

On the identity of *Aphyosemion christyi* (Boulenger, 1915), *A. schoutedeni* (Boulenger, 1920), and *A. castaneum* Myers, 1924 (Pisces, Cyprinodontiformes, Aplocheilidae)

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Abstract

The definition, status and validity of three old taxa of the nominotypical subgenus *Aphyosemion* Myers, namely *A. christyi* (Boulenger, 1915), *A. schoutedeni* (Boulenger, 1920), and *A. castaneum* Myers, 1924, are reviewed. A lectotype for *christyi* is designated from syntypes showing a high variability. The study of the numerous syntypes of *christyi* reveals that the taxon is identical to *A. margaretae* Fowler, 1936 and its senior synonym. The populations from Kisangani and its surroundings, previously erroneously named *Aphyosemion christyi* are shown to be different from *schoutedeni*. Hence, the taxon *castaneum*, described from that region and type species of the genus, is revalidated. Based on the syntypes in good condition that show no pigment at all and on topotypes with pigments, the status of *schoutedeni* is discussed and is seen as an uncertain species (*nomen dubium*), either as a distinct species or, but less likely, as a junior synonym of *A. decorsei* (Pellegrin, 1904).

Résumé

La définition, le statut et la validité de 3 taxa anciens appartenant au sous-genre nomino-typique *Aphyosemion* Myers, précisément *A. christyi* (Boulenger, 1915), *A. schoutedeni* (Boulenger, 1920),

et *A. castaneum* Myers, 1924, sont revus. Un lectotype pour *christyi* est désigné d'après des syntypes présentant une forte variabilité. L'étude des nombreux syntypes of *christyi* révèle que ce taxon est identique à *A. margaretae* Fowler, 1936 et son synonyme senior. Les populations de Kisangani et des alentours, auparavant nommées par erreur *Aphyosemion christyi*, sont démontrées comme différentes de *schoutedeni*. Par suite, le taxon *castaneum*, décrit de cette région, et qui est l'espèce-type du genre, est revalidé. D'après les syntypes en bon état qui ne présentent absolument aucun pigment et des topotypes avec des pigments, le statut de *schoutedeni* est discuté et considéré comme une espèce incertaine (*nomen dubium*), soit une espèce distincte, soit, mais de façon moins probable, comme un synonyme junior de *A. decorsei* (Pellegrin, 1904).

Introduction

After the upgrade of *Fundulopanchax* from subgenus in *Aphyosemion* to genus level (Parenti, 1981; Van der Zee &

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Wildekamp, 1995; Murphy & Collier 1999), the genus *Aphyosemion* (Aplocheilidae, Nothobranchiinae) consists of 66 species (Huber, 2001-2002). With exception of two species that live west of the Cross River the distribution of the genus *Aphyosemion* is restricted to the Lower Guinea and Congo ichthyo-provinces. Eighteen species names were created for taxa that belong to the subgenus *Aphyosemion* within the genus *Aphyosemion* (Huber, 2004). This subgenus is almost completely restricted to the Congo ichthyo-province. Only two species are distributed in the Haut-Ogôoué (Lower Guinea) sub-province. Based on the distribution of *Tilapia* species, Thys van den Audenaerde (1966) identified this sub-province and he was able to demonstrate that this sub-province contains numerous Congo species.

Since the descriptions of the oldest taxa belonging to the subgenus *Aphyosemion* were based on non-discriminating morphological characters, doubtful type localities and/or type material often in poor condition, most species have been subject of discussion (Huber & Scheel 1981, Huber 2005a,b). Distinguishing species of the subgenus based on morphological characters is practically impossible, due to the intra-specific variability of these characters.

The colour pattern of male *Aphyosemion* probably plays an important role in sexual selection (Brosset, 1982: female being responsible of male selection of its own species). Chromosomal re-arrangements are very common in *Aphyosemion* species (Scheel, 1974). This probably represents (in combination with sexual selection) a

powerful mode of speciation. Within the distribution range of the subgenus *Aphyosemion*, several distinct colour patterns can be recognized. Sometimes these patterns are quite constant over larger distances, but in other occasions they are highly variable, especially in the central part of the Congo basin, where a patchwork of phenotypes can be recognized (Huber 1998, Huber 2005a,b). On the other hand similar phenotypes are found in different small geographic areas, but isolated from each other by immense distances ("spotty phenotypes" in Huber, 2005a,b). It is not yet known whether these phenotypes are conspecific or the result of convergent evolution.

