Aphyosemion grelli (Cyprinodontiformes: Nothobranchiidae), a new species from the Massif du Chaillu, southern Gabon

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Abstract

A new species of Aphyosemion is described from Gabon, based on ten specimens collected in a small stream belonging to the hydrographic system of the Ikoy River on the northwestern edge of the Massif du Chaillu. Aphyosemion grelli is distinguished from all congeners by possessing a unique colour pattern of the unpaired and pelvic fins in the female consisting of the combination of a yellow basal portion and greyish to dark grey broad margin. Males of the new species share the black margins of the unpaired fins with A. congicum, A. labarrei, A. ocellatum, A. passaroi, and A. teugelsi, but differ from these by the combination of colouration characters and morphology. Phylogenetic relationships of the new species are still unclear; a possible close relationship with the A. coeleste group is tentatively excluded because, although geographically close, there are differences on flank colour pattern, head length and number of anal-fin rays.

Key words

Killifish, Africa, Ikoy River, Ikobey, systematics, taxonomy, biogeography.

Introduction

The genus Aphyosemion Myers, 1924 is a speciose clade of West African killifishes, with over 80 species inhabiting small streams from Togo to Angola along the coastal plain, the inland plateau and the lowlands of the Congo River basin (Huber, 2000). Among this genus Scheel (1990) recognised nine species groups, combining different information including colour patterns, karyotypes, and distribution: the Aphyosemion batesii group, the A. bivittatum group, the A. calliurum group, the A. cameronense group, the A. coeleste group, the A. elegans group, the A. exiguum group, the A. georgiae group, and the A. striatum group. Most of these species groups have been assigned to specific subgenera: the subgenus Aphyosemion corresponds to the A. elegans group, Chromaphyosemion (Radda, 1971), was established to recognise the very distinctive A. bivittatum group. The subgenera Kathetys, Raddella (Huber, 1977) and Diapteron (Huber & Seegers, 1977) were established to recognize the similarly distinctive A. exiguum, A. batesii and A. georgiae species groups, respectively. The taxon Mesoaphyosemion (Radda, 1977) was established as a subgenus of Aphyosemion and originally included all the species that show a superficial similarity turning this assemblage into a taxonomic “container”, but is currently limited to members of the A. cameronense group (Sonnenberg & Blum, 2007). Some species are difficult to place definitively into any one of these groups because currently no comprehensive and detailed comparative morphological study of the African nothobranchiids is available. Recently, Sonnenberg (2007), Van der Zee
& Sonnenberg (2011), and Sonnenberg & Van der Zee (2012) propose raising the aforementioned subgenera to the genus level.

The Massif du Chaillu is a mountain range starting in central Gabon just south of the Ogooué River (south of the city of Ndjolé) in a SSE direction across the Gabon-Congo border into the Republic of Congo with an average elevation of 400 to 700 metres. Systematic collections along the few roads in this mountain range have shown a remarkable present day diversity of the nothobranchiid fauna (Huber, 1980, 1994; Huber & Radda, 1977; Radda, 1980). In the Gabonese part of the Massif du Chaillu, nine Aphyosemion species are currently known: Aphyosemion aureum, A. citrineipinnis, A. coeleste, A. hanneloreae, A. hofmanni, A. joergenscheeli, A. ocellatum, A. passaroï, and A. wuendschi (Huber, 2000; Wilderkamp, 1993). Apart from A. hofmanni, A. hanneloreae, and A. wuendschi not belonging to any defined group and A. joergenscheeli which seems genetically close to A. escherichi, all remaining species belong to the A. coeleste species group (Huber & Radda, 1977; Murphy & Collier, 1999; Huber, 2000; Collier, 2007).

In January 2002, the second author was able to cross the River Ngounié east of Sindara, and discover an Aphyosemion with dark grey fin margins in females and black margins in males, from a stream on the western edge of the Massif du Chaillu. It became apparent that these specimens represent a species unknown to science which is herein formally described.

**Material and Methods**

Morphometric measurements were taken by means of a micrometer, partly under a dissecting microscope, and rounded to the nearest 0.1 mm. Counts and methods follow Huber (2000) with addition of Valdesalici (2010). Measurements, including subunits of the head, are presented as percentages of standard length (SL). The number of all visible rays of the dorsal, anal, caudal, pelvic, and pectoral fins were counted; the abbreviation D/A means the relative position of the first dorsal-fin ray in regard to the opposite anal-fin ray. Scale count on the mid-longitudinal series is the number of scales between the upper attachment of the opercular membrane and the caudal fin base. Excluded are the scales posterior to the...
hypural junction, which were counted separately. Nomenclature for the neuromast system on the head follows Schöel (1968) and Huber (2000) and that for the frontal squamation follows Hoedenman (1958). Morphological data from Huber (1994), Huber & Radda (1977), Radda (1980), Van der Zee & Sonnenberg (2010) were used here for comparisons. Osteological preparations (cleared and stained, C&S) were made according to Taylor & Van Dyke (1985), but not stained for cartilages. The type material is deposited in the following institutions: Staatliches Museum für Naturkunde (SMNS), Stuttgart, Germany & Museum für Tierkunde, (MTD), Dresden, Germany.

