VERTEBRATE ZOOLOGY

63 (3): 301 – 306
20.12.2013

SENCKENBERG

Description of *Apistogramma helkeri* sp. n., a new geophagine dwarf cichlid (Teleostei: Cichlidae) from the lower río Cuao (Orinoco drainage) in Venezuela

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Accepted 01.xi.2013.
Published online at www.senckenberg.de/vertebrate-zoology on 18.xii.2013.

Abstract

Apistogramma helkeri sp. n. is described from the drainage of the lower río Cuao in the Estado Amazonas of Venezuela. It is most similar to *Apistogramma hongsloi* Kullander, 1979, but differs from this species by its colouration and the shape of its dorsal fin. It can be distinguished from all the other described *Apistogramma* species by the following combination of characters: caudal fin rounded, hyaline and immaculate; dorsal fin lappets short, truncate, without extension or prolongation; caudal spot large, vertically extended; lateral band chain-like or running in a zigzag to 7th bar, not reaching caudal fin or caudal spot; upper pectoral spot present; three distinct abdominal stripes.

Resumen

Se describe una nueva especie de cíclido, *Apistogramma helkeri*, de la cuenca del bajo río Cuao en el Estado Amazonas de Venezuela. La nueva especie se parece a *Apistogramma hongsloi* Kullander, 1979, pero se diferencia de esta especie por su patrón de coloración y la forma de la aleta dorsal. La nueva especie se distingue de todas las demás especies del género *Apistogramma* por la siguiente combinación de carácteres diagnóstico: aleta caudal redondeada, hialina e inmaculada; aleta dorsal con membranas cortos y truncadas, sin prolongaciones; mancha caudal rectangular, verticalmente alargada; banda lateral en forma de zigzag con bordes irregulares hasta la posición de la séptima barra transversal; aletas pectorales con una única mancha en la axila superior; tres líneas longitudinales abdominales bien definidas.

Kurzfassung

Apistogramma helkeri sp. n. wird aus dem Flusssystem des unteren río Cuao aus dem Estado Amazonas in Venezuela beschrieben. Die neue Art ist *Apistogramma hongsloi* Kullander, 1979 am ähnlichsten, unterscheidet sich von jener Spezies jedoch durch ihre Färbung und die Form der Rückenflosse. Die neue Art lässt sich von allen anderen bisher beschriebenen *Apistogramma*-Arten durch die Kombination folgender diagnostischer Merkmale abgrenzen: Schwanzflosse rundlich, transparent und ungemustert; Häute der Dorsale kurz, gestutzt, nicht verlängert oder ausgezogen; Schwanzwurzelfleck vertikal vergrößert; Längsband ketten- oder zickzackförmig, endet vor dem Schwanzwurzelfleck auf dem 7. Querband; oberer Brustflossenfleck vorhanden; zwei deutliche Unterkörperstreifen.

Key words

Ichthyology, taxonomy, singletons, Cichlidae, Cichlinae, Geophagini, new species, Estado Amazonas, Venezuela.

Introduction

The South American genus *Apistogramma* Regan is one of the most species rich cichlid genera. At present there are 82 valid species. In addition more than 30 species, which have not been formally described, are listed in the popular aquarium literature (Staeck, 2003; Römer, 2006; Staeck & Linke, 2006). Most *Apistogramma* species are small fishes for their males, which are usually greater than females, generally have only a SL length of less than 60 mm. Pronounced sexual dimorphism in morphology, fin shape and colour patterns is common in this genus. Males of different species are usually more distinct from each other than females.

Many *Apistogramma* species have an extremely restricted geographical distribution and are confined to very small areas, sometimes no more than a few tens or hundreds of square kilometres, or to the drainage of a few adjacent small rivers or even to the catchment of a single river (Staeck, 2003; Römer, 2006; Staeck & Linke, 2006). This is especially a characteristic of the tropical forest species from Venezuela, Colombia, Peru and Brazil.

In 2011 Mesa & Lasso recorded 20 *Apistogramma* species from the drainage of the río Orinoco in Venezuela and Colombia. Since then two additional species from the upper Orinoco drainage in the Estado Amazonas have been added: *Apistogramma diplotaeniata* Kullander 1987 from the lower río Atabapo (Staeck, 2013) and a species not known before from the lower río Cuao (Helker, 2013). The objective of this paper is to present a formal description of the new species which brings the total number of described taxa in the genus to 83 and elevates the number of species known from Venezuela to 22.