* Table 1: Huber (2005a,b) classified these 18 species names in three categories:

- 1 = well diagnosed & valid name
- 2 = well diagnosed, insufficiently defined, probably valid names
- 3 = insufficiently diagnosed and defined, valid names or synonyms

Of the latter category, four names are originating from the northeastern most part of the distribution area of the subgenus: *Aphyosemion christyi* (Boulenger, 1915) *A. schoutedeni* (Boulenger, 1920), *A. castaneum* Myers, 1924 and *A. margaretae* Fowler, 1936.

In this paper, an attempt is made to clarify the identity of these taxa based on specimens present in the collection of the Musée Royal de l'Afrique Central (MRAC Tervuren, Belgium) and of the Natural History Museum (NHM, previously BMNH, London). MRAC harbors the largest collection in the world of fish species from the Congo ichthyo-province.

Table 1.

The following 18 species names were created for representatives of the subgenus *Aphyosemion* (*Aphyosemion*):

Taxon		Huber 2005a,b
<i>Haplochilus elegans</i>	Boulenger, 1899	2
<i>Haplochilus decorsei</i>	Pellegrin, 1904	3
<i>Haplochilus ferranti</i>	Boulenger, 1910	2
<i>Haplochilus lujae</i>	Boulenger, 1911	2
<i>Haplochilus christyi</i>	Boulenger, 1915	3
<i>Haplochilus schoutedeni</i>	Boulenger, 1920	3
<i>Aphyosemion castaneum</i>	Myers, 1928	3
<i>Panchax congicus</i>	Ahl, 1924	2
<i>Aphyosemion margaretae</i>	Fowler, 1936	3
<i>Aphyosemion cognatum</i>	Meinken, 1951	1
<i>Aphyosemion melanopteron</i>	Goldstein & Ricco, 1977	3
<i>Aphyosemion lamberti</i>	Radda & Huber, 1977	1
<i>Aphyosemion rectogoense</i>	Radda & Huber, 1971	1
<i>Aphyosemion chauchei</i>	Scheel & Huber, 1981	1
<i>Aphyosemion schioetzi</i>	Scheel & Huber, 1981	1
<i>Aphyosemion lefiniense</i>	Woeltjes, 1984	2
<i>Aphyosemion polli</i>	Radda & Pürzl, 1987	3
<i>Aphyosemion plagitaenium</i>	Huber, 2004	1

Verification of the identity of *Aphyosemion christyi* (Boulenger, 1915) and *A. margaretae* Fowler, 1936

In 1915 Boulenger described *Haplochilus christyi* based on 69 syntypes originating from Bafwasendé (1.117N; 27.217E), Lindi River, Ituri forest, N.E. Congo DRC (former Zaire).

Characteristics in the original description: D 10-11, A 14-15, and longitudinal scales 32-34. Males with more or less numerous ("plus ou moins nombreuses") carmine rounded spots, fins with rounded carmine spots and caudal fin with carmine edges.

Although the type material (syntypes registered as BMNH 1919.9.10.286-295, 10

spms, of which one has been donated to ZMB in June 1927, and MRAC 7244-7302, 59 spms) is more than 90 years old, it is still in remarkably correct condition.

The carmine spots on fins and flanks are very well preserved.

However, the colour pattern of anal fin - that is critical to our verification- is somewhat variable in male:

- 2 types of colour pattern may be seen in MRAC male syntypes (fig. 1): with longer and more numerous, but irregular flames, or with short and less numerous flames, possibly featuring a mid line.

- 1 type of colour pattern may be seen in BMNH male syntypes, with fully complete flames in all unpaired fins.

