huber (1994: idem) for the types of *decorsei* may become without potential significance.

Fortunately the first preliminary results of molecular biology (mitochondrial genes, Murphy & Collier, 1999) are in line with our understanding of species names based on male colour patterns (a few discrepancies have been noted in *elegans* and *decorsei* sensu Murphy & Collier, but these correspond to minor misidentifications by these authors).

This paper is published to take into account several novelties concerning the *elegans* superspecies that change our knowledge and



Top. *Aphyosemion* sp. Lobaye

Middle *Aphyosemion* sp. Kisangani

Photos Maurice Chauche
Bottom *Aphyosemion* sp. Gilima

definition of some components of the super-species since the author's previous studies of the group (Huber & Scheel, 1981 for all then known taxa; Huber, 1994 for *decorsei* only), notably:

- in 1983, a young French aquarist, Christophe Moreau, visited a single locality within the northwestern part of the cuvette in Congo, at Bombala, near Impfondo (RPC 1983/2)

- in 1985, three renowned aquarists, Winfried Stenglein, Jan Pap and Wolfgang Grell, collected live, for the first time, killifish species from the northeastern cuvette and its belt in Zaïre (1), especially near the type localities of *christyi*, *castaneum* and *margaretae*: unfortunately, their findings have not been covered scientifically, except for a revalidation of *margaretae*.

- in 1991, three other aquarists, Paul De Wageneer from Belgium, Leen Van Den Berg and Bas Vlijm from Holland, re-collected along the same road of northern Congo as the author did in 1978: they were able to record at least three new collecting localities for *Aphyosemion chauchei* (Obeya, Ottende? and Oyoué), thus extending the distribution of the species and to discover a new atypical population that remained un-studied and is described in another paper.

- in 1994, a French herpetologist, Laurent Chirio, brought back a single population from the primary forest of southwestern Centrafrique (northwestern belt of the cuvette), in Lobaya river, that was sympatric with a probably new component of the *wildekampii* superspecies; this strongly red punctuated population may be related to the unidentified populations of the primary forest in the northwestern belts of the cuvette, West-Mokéko (1978 localities JH141/142/156).

- in 2002, the ichthyologist, Uli Schliewen, from Munich museum made a col-

lecting trip to the Bandundu Province of west central Zaïre and recorded four new collecting points in the cuvette itself.

The study of the material of these new collections induces several novelties concerning the *elegans* superspecies that changes our knowledge and definition of some components of the superspecies since the author's previous studies on the group (Huber, 1978, Huber & Scheel, 1981 for all then known taxa; Huber, 1994 for *decorsei* only and Huber, online, 2001-2004). The results are published into two independent reports, one publication with the description of the new species (Huber, 2004, in press), the present publication with the study of material and the components of the *elegans* superspecies.

Our two papers are limited to those novelties and do not propose a full revision of the *elegans* superspecies, because another researcher, Jouke van der Zee, has undertaken (pers. comm.) a complete review of the huge collections of preserved material recorded in Tervuren Museum and will publish it as soon as possible. Without anticipating his conclusions, it is unavoidable to tackle the issue of the identification of the northeastern components of the *elegans* superspecies, whether they are named *christyi*, *castaneum*, *schoutedeni* or *margaretae* and the various options are discussed herein because they impact on the identifications of the Bandundu collections. This paper is tentatively published in an aquarist magazine (D.K.G. in German and B.K.A. in English), to acknowledge the crucial role aquarists have on the conservation of species, on the availability of new populations by actually collecting them themselves and on the maintenance of species, notably the *Epoma* strain since 1991.

(1) The country named Zaïre is still used and not the official new name of "Democratic Republic of Congo", to easily differentiate it from the Congo, officially the "Popular Republic of Congo", (no need to stress that

fish are not concerned by this only humans). As an example to follow, the German single aquarist specialised study group on the *elegans* superspecies, within the D.K.G. is remarkably efficient (<http://dkg.killi.org/killifische/elegans/index.php>). On the other side, researchers are faced with an incredible biological complexity and have to sort out messy decisions in previous very old descriptions, because of the good, but sometimes uncomfortable to apply rules of the code of the International Commission of Zoological Nomenclature (ICZN) on historical priority, on type material and on type locality. Should name changes arise, as it will probably be in this case, this is our kind request to genuine aquarists to understand our difficulties.