Material and methods

The type specimens were fixed in 75% ethanol. The holotype and paratype are deposited in the fish collection of the Museum für Tierkunde Dresden (MTD F).

The techniques for taking measurements and meristic data follow those described in Kullander (1980; 1986) and Kullander & Nijssen (1989). Measurements were made with an electronic digital caliper reading to the nearest 0.1 mm. Specimen lengths are given as standard length (SL). Scale rows are numbered as described in Kullander (1990). Numbers in brackets after counts indicate the number of specimens examined with that condition.

In accordance with previous taxonomic publications on the genus *Apistogramma* (e.g. Kullander & Ferreira, 2005; Mesa & Lasso, 2011), the new species is diagnosed on external characters. The species concept used here is the diagnostic variant of the phylogenetic species concept (Nixon & Wheeler, 1990).

Table 1. Morphometric data of the two type specimens of *Apistogramma helkeri* spec. nov (two adult males). All measurements are presented as percentages of standard length, except standard length in mm.

Standard length (mm)	40.1	37.7
Head length	34.4	35.5
Snouth length	6.2	6.6
Body depth	36.7	35.0
Eye diameter	11.7	12.5
Interorbotal distance	8.2	8.0
Preorbital length	3.7	3.7
Peduncle depth	16.7	16.7
Peduncle length	13.2	13.8
Pectoral fin length	27.9	26.0
Length last D spine	16.0	15.4
Length of pelvic fin	29.9	28.6
Dorsal fin base length	59.1	58.9
Anal fin base length	21.9	20.4
Total length	127.2	132.6

Apistogramma helkeri sp. n.

Figs. 1 – 4, Table 1

Holotype. MTD F 33020, adult male, 40.1 mm SL, Venezuela, Estado Amazonas, drainage of the lower río Cuao, approx. 500 m upstream of the village Danto (approx. 05° 02′ N, 67° 33′ W), leg. O. Helker, J. Tomas & F. Vermeulen, 2009.

Paratype. MTD F 33021, adult male, 37.7 mm SL, collecting data like holotype.

Diagnosis. A small, high-bodied (body depth 35 – 37% of SL) geophagine cichlid, differing from other *Apistogramma* species by the combination of the following characters: (1) caudal fin rounded, hyaline and immaculate; (2) dorsal fin lappets short, truncate, without extension or prolongation; (3) caudal spot large, vertically extended; (4) lateral band chainlike or running in a zigzag to 7th bar, not reaching caudal fin or caudal spot; (5) upper pectoral spot on the dorsal base of the pectoral fin present; (6) three distinct abdominal stripes.

Description. Refer for general appearance and colour pattern to Figs. 1 – 2. Morphometric data are summarised in Table 1. A comparatively high-bodied species (body depth 35 – 37 % of SL). Predorsal and preventral contours about equally steep. Snout short, rounded in lateral and dorsal views. Mouth terminal, jaws equal

Fig. 1. *Apistogramma helkeri* sp. n., holotype, adult male, 40.1 mm SL, four years after fixation, MTD F 33020.