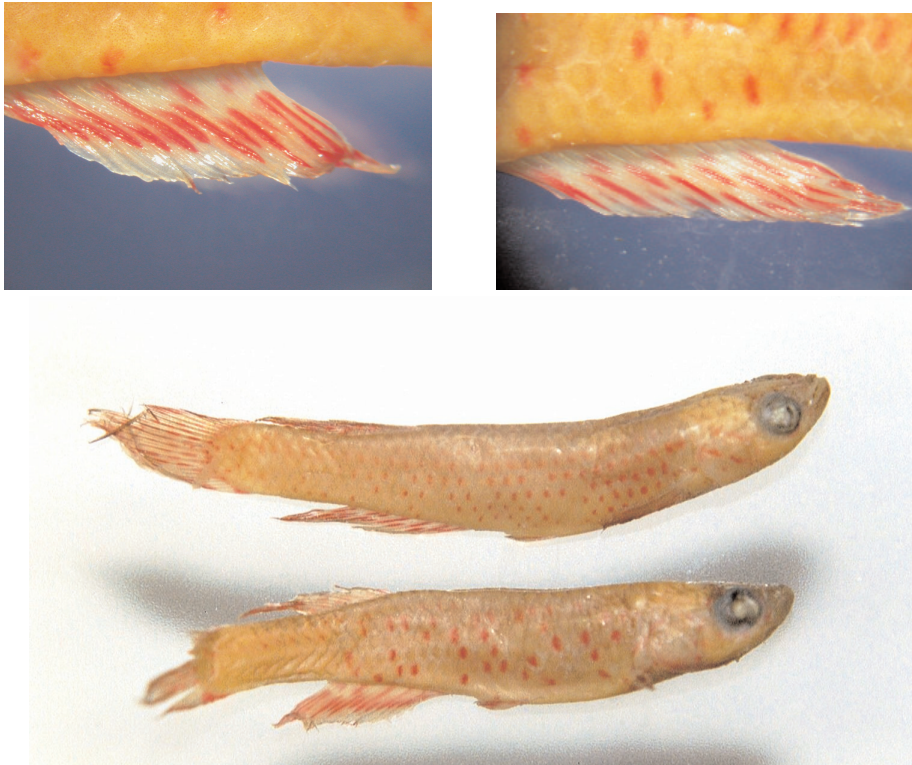


Fig.1. *A. christyi* type material in MRAC showing two different phenotypes on male anal fin and on sides. Top: app.80 small carmine spots. Bottom: app.40 larger spots.

It is not known if that variability stems from 2 or 3 different collections from nearby locations (north and south of the Lindi River), or from collections from different periods and one single location, or even polychromatism within a single location.

A re-examination of meristic data confirmed Boulenger's data for dorsal and anal fins (D 10-11, A 14-15). The scales in the longitudinal line however ranged from 29-31 (Boulenger: 32-34). The scales on the hypural plate are not counted to-day. Probably Boulenger included those scales in his counts. The dorsal fin

is inserted opposite anal fin ray 8 - 9.

Remarkable is the wide range of the number of carmine spots on the flanks. It varies from 39 to 138, with the majority of individuals between 50 and 80 spots. Specimens with very low numbers of spots always show larger spots and more intensively pigmented anal fins. In specimens with high numbers of spots, the small spots are arranged in more or less regular lines.

Until today very few fish collections had been made around Bafwasendé. Indeed, *Aphyosemion* species were collected only twice.



Fig 2a. *A. christyi* HZ 85/14 1.6 km west of Epulu River J. van der Zee



Fig 2b. *A. christyi* HZ 85/19 2 km west of Bafwasendé R. Wildekamp

First, the type specimens of *Haplochilus christyi* were collected in 1912 or 1913 by Dr. C. Christy. Second, in 1985 Stenglein, Grell and Pap collected *Aphyosemion* species at six locations around Bafwasendé during a very well documented cyprinodont collection trip (Stenglein, 2004). They were able to make collections 2 km west, 5 km east and 22 km east of Bafwasendé, north of the Lindi river (respectively coded HZ 85-19, HZ 85-18, HZ 85-17). South of the Lindi river they collected at 18, 21 and 68 km southwest of Bafwasendé along the road to Kisangani (respectively HZ 85-20, HZ 85-21, HZ 85-22). All specimens of locations north of the Lindi river were characterized by densely spotted unpaired fins, numerous small spots (75 - 138) on the sides more or less arranged in rows, no (sub) marginal light band in anal fin, vague sub-marginal light band in the caudal fin, no red band on yellow lower lip, and very thin red "*Aphyosemion*" markings behind the eye. In the offspring sometimes the red spots of the anal fin were concentrated in larger inter-radial lines (routinely called "flames").

The same "flamed" phenotype was discovered by Stenglein, Grell and Pap

(same Haut Zaire Expedition 1985) 170 km to the northeast of Bafwasendé in the Epulu river basin, closer to the type locality of *Aphyosemion margaretae* Fowler 1936 (respectively HZ 85-14, HZ 85-15, HZ 85-16), respectively at 1.6, 12 and 19.4 km west of the Epulu river.