**Aphyosemion grelli**, new species

Figs. 1–4, Table 1

**Holotype.** SMNS 25471, male, 29.2 mm SL; Gabon, Province de la Ngounié, Département de Tsamba-Magotsi, 50 km east of the ferry across the River Ngounié along the road “Route Régionale 22” to Ikobey (Ikebe), a small stream belonging to the Ikoy River system (00°59′ 07″ S, 10°56′ 00″ E), 19 January 2006, Wolfgang Eberl & François Mengila.

**Paratypes.** SMNS 25472, 5 males, 26.9–30.7 mm SL, 2 females, 25.8 & 29.6 mm SL; collected with the holotype. MTD F 32782-83, 1 male, 29.4 mm SL & 1 female, 29.0 mm SL C&S; same data as above, 22 January 2002, Wolfgang Eberl & Guido Passaro.

**Diagnosis.** Distinguished from all congeners by possessing a unique colour pattern of the unpaired and pelvic fins in females consisting the combination of a yellow basal portion and greyish to dark grey broad margin (vs. never a similar colour pattern). Males are similar to Aphyosemion congicum, A. labarrei, A. ocellatum, A. passaroi, and A. teugelsi and distinguished from all other species of the genus by having black margins on their unpaired fins (vs. never a similar colour pattern). *Aphyosemion grelli* differs from *A. congicum* males by the blue-green body and head colouration (vs. orange); by the rounded dorsal and anal fins (vs. pointed); by a horizontal series of densely set dots on flank (vs. a few, larger and sparsely set dots); by a thin black distal margin on dorsal fin (vs. dorsal fin almost completely black); by the rounded caudal fin (vs. caudal fin pointed dorsally and ventrally) and by 11–12 dorsal-fin rays (vs. 9–10). *Aphyosemion grelli* differs from males of *A. labarrei* by a horizontal series of dots on flank (vs. a dense pattern of large red blotches forming fused, irregular bands on caudal peduncle); by the
rounded caudal fin (vs. pointed dorsally and ventrally); by 10–12 dorsal-fin rays (vs. 12–14); by 13–14 anal-fin rays (vs. 14–17) and by 12 circumpundicular scales (vs. 13–14). *Aphyosemion grelli* differs from males of *A. ocellatum* by a horizontal series of dots from humeral to caudal-fin base (vs. single blue broad rounded blotch at humeral region); by the more anterior insertion of dorsal fin relative to anal-fin origin (D/A 6–7 vs. D/A 8–9) and by 13–14 anal-fin rays (vs. 15–16). *Aphyosemion grelli* differs from males of *A. passaroi* by the presence of a horizontal series of dots on flank (vs. absence or a more irregular pattern of a few smaller dots on flank); by caudal-fin with narrow black dorsal and ventral distal margins (vs. broad black band along entire margin of caudal fin); by anal-fin without any spots (vs. with a pattern of red dots) and by 13–14 anal-fin rays (vs. 15–16). *Aphyosemion grelli* differs from males of *A. teugelsi* by the light pectoral-fin margin (vs. dark); rounded dorsal and anal fins (vs. pointed); by 16–18 pectoral-fin rays (vs. 14–15); by 28–32 caudal-fin rays (vs. 23–25) and by 9–10 scales on transverse series (vs. 7–8).

**Description.** Morphometric data in Table 1. *Aphyosemion grelli* shows sexual dimorphism: males are more colourful; dorsal and anal fin larger and positioned more anteriorly compared to females. Females show pocket-like membrane over urogenital papilla. Scales slightly laterally compressed; dorsal profile slightly convex, maximum body depth at pelvic-fin origin. Ventral profile slightly convex, slightly concave to nearly straight on caudal peduncle. Snout slightly rounded, mouth directed upwards, lower jaw longer than upper jaw. Caudal fin subtruncate. Dorsal and anal fins located posterior to mid-body, tips rounded.

Frontal neuromast series ‘open’ type. Supraorbital series with three neuromasts. Preopercular canal with six pores. One neuromast on each scale of median longitudinal series.

**Table 1.** Morphometric data of *Aphyosemion grelli*. Measurements are given as percentages of standard length in mm. Eye diameter, interorbital width and snout length are given as percentages of head length. Cleared and stained material is not included.

<table>
<thead>
<tr>
<th></th>
<th>holotype</th>
<th>All males (n = 7)</th>
<th>females (n = 2)</th>
</tr>
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<tr>
<td>Standard length (mm)</td>
<td>29.2</td>
<td>26.9–30.7</td>
<td>25.8–29.6</td>
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<td>Depth at pelvic fin</td>
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<td>21.2–24.4</td>
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<td>Predorsal length</td>
<td>67.8</td>
<td>63.5–67.8</td>
<td>68.2–68.9</td>
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<td>Length of dorsal-fin base</td>
<td>14.0</td>
<td>13.2–16.3</td>
<td>12.5–13.9</td>
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<tr>
<td>Preanal length</td>
<td>61.3</td>
<td>58.9–61.3</td>
<td>62.8–63.9</td>
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<tr>
<td>Length of anal-fin base</td>
<td>17.4</td>
<td>17.2–19.8</td>
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<tr>
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<td>46.3–50.3</td>
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<tr>
<td>Length of caudal peduncle</td>
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<td>22.6–24.9</td>
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<tr>
<td>Depth of caudal peduncle</td>
<td>13.6</td>
<td>12.2–14.2</td>
<td>12.4–12.5</td>
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<tr>
<td>Head length</td>
<td>29.7</td>
<td>26.7–31.2</td>
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<td>Snout length</td>
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<td>26.1–31.2</td>
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<tr>
<td>Eye diameter</td>
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<td>23.7–29.2</td>
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<td>Interorbital width</td>
<td>35.6</td>
<td>35.0–42.8</td>
<td>36.2–41.4</td>
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</tbody>
</table>