11. COMMENTS ON THE VALIDITY OF THE KNOWN COMPONENTS OF THE *ELEGANS* SUPERSPECIES

With the new species, the following 18 taxa are available (in ICZN sense), that belong to the *Aphyosemion elegans* superspecies (Huber & Scheel, 1981, Wildekamp, 1993): the *Aphyosemion elegans* superspecies is easily defined within the genus *Aphyosemion* by the combination of the following 6 characters compared to other subgenera, (1) short-based dorsal fin (less than 10 rays on average), (2) a not flamed shaped dorsal fin (unlike *Kathetys*), (3) a tendency to a slenderer body shape (maximum depth at anal fin level, less than 19% in standard length, versus more than 21% for *Mesoaphyosemion*, obviously not considering aquarium specimens, (4) all unpaired fins with streamers (unlike *Diapteron*), (5) a remote dorsal fin position, inserted far behind from anal fin insertion (unlike *Chromaphyosemion* and *Diapteron*), (6) a "net" on females sides, made of a regular grey reticulation around the scale edges (versus none or very faint and irregular in other groups). According to the author, these characters also define the nominal subgenus *Aphyosemion*, even if the related subgenus, *Mesoaphyosemion*, is in strong need of re-definition. This diagnosis is not shared by any

other group of African killifishes but one, *Adamas formosus*, also living in the Congo cuvette and showing a remarkable colour pattern convergence; however, *Adamas* is easily separated from the *elegans* superspecies by the white "diamond blotch on head", by the smaller size, by the larger eye with a dark transversal bar, by the strong melanism, without "net" (a very primitive taxon, according to Huber, 1998), by the "lampeye like behaviour and by the semi-annual breeding cycle.

These 18 names are listed hereafter according to the year of description and with their description's names:

Haplocheilus elegans Boulenger, 1899
Haplocheilus decorsei Pellegrin, 1904
Haplocheilus ferranti Boulenger, 1910
Haplocheilus lugae Boulenger, 1911
Haplocheilus christyi Boulenger, 1915
Haplocheilus schoutedeni Boulenger, 1920
Aphyosemion castaneum Myers, 1924
Panchax congicus Ahl, 1924
Aphyosemion margaretae Fowler, 1936
Aphyosemion cognatum Meinken, 1951
Aphyosemion melanopteron Goldstein & Ricco, 1970
Aphyosemion lamberti Radda & Huber, 1977
Aphyosemion rectogoense Radda & Huber, 1977
Aphyosemion chauchei Huber & Scheel, 1981
Aphyosemion schioetzi Huber & Scheel, 1981
Aphyosemion lefiniense Woeltjes, 1984
Aphyosemion polli Radda & Pürzl, 1987
Aphyosemion plagitaenium Huber, 2004 (separately described).

The first comments on this list are critical:

- all taxa described before the second world war correspond to fish that are unknown live from their type locality.
- all those old taxa, but *margaretae*, have been described from the cuvette where complexity is very high.
- one taxon, *congicum*, has its type locality labeled as "Kongo"!

Up to today, the systematics of the *elegans* superspecies have been "stable" for those old taxa but the identifications have been proposed by default and based on aquarium material collected not too far from, but definitely not at, type localities. However, it may be worth to mention aquarists readers or to remind them of some key basics of zoological nomenclature: a species is formally described by (1) the designation of type material (i.e. a single specimen, the holotype, preserved in alcohol or formaline in a museum institution, even if in older times several "identical" specimens from the same collection were accepted and then named syntypes), (2) the information of the locality where the type(s) was (were) collected (i.e. the "type locality" or "terra typica", even if in older times several type localities, those of the syntypes, were accepted), (3) since 1930, compulsory (not before!), a diagnosis of the new name, i.e. a definition that presents the unique characters of the new species and its comparative differences versus similar - or hypothetically related - species. These three important rules are critical in the following discussion regarding the validity or synonym of the various names that have been described from 1899 until today for the *elegans* superspecies.