Fowler (1936) based his description of *A. margaretae* on two specimens that were collected by the George Vanderbilt African Expedition of 1934. Types originated from "Saidi's Village" 10 miles west of the Epulu River ferry at an elevation of 853 m (1.433N and 28.450E).

Besides the George Vanderbilt Expedition of 1934 and the Haute Zaire Expedition of 1985, three other collections of *Aphyosemion* species in the Epulu River basin are available in the MRAC collections. P. Depasse collected 5 specimens in 1952 in the Epulu River at Camp Putnam (MRAC 87588-592). As well T. Roberts (July 1986, MRAC 91-079-P-0456-460) and L. de Vos (February 1990, MRAC 90-30-P-1472-481) collected an *Aphyosemion* species very close to the Epulu River ferry. The latter two locations are very close to the type locality of *A. margaretae*. Although the red pigmentation has

vanished in these collections, the colour pattern (similar to the HZ 85-14 population) is still visible. All specimens collected in this area are rather uniform in terms of male colour pattern.

Characteristics given in the original description of *margaretae*: D 9-10, A 13-14, Scl. 25-26 (+3), 4 or 5 more or less longitudinal rows of deep brilliant crimson small spots. Unpaired fins with large numerous variable brilliant crimson blotches or spots.

Fowler drew one male, showing short flames on unpaired fins, a rounded caudal fin shape, and a red vertical border on that fin, joining with the margins. However, his drawings were approximate and the caudal shape and pattern should be seen as an idealization of the fish: erroneous for the shape, hypothesized for the border pattern, from the discontinuous series of flames endings.

Various populations of *A. margaretae* from close to the type locality have been studied (including the types: Huber, 1978). All specimens show the same colour pattern that was presented in the text of the original description. Higher numbers were found for the number of fin rays in the dorsal (10-11) and the anal fins (14-15), D/A= +8-9. Besides, a higher number of lateral scales (28-30) was found. *A. margaretae* always has numerous small red spots on the sides, more or less arranged in rows.

There are no differences in colour pattern between populations around Bafwasendé (north of the Lindi River) and the Epulu River basin (collections of Stenglein et al.

; description of *margaretae*): for example, HZ 85-14 (Epulu) and HZ 85-19 (Bafwasendé) are almost indistinguishable. And there are no significant differences in major meristics between populations and between types of *christyi* and *margaretae* (dorsal rays, anal rays, D/A deviation, i.e. number of rays of anal fin from level of dorsal insertion).

Notably if BMNH types are considered: this is the reason why we hereby designate a lectotype of *christyi* with the flamed pattern: BMNHN 1919.9.10.286, an adult male, 36.1 mm S.L., 46.1 mm T.L. (in glass tube), while BMNH 1919.9.10.287-295 (9 specimens) become paralectotypes (like the MRAC specimens and the single ZMB specimen, if it still exists).

Therefore *A. margaretae* Fowler 1936 is regarded as a junior synonym of *A. christyi* (Boulenger, 1915).

Variability:

North of the Lindi river no specimens were found (nor in their offspring) with larger red spots in relatively low numbers as presented in the picture of the type species of *christyi* (fig. 1, bottom). However all populations collected southwest of the Lindi River show low numbers of larger spots (35 -50 spots in HZ 85-20 and 20 spots in HZ 85-22). Not a single specimen with higher numbers of small spots was found south of the Lindi River. The MRAC type material of *A. christyi* however contains both phenotypes, although the typical red band on the caudal peduncle of the HZ 85-20 is not present. For the time being material of Bafwasendé, southwestern populations, is

temporarily regarded as *A. aff. christyi*. In terms of altitude these variant populations correspond to the gradation from the cuvette to the plateau (above 500 m), a key issue in the subgenus phylogeny (Huber, 1998, 2005a,b).

Diagnosis:

A. christyi can be distinguished from other representatives of the subgenus by the poorly developed opercular markings behind the eye, the yellow lips without (or poorly developed) red bands below the mouth, a poorly developed light submarginal band in the lower caudal fin, no (or hardly developed) extensions of the unpaired fins.

Distribution:

Although *A. christyi* is probably restricted to the upper reaches of the Ituri river and its tributaries and westerly, up to the Lindi River and tributaries in the Ituri forest, at elevations over 500 meters, it cannot be excluded that it has a much larger distribution area in the eastern part of the Congo basin.