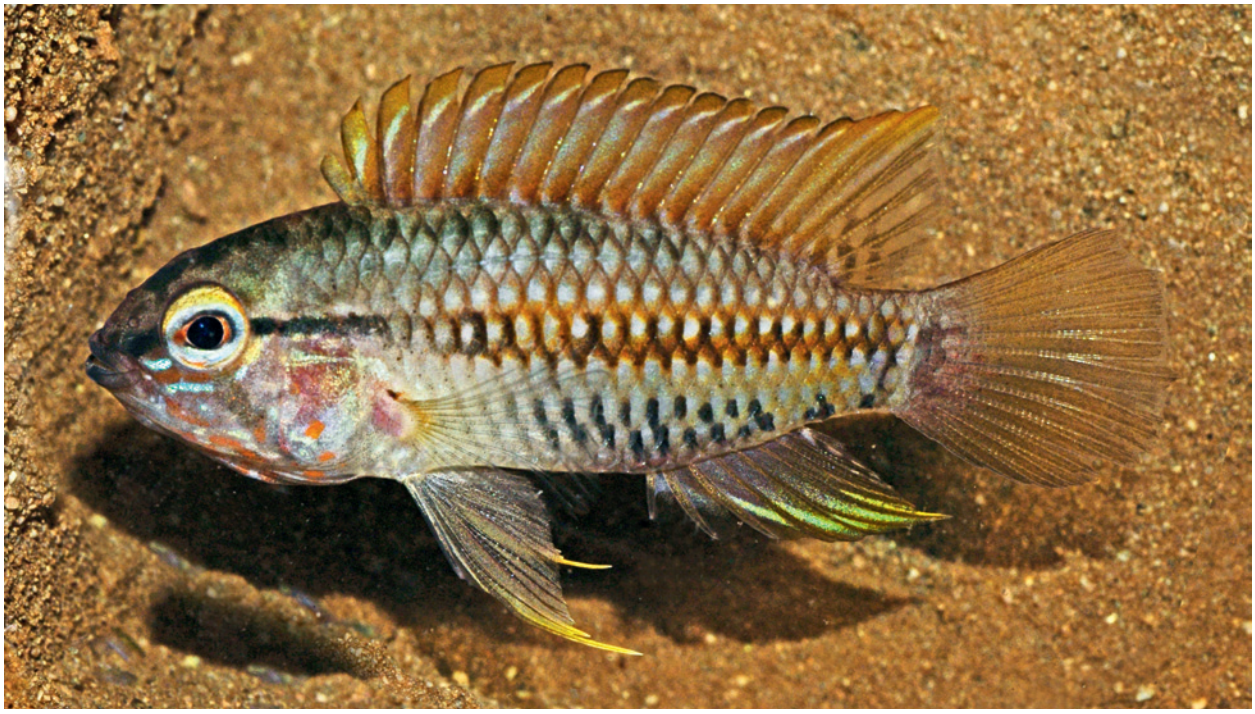

Fig 2. Live topotypic adult male of *Apistogramma helkeri* sp. n. shortly after capture in a photographic tank. Photo: F. Vermeulen.

anteriorly; maxilla extending to margin of orbit. Eye located supralateral, margin slightly distant from predorsal contour. Head length about 1/3 of SL. Caudal peduncle deeper than long.

Dorsal fin in adult males with short, truncate lappets. Soft dorsal and anal fin in males pointed, without prolongation. Caudal fin in males rounded, comparatively short (< 33 % of SL), with 8 principal rays in each lobe. Pelvic fins pointed. Pectoral fins rounded (pectoral-fin length 26 to 28 % of SL). Dorsal fin XIV.7 (1) or XV.7 (1). Anal fin III.6 (2).

E1 row scales 22 (1) or 23 (1). Cheeks anteriorly naked or completely scaled, with 3 horizontal scale rows. Lateral line scales 14/5 (2). About 30% of proximal part of caudal fin scaled. All other fins without scales. Preopercle with six pores; posterior margin of ascending limb smooth. Dentary lateral canal with 5 pores.

Jaw teeth caniniform, uniscupid, linguad curved; 25 (1) in outer hemiseries of upper and 26 (1) of lower jaw. Outer row series extending along entire jaw margin. Gill rakers externally on first gill arch, one in angle and 1 (2) minute on ceratobranchial. Lower pharyngeal toothplate wider than long (length about 80% of width); 13 to 16 teeth in posterior row, 5 to 6 teeth in median row. Medioposterior teeth largest; teeth gradually decreasing in length in rostrad and lateral direction. Medioposterior teeth and teeth in the posterior rows bicuspid, laterally compressed.

Fig 3. Lower pharyngeal tooth plate of *Apistogramma helkeri* sp. n. (37.7 mm SL).

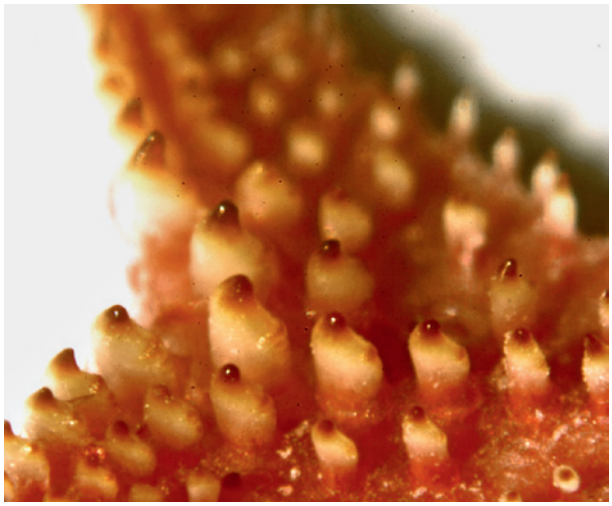

Fig 4. Medioposterior teeth of lower pharyngeal bone (lateral view).