Because systematics are based on historical priority (a name described earlier has priority over a younger name if they correspond to the same species), on type material and on type locality, it is necessary to make a review of our present knowledge, according to the history of descriptions before 1930:

• in 1899, the description of the first member of the *elegans* superspecies, namely *A. elegans*, from Bikoro and also Coquilhatville (today Mbandaka), western central Zaïre, based on preserved material only, does not refer to a vertical pattern in male; this pattern may have been normally wiped out during the preservation process, but it may alternatively have been absent in both series of types (syntypes) when alive; today,

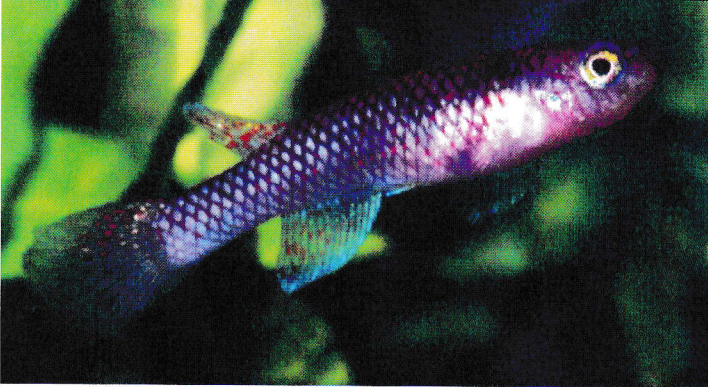
the identification of *elegans* is based on fasciated fishes collected from the region around the type localities, but not precisely there; it is hoped that, in at least one of the two type localities, fish with this barred pattern can be collected in the future and thus the identification can be confirmed (and redescription be done); if not, the resulting situation will be extremely confusing because, "par ricochet", the validity of all subsequently described species from the cuvette (namely *christyi*, *castaneum*, *schoutedeni* and even *decorsei*) will be destabilized. Before this re-collection, it is our opinion that it is useless - eventually senseless - to designate a lectotype for this taxon, because it will immediately restrict the two type localities to a single one.

• in 1915 and 1920, the descriptions of 2 taxa by the same author (Boulenger), namely *christyi* and *schoutedeni* and in 1924 and 1936, the descriptions of 2 additional taxa from the same region, namely *castaneum* and *margaretae* poured a lot of confusion in the situation: up to 1985 and the upper Zaïre collections, an easy solution was to consider all of them (with some variation, depending on authors) as junior synonyms of *christyi*, the oldest name; however, the 1985 expedition has reshuffled the cards by showing that in the area of Bafwasendé, the type locality of *christyi*, 2 geographically-scattered phenotypes are present, one similar to *margaretae* (many small dots longitudinally on sides and thin short red flames in posterior caudal fin, forming an outer broken vertical bar), the other with a (broken) red median line on male anal fin, similar to the fish from Kisangani, the type locality of *castaneum*; the situation is even more complicated by the fact that the description of *schoutedeni* does not present any diagnostic pattern characters (except the vague statement that punctuations of *schoutedeni* are small, while the contrary would be expected in comparison to *christyi* from type locality!).

• in 1910 and 1911, the descriptions of 2 taxa by the same author (Boulenger) and



Aphyosemion plagitaenium males displaying Photo Heinz Ott



Aphyosemion plagitaenium male above female below Photos M. Chauche

from the same area near Kondué in southeastern Zaïre, namely *ferranti* and *lujae*, did not point to immediate confusion but “spotty” phenotypes collected very far from their type localities started to question the definition of species in that group (cf. PK18.1 West Bafwasené and Oyo, each locality being situated more than 1000km away from Kondué!), with respectively a colour pattern similar to the descriptions of *ferranti* and to *lujae*.

in 1924, the description of *congruicum* brought available a taxon with a unique pattern of broad black margin at dorsal fin but without a precise type locality (“Kongo”!); today, following Seegers (1988), this is considered as valid and a senior synonym of *melanopteron* described by two American researchers with the same pattern characteristics and a precise type locality but with our knowledge of the “spotty” phenotypes, this move may appear risky (and unfair to our American counterparts), since similar phenotypes might be collected elsewhere in the cuvette.