Systematic consequence of the redefinition:

The redefinition of *A. christyi* as a senior synonym of *margaretae* leaves un-named the aquarium populations of *Aphyosemion* from Kisangani, previously identified as *christyi*. The identification of these populations is dealt with in the next paragraph.

Verification of the identity of *Aphyosemion schoutedeni* (Boulenger, 1920) and *A. castaneum* Myers, 1924

Five years after his description of *Haplochilus christyi* Boulenger (1920)



Fig. 4. One of the MRAC types of *A. schoutedeni*. J. van der Zee

described *Haplochilus schoutedeni* of Madié (or Medje) approximately 150km north of Bafwasendé, close to the northern limit of the rain forest. In that paper, he reproduced the description of *christyi* along with that of *schoutedeni*: therefore, he had the two fish in mind (and also the registration numbers in BMNH are sequential). Boulenger stated that *schoutedeni* is closely related to *christyi*, but it can be distinguished from the latter species by a lower number of dorsal fin rays (D 9 versus D 10-11) and less scales in the longitudinal line (28-30 versus 32-34). The description of the colour pattern is very limited: dorsally brown and ventrally whitish, scales with or without small ("petits") red spots. The colour pattern of the fins is not described at all.

Poll (1951) reviewed the types of *A. schoutedeni* located in MRAC and he concluded that Boulenger made mistakes with respect to meristics and the description of the form of the caudal fin. According to Boulenger the dorsal fin has 9-10 fin rays (Poll: 8-11) and the caudal fin is rounded (Poll: bi-filamented, i.e. lyre-shaped as called today). Poll found the same number of longitudinal scales as Boulenger (28-30).

Type material of *A. schoutedeni* is present

(like for *A. christyi*) in the collection of MRAC (7173-204, 32 spms) and of BMNH (1919.9.10.296-302, 7 spms). Although both series are still in good condition, there is a major difference in the conservation of body pigmentation with *christyi*. In *A. christyi* the red pigmentation is very well preserved, whereas in *A. schoutedeni* the whole pigmentation is lost on fins and on sides. While males of *schoutedeni* can still be disclosed, based on their extended unpaired fins. Therefore no clear definition of *A. schoutedeni* can be made based on the types and on text of description, and it is unknown if Boulenger had specimens with pigments, or not, for his description. Notably, it is unknown why Boulenger used the descriptive adjective "petits" (small) spots on sides for *schoutedeni* while, as seen above precisely, those of *christyi* are small, while his mention "with or without" such spots suggests the spots are not numerous, unlike *christyi*.

Beside the type material of *A. schoutedeni*, two other lots of *Aphyosemion* from the type locality, Medje, are present in the MRAC collections:

- 1 specimen collected by Schouteden and identified as *A. christyi* by David in 1936 and as *A. schoutedeni* by Poll in 1951. (MRAC 21641)

- 2 specimens collected by Lang and Chapin at the American Museum Congo Expedition (1909-1915) labeled as *Aplocheilus elegans* and identified as *A. schoutedeni* by Poll in 1951 (MRAC 15664-15665).

In the latter lot, the colour pattern is quite well preserved, as can be seen in fig. 5.

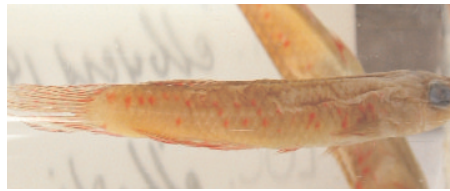


Fig. 5. MRAC male topotype of *A. schoutedeni*. J. van der Zee

A relatively low number of rather large red spots is present on the sides, X-like shaped and arranged in a row in the posterior body. Both red bands below mouth are present. Dorsal and anal fins show red spots. In the caudal fin a narrow sub-marginal light band in the upper part and a broad light sub-marginal band, bordered with red, can be seen in the lower part. Males of *A. schoutedeni* show extensions in the unpaired fins in the type material (notably in NHM), as well as in the other collections from Medje. These extensions, together with the colour pattern on the sides, the well marked bands below mouth, the broad light sub-marginal band in the caudal fin and the extensions of caudal fin rays in males clearly separates these specimens from *A. christyi* in the new sense.