Colouration of preserved specimens. Dull yellowish ground colour, slightly darker along back; with brown markings. Bars indistinct, not extending below lateral band, expressed chiefly above upper lateral line as spots along the dorsal fin base. Lateral band beginning with narrow postorbital stripe to bar 2 position. On lateral band scales with brown margin and lighter centre. Lateral band approx. one and one half scale deep, terminating with bar 7; consisting of dark brown spots on margins of row 0 and row El scales to form a zigzag band. No lateral spot. Head with brown preorbital stripe, brown supraorbital stripe from posterodorsal half of orbit to middle of nape, and moderately wide brown suborbital stripe from posteroventral orbital margin to angle of preopercle.

Pectoral spot single, forms a small dark brown blotch at dorsal margin of pectoral-fin base. Three distinct abdominal stripes composed of elongated spots: one from upper pectoral axilla edge to caudal peduncle, another from lower axilla edge to caudal peduncle, a third from little below axilla to anal fin base. No midventral stripe, but black around vent. Caudal spot rectangular, vertically extended.

Unpaired fins dusky to brownish. Soft portion of dorsal fin with three indistinct vertical spot-stripes crossing the 3–4 posterior interradial membranes. Anal fin also with two rows of brownish dots across posterior interradial membranes. Caudal fin immaculate. Pelvic fins with dark brown spine.

Coloration of live specimens. Based on photographs taken in the field shortly after capture. Ground colour of sides greyish white, slightly darker along back, dark grey on nape. Gill cover and cheek with iridescent blue spots and lines alternating with red spots and lines. Margins of iris red.

Blackish spot at the base of the upper margin of the pectoral fin. Intense preorbital stripe, continued upon upper lip. Moderately wide brown suborbital stripe from posteroventral orbital margin to angle of preopercle. Narrow postorbital stripe running from posterior rim of the eye to bar 2 position. Supraorbital stripe faintly expressed or absent.

Lateral band chainlike or running in a zigzag, approx. one and a half scale deep, terminating with bar 7. The zigzag appearance of the lateral band is formed by dark pigment marginally on the scales in row 0 and E1. Three narrow dark orange horizontal lines along middle of flank: one in the centre of lateral band, two others at its upper and lower margin.

Caudal spot rectangular, vertically extended. Two or three distinct blackish abdominal stripes composed of elongated spots: one from upper pectoral axilla edge to caudal peduncle, another from lower axilla edge to caudal peduncle. Sometimes a third from little below axilla to anal fin base.

Base of dorsal fin maroon; lappets dull orange or maroon with iridescent green submarginal basis; rest of dorsal fin with pale greyish green hue; three vertical rows of dark dots on posterior part of soft fin. Marginal part of soft anal fin with greenish hue; marginal part of spinous anal fin blackish; rest of anal fin uniformly dusky except for two vertical rows of dark dots on posterior part of soft fin. Caudal fin hyaline and immaculate. Pelvic fins greyish with yellow prolongations. Pectoral fins colourless and hyaline.

Distribution and Ecological notes. *Apistogramma helkeri* is currently known only from the type locality in the drainage of the lower río Cuao, a tributary of the lower río Sipapo (Estado Amazonas of Venezuela).

The collecting site of *Apistogramma helkeri* is a blackwater swamp in the vicinity of the village Danto. The associated fish fauna includes *Nannostomus marginatus* Eigenmann, 1909, *N. trifasciatus* Steindachner, 1876, *Carnigiella strigata* (Günther, 1864), the dwarf cichlids *Laetacara fulvipinnis* Staeck & Schindler, 2007 and *Apistogramma uaupesi* Kullander, 1980 (see Helker, 2013).

Fig 5. Type locality of *Apistogramma helkeri* sp. n. in a black-water swamp in the drainage of the lower río Cuao, tributary of the lower río Sipapo. Photo: O. Helker.

Etymology. Named for Oliver Helker, one of the collectors, who brought this species to our attention and provided several photos and the information on the collecting site.

Discussion

After careful consideration we decided to present the formal description of the new *Apistogramma* from the río Cuao in this paper although there are only two type specimens available. We think that there are several good reasons for this decision. In a recent study Lim *et al.* (2012) revealed that a remarkable number of vertebrate species are represented by only one specimen, for approx. 19% of all described vertebrate species are singletons (i. e. species known only from a single specimen) and 35% are uniques (i. e. species that have been collected only once). That means that many species have been collected only once or are even known only from one specimen.