Hence, Zee will have the following very difficult threefold choice to decide and select upon for the northeastern Zaïre taxa (3 options at least);

- conservative (designate, if possible, a lectotype with a red median, continuous or broken, line on anal fin and assign the alike western Bafwasené, including Kisangani, material to *christyi*, then revalidate *margaretae* for the eastern populations and leave untouched the synonymy status of *castaneum* and *shoutedeni*),

- pro-active (assign the Bafwasené material to a *margaretae*-like fish, named *christyi*, *margaretae* being its junior synonym, consider *shoutedeni* topotypic material as identical to the Kisangani fish - like poll did - and then revalidate *shoutedeni* with a different definition than today, with *castaneum* as its junior synonym),

- disruptive (same as pro-active but alternatively consider *shoutedeni* as more likely related and a junior synonym of *decorsei*, then revalidate *castaneum* for the Kisangani fish and restrict the name *christyi* to populations from Bafwasené and eastwards, with *margaretae* as its junior synonym).

Before his decisions, it is better not to change the current systematics and in this paper, patterns similar to the fish from Kisangani (today named *christyi*) will be referred as sp. Kisangani-like (*castaneum* in a strict sense).

Then these 18 names, according to the most recent evidence (recent collecting localities, DNA fingerprints), can provisionally be assigned to one of the following 3 categories in terms of objective validity: first, well diagnosed and defined valid names, second, well diagnosed but insufficiently defined probably valid names, third, insufficiently diagnosed and defined possibly valid names or junior synonyms.

1-Well diagnosed and defined valid names.

All these names - alphabetically listed - stable patterns from the plateau or from the western cuvette belts. None is from the cuvette itself.



A.chaucheii RPC130/78

Aphyosemion chaucheii

Diagnosis: deep orange (not yellow and thin) marginal broad zone in anal fin and red, vertically oblong, numerous (small) spots on blue

sides and inner fins of male (blue counterpart phase of *schioetzi*).

Range: small, in northwestern forested plateau of Congo.

Systematic remarks: this taxon is well defined and known by half a dozen populations in the forested plateau of Congo. It is replaced by *schioetzi* southerly and by *elegans* (in Lambert's case) northerly and easterly. Hence it can be hypothesized that the rest of its distribution lies westerly in Congo and maybe Gabon, up to that of *lamberti*.



Aphyosemion cognatum Photo Ed. Pürzl

Diagnosis: narrow white (or pale blue) margin and red submargin on dorsal and caudal fin of male, red margin in anal; very numerous red dots (irregularly or in longitudinal series, not vertically arranged) on male sides.

Range: small (with certainty), downstream the Kinshasa-Brazza area, in Congo and Zaïre. Other populations from outside the original distribution e.g. from Lac Fwa, have been assigned to *congicum* but DNA samples (Murphy & Collier, 1999) place them somewhat separate in the same phylogenetic line. It is replaced northwesterly of its type area by *schioetzi*.

Systematic remarks: this taxon was initially well defined, however, new populations identified as such have extended the range but a bit confused the diagnosis and notably its separation with *elegans* (in Lambert's sense). Wildekamp (1993) raises doubts on the separation of the 2 taxa, based on (pers comm.,

Nov. 2003) a population that was introduced in Holland by a KFN (Dutch Killifish Association) member that had set up a brewery in Bandundu.

That population showed both the Boendé type of colour pattern (wide dark red band at the dorsal fin: *elegans* in Lambert's sense) and the *cognatum* type as well (a light tip at dorsal fin but no dark red broad submargin). They were bred for several generations and both types were maintained during that period but apparently no crossing experiments were undertaken. This is confirmed by a recent aquarium import (Tirbak, per. comm. 2004) said to originate from Maindombe which shows, on photos, a "*cognatum* like" pattern in the dorsal fin of male and a fasciated pattern on sides, within the *elegans* distribution (in Lambert's sense): this ambiguity can only be levied by using the male pattern on sides and not the male pattern on dorsal fin, as the primary criterion to separate *cognatum* and *elegans* (in Lambert's sense); anyhow, clearly, populations of *cognatum* from the typical region are well differentiated and genetically defined.



Aphyosemion lamberti Photo Ed. Pürzl

Diagnosis: red flames on all unpaired fins of male and scattered speckles on sides over a blue background (the blue countertype phase *rectogoense*).

Range: large, in southeastern forested Gabon. It is well known by at least 20 collecting spots and replaced southeasterly, in savannah, by *rectogoense* and easterly, in the forest, probably by *chauchei*.

Aphyosemion plagitaenium

Diagnosis: red chevrons or oblique lines on posterior sides and red blotches near the basis of the anal fin of male over yellow/blue background.