The present definition and status of *schoutedeni* are subject to discussions. According to Huber & Scheel (1981), it is a junior synonym of *Aphyosemion decorsei* (Pellegrin, 1904), based on few pigments on sides and fins in the description. According to Huber (2001-2002) the aquarium population originating from Gilima (2,417N ; 27,302 E) comes close to *A. schoutedeni* (in the sense of Huber & Scheel 1981) with respect to colour pattern (it is very similar to what is

hypothesized as live topotypes of *decorsei*) and to geographical distribution (Gilima is hypothesized as located east-northeast of Madié, the type locality of *schoutedeni*, and Bessou, the type locality of *decorsei*, is situated west-northwest of Madié).

However, the population of Gilima comes from a commercial import and its geographical origin cannot be considered as guaranteed (another Gilima village is recorded near to Kinshasa, the capital city of DRC Congo, where *polli* is originating, with a similar colour pattern and where most fish traders are located).

The known *schoutedeni* topotypic series, except the syntypes, show a pattern of red spots all over the anal fin and a clear broad submarginal light band in the caudal fin.

Therefore, pending further live collections at type locality, it is best to consider *schoutedeni* as an uncertain species (*nomen dubium*) with 2 distinct options:

- either live topotypes show a pattern similar to the MRAC collections by Lang and Chapin, then *schoutedeni* will be seen as a valid distinct species,

- or (but less likely) an additional sympatric species with few spots on the sides and none on the anal fin in the male, is also living around Madié and *schoutedeni* might be identical with *decorsei*.

In 1924 the genus *Aphyosemion* was created and a new species, *A. castaneum*, was described as the type-species (Myers, 1924). The type material was collected in April 1915 at Stanleyville (present Kisangani) by the American Museum

Congo Expedition. Beside the type material, Myers mentions another population of the new species: 2 specimens from Medje collected by Lang and Chapin. Hence Myers was probably unaware of Boulenger's description of *A. schoutedeni* in 1920 from the same locality.

Since the description of *A. castaneum*, many collections of this phenotype have been collected around Kisangani. In all collections a median band of red pigmentation is present in males. This line is not present in the specimens with pigments originating from Medje. Another difference is the shape of the red spots on the caudal peduncle which are rounded in *A. castaneum* and X-shaped in the Medje material. Therefore the authors do not agree with Poll (1951) that *A. castaneum* is a junior synonym of *A. schoutedeni* and this position is in accordance with the "disruptive option" left opened by Huber (2005a,b).

A. castaneum is regarded as a valid species and is revalidated herein to identify populations from Kisangani and surroundings that were previously erroneously named *christyi*.

Diagnosis:

A. castaneum can be distinguished from other representatives of the subgenus by the median red band in the anal fin and by the very dark red colour of the margins of dorsal and caudal fin (black in preserved specimens). The body is blue with few - up to 50- rounded red spots (never X-like shaped). The opercular markings behind the eye are well developed, red bands are present below mouth and a light sub-marginal band in the lower part of caudal fin is clearly visible. Two colour phases -yel-

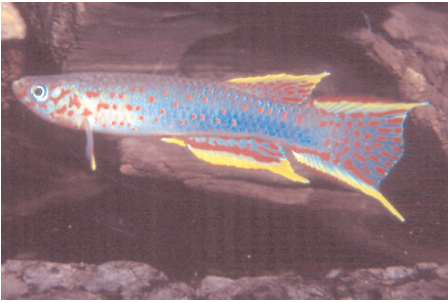


Fig. 6a, *A. castaneum* 10 km west of Kisangani (HZ 85/1), yellow phase. R. Wildekamp

low and blue- allopatrically occur in male according to populations (see fig 6a above and 6b the cover, the unpaired fins submargins). The colour is showing the same pattern in the anal and in the caudal fin. Well developed extensions of the unpaired fins, like *schoutedeni* types, but unlike the vicariant *christyi*.

Distribution:

A. castaneum is distributed in the north-eastern part of the Congo drainage. Some isolated populations are found in the central Congo cuvette in tributaries of the rivers Tshuapa, Lomela (e.g. the Schliewen's collections in Huber, 2005a,b) and of Salonga River. Numerous populations are present between the rivers Aruwimi and Lomani (north and south-west of Kisangani). The border between the ranges of *christyi* in the new sense and *castaneum* is unknown. *A. castaneum* is found up to 90 km east of Kisangani in tributaries of the Tshopo River.

No *Aphyosemion* species are known east of Tshopo River up to the most western populations of *A. christyi* (as aff.), a distance of approximately 90 km, although several collectors visited this area. The Tshopo river is at the edge of the 500 meter altitude line, separating the cuvette

from the surrounding plateau and is probably separating *A. castaneum* from *A. christyi*.