**Colouration.** Male (Figs. 1 & 2). Body and head metallic blue-green, three interrupted horizontal series of red dots on flank. Two narrow oblique red bars on opercle. Dorsal, anal and pelvic fins blue-green with narrow black distal margin. Caudal fin blue-green with dark blue irregular dots, dorsal and ventral distal margin black, dorsal and ventral posterior portion white. Pectoral fin hyaline with ventral white margins.

Female (Figs. 3 & 4). Body and head grey-brown, three interrupted horizontal series of small red dots on flank. Pectoral fin hyaline. Dorsal, anal, caudal and pelvic fins yellow with broad grey distal margin.

**Distribution and habitat notes** (Figs. 5 & 6). *Aphyosemion grelli* is known only from the type locality, a small stream belonging to the hydrographic system of the Ikoy River, crossing the RR 22 from southwest to northeast on the north-western edge of the Massif du Chaillu. At the time of collecting the stream was no wider than 1 m with a depth less than 40 cm. The only other fish present were small unidentified *Barbus* species.
Etymology. The new species is dedicated to the late Wolfgang Grell, member of the DKG (German Killifish Association); a talented killifish collector, breeder, and photographer who only one year before his death in May 2001, directed the second author’s attention to the probable existence of an unknown species in the area east of Sindara.

Discussion

The Aphyosemion coeleste species group is distributed on the Massif du Chaillu and was defined by Huber & Radda (1977). Despite its distribution and although males A. ocellatum and A. passaroi possess similar patterns on the unpaired fins, we hesitate here to assign A. grelli into this species group. A. grelli differs from all others members of this assemblage by the presence of a dotted pattern on the flank from humeral to caudal-fin base (vs. absence or if present limited to humeral area or few, smaller and irregularly distributed dots), a relatively longer head (26.7 – 31.2 % SL vs. 22.0 – 29.0 % SL) and fewer anal-fin rays (13 – 14 vs. 14 – 17). Aphyosemion grelli does not belong to the subgenus Aphyosemion, so is clearly not related to A. congicum, because, apart from the preopercular neuromast system with 6 pores, the slender body, and the posterior origin of the dorsal fin, it does not show less than 10 dorsal fin-rays, the females do not show a strong reticulation due to dark scale borders, and the edges of the caudal fin in males are not pointed or extended as in the species of this subgenus (Huber, 2005; van der Zee & Sonnenberg, 2011).

Inferring a possible relationship of Aphyosemion grelli, belonging to ichthyofaunistic „Gabonian group“ (sensu Scheel, 1974) and in Ogooué River system, with the other species showing black margins on unpaired fins is so far impractical because both A. labarrei and A. teugelsi belong to ichthyofaunistic „Zaire group“ (sensu Scheel, 1974) and are known from the left bank of the Congo River in the Democratic Republic of Congo.

Scheel (1990) placed A. labarrei in the A. elegans group, however the molecular data clearly exclude this taxon from this group (Murphy & Collier, 1999; Collier, 2007).

Male A. grelli are distinguished from male A. labarrei by the colour pattern on the flank (horizontal series of dots vs. a dense pattern of large red blotches, forming fused irregular bands on caudal peduncle), by the shape of the caudal fin (rounded vs. pointed dorsally and ventrally), by the length of the dorsal fin (tip reaching middle of caudal peduncle vs. reaching caudal fin); by more dorsal- and anal-fin rays (10 – 12 vs. 12 – 14 and 13 – 14 vs. 14 – 17, respectively), and by fewer circumpeduncular scales (12 vs. 13 – 14).

Due to the differences with the members of the geographically close subgenus Aphyosemion (Van der Zee & Sonnenberg, 2010; Van der Zee, 2011), Aphyosemion teugelsi probably belongs to a currently unknown supra-specific taxon. Male A. grelli can be distinguished from male A. teugelsi by a different colour of the pectoral-fin margin (white vs. dark brown), by the different

Fig. 6. Distribution of Aphyosemion grelli and the other known Aphyosemion species in the Massif du Chaillu and southern Gabon.
shape of the dorsal and anal fins margin (rounded vs. pointed), by more pectoral- and caudal-fin rays (16 – 18 vs. 14 – 15 and 28 – 32 vs. 23 – 25, respectively) and by more scales on transverse series (9 – 10 vs. 7 – 8).

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References