Range: known only from type area, near Epoma, in forested northwestern highlands of Congo. It is replaced southeasterly by *elegans* and northerly by the un-named phenotype of West-Mokéko and surroundings.



A. schioetzi Ngombi Z91/1 Photo Mick Packwood

range of *schioetzi*, starts the distribution of the components of the *ogoense* superspecies, e.g. *A. pyrophore* and *ottogartneri*).

2. Well defined but insufficiently defined probable valid names.

These names correspond to well-individualised colour patterns in male but there are important data that are missing before considering them as fully valid.

Aphyosemion rectogoense Photo Alan Brown

Diagnosis: red flames near base of unpaired fins in male, followed by a broad yellow submargin and red margin, plus scattered speckles regularly on sides over a yellow background (the yellow counter type phase of *lamberti*); an irregular red zig zag line, along the body base (by convergence with *ogoense*, a frontier species).

Range: known only from few spots, in south-eastern savannahs of Gabon and replaced easterly by *schioetzi* and northerly by *lamberti* in the forest.

Aphyosemion schioetzi

Diagnosis: yellow marginal thin zone in anal fin (with or without dark edge) and red, vertically oblong, numerous spots on yellow sides and inner fins of male (the yellow counterpart phase of *chauchei*).

Range: large, in savannahs of western belts of the Congo cuvette in western and southwestern Congo; replaced easterly by *cognatum* and northerly by *chauchei* in the forest (west of the



Aphyosemion congicum Photo Ed. Pürzl
Diagnosis: broad dark margin at male dorsal fin, and at upper caudal fin, together with variably numerous red spots on yellow-brown sides, since the re-description by Seegers(1988). However, its validity is unstable due to its very vague type locality "Kongo" (see further, the discussion on *melanopteron*).

Range: small, in southwestern belts of the Congo cuvette, east of Kinshasa, southwestern Zaïre.



Aphyosemion elegans "Boende 2002
(Heinz Ott, DKG)

Aphyosemion elegans

Diagnosis: red bars on posterior sides of male, plus a broad dark red line on mid part of dorsal fin. This needs confirmation on topotypes collected from Bikoro or Mbandaka, northwestern Zaïre, because it is unknown live since its description. However, this assumption (by Lambert in the early sixties) today looks reasonable because fasciated populations are available from west (Huber, 1978 and VanDeun, 2002) and east of the type locality. Still, the drawing of the type and the description by Boulenger do not highlight any vertical bars: it is not known whether it is due to the fact that the description was based on not fresh preserved material with a vanished pattern or if the true *elegans* is a distinct "spotty" phenotype of the cuvette, without bars.

The latter case is not impossible: *lefiniense* is another example of a "spotty" phenotype (i.e. known from a single location surrounded by different populations, precisely westerly-surrounded by the widespread *schioetzi*) and the population of Inongo is also somewhat aberrant (without bars), not far from the "normally" barred population of Lui Kotalé. See also (further) the case of the population from near Impfondo, northeastern Congo and also (above) the case of Tirbak's blue phase population from near Maindombe with red bars on sides but no broad mid band on male dorsal fin, both identifiable as *A. aff. elegans*.

Range: large, in forested northwestern belts of Congo cuvette, northwestern Congo and in the cuvette itself in adjacent Zaïre.



Aphyosemion lefiniense Photo M. Chauche

Diagnosis: well separated from other components of the *elegans* superspecies by the yellow margin (not red) and broad red submargin on all fins of male (i.e. a reversed, symmetrical pattern). However, this species is only known from one spot, its type locality and it needs to be re-diagnosed and genetically studied with new additional material.

Range: known only from type area, near La Léfini, in eastern Congo, at the boarder of, but within, the cuvette.



Aphyosemion lujae Photo L. Seegers

Diagnosis: a ladder-like red pattern on male anal fin, made of a broad red inner line and red flames towards base; a red flamed caudal fin in male (hypothesized from well preserved types: unknown live; see further the re-description and the lectotype designation).

Range: known only from type area, near Kondué ("sankan River"), Kasai river, in the southern belts of the cuvette in southeastern Zaïre (but some "spotty" populations of the cuvette, geographically very far from Kondué, show the same pattern).

To be Continued.....