Between the Aruwimi river and the Uele river *A. castaneum* is replaced by a different species (not indicated on the map). This species might be conspecific with *A. schoutedeni* or represent a yet undescribed species.

Acknowledgements

During a first period, both authors worked independently:

- on material from western Congo (*A. plagitaenium*) and central Zaire (Uli Schliewen's material in ZSM) for Jean Huber (2004, 2005a,b)
- on material from southern Zaire (new species, in prep.) and overall Congo basin (review of MRAC collections, in prep.) for Jouke van der Zee.

As mentioned above, *christyi* types in MRAC were variable and the status of that key taxon was difficult to ascertain.

A recent visit to London NHM (February 2005) by Jean Huber for a distinct project (*Fundulopanchax fallax*, submitted) allowed to establish that *christyi* types, there, were better typified, without variability and clearly identical to *margarettae*. Hence, the two authors changed their plans and decided to publish this short systematic note together.

The following museum officials are then warmly thanked for their cooperation with regard to this difficult study: Oliver Crimmen and James Maclaine in London, Uli Schliewen in Munich, and Miguel Parrent and the late Guy Teugels in Tervuren.

Our warmest thanks, too, go to Ruud Wildekamp and Maurice Chauche, for lending their photographs.

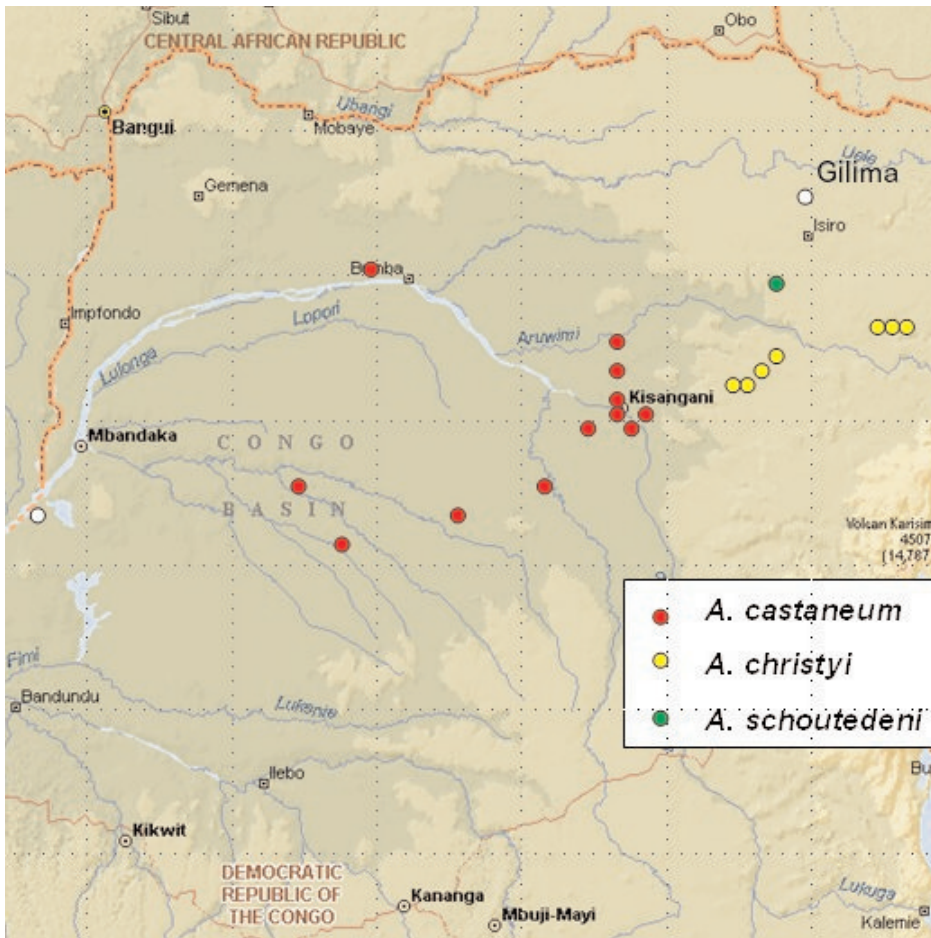


Fig. 7 Distribution of *A. castaneum*, *A. christyi*. Position of type locality of *A. schoutedeni* and of Gilima (if not, near Kinshasa). J. van der Zee

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