This also applies to *Apistogramma* species. There are several precedents for formal descriptions of *Apistogramma* species based on an extremely limited number of specimens, e. g. *Apistogramma moae* Kullander, 1980 (2 ♂♂), *A. piauiensis* Kullander, 1980 (1 ♀, 2 subadult specimens of undetermined sex), *A. geisleri* Kullander, 1980 (1 ♂, 1 ♀); *A. lineata* Mesa & Lasso, 2011 (2 ♂♂), *Apistogramma minima* Mesa & Lasso, 2011 (2 subadult specimens of undetermined sex).

The description of new species taxa based on a low number of specimens has been rejected by Dayrat (2005). However, rarity is not only a prevalent phenomenon in taxonomic research but also in specimen samples that are used for species descriptions (Lim *et al.*, 2012), for species occurring only in a small distribution area or having a low abundance are well known in population and community biology (Gaston, 1994). Particularly communities in tropical areas frequently contain a high number of rare species, and therefore even in large collections singletons represent often more than half of the species (Novotny & Basset, 2000).

Given the commonness of the rarity of specimens, a strict adherence to the rule that species should never be described based on one specimen or a few specimens would prevent the description of a very significant proportion of the species-level diversity. Nowadays there is a general agreement that examples of biodiversity should be documented as soon as possible because of the rapidly growing danger that species of ecological, evolutionary, conservation or management interest become extinct before they are known to science. Therefore Lim *et al.* (2012) recommend that taxonomists treat singletons using ad hoc methods until new techniques and methods for delimiting species become available.

The description of a species known only from an extremely low number of specimens is justified if it falls outside the well known range of the intraspecific variability of closely related well-sampled species and has a distinct set of diagnostic characters that renders it highly unlikely that it belongs to an already described species. In closely related *Apistogramma* species even measurements and counts of large numbers of specimens generally are of little value for delimiting taxa as these data overlap. But details of the colouration and patterns of dark markings proved to be diagnostic in male *Apistogramma* and permit to distinguish them (Kullander, 1979; Antonio *et al.*, 1989; Kullander, 2004).

Among the species of *Apistogramma* described from the Orinoco basin *Apistogramma helkeri* is the only one having a combination of the following characters: a hyaline immaculate caudal fin, distinct abdominal stripes and a dorsal fin without any modification in adult males. In its general morphology and colour patterns it is most similar to *Apistogramma hongsloi* Kullander, 1979 from the ríos Meta, Vichada, Cataniapo, Capanaparo and Suapure (Mesa & Lasso, 2011). Both species share a rounded, clear and immaculate caudal fin, the zigzag or chain appearance of the lateral band, an upper pectoral spot and distinct abdominal stripes. Adult males of *Apistogramma helkeri* differ from this species in having short instead of produced anterior dorsal-fin lappets (Kullander, 1979; Mesa & Lasso, 2011). In addition the red markings typical of the males of *Apistogramma hongsloi* are missing in *A. helkeri.*

A second species with a rounded, hyaline immaculate caudal fin, short anterior dorsal-fin lappets and a zigzag band is *Apistogramma alacrina* Kullander, 2004 described from Colombia in the río Guaviare drainage and the drainage of the río Orteguaza, a tributary to the río Caquetá. It can be distinguished from *Apistogramma helkeri* by a dark blotch on the ventral base of the pectoral fin and the lack of abdominal stripes. In alcohol adult males of *Apistogramma alacrina* may have about four vertical rows of light dots medially on the proximal half their caudal fin (Kullander, 2004; Mesa & Lasso, 2011).

The zigzag appearance of the lateral band, which is formed by dark pigment marginally on the scales in row 0 and E1, and the rounded immaculate caudal fin is also shared with *Apistogramma macmasteri* Kullander, *A. hoignei* Meinken, *A. viejita* Kullander, *A. guttata* Antonio, Kullander & Lasso, *A. nororientalis* Mesa & Lasso, *A. caudomaculata* Mesa & Lasso and *A. pedunculata* Mesa & Lasso. All these species are members of the *Apistogramma macmasteri* species group. *Apistogramma helkeri* males differ from the members of this species group in having short instead of produced anterior dorsal-fin lappets (Mesa & Lasso, 2011; Staeck, 2013) and, therefore, cannot be mistaken for one of these species. *Apistogramma intermedia* Mesa & Lasso, 2011 from the río Caura drainage and the Orinoco Delta differs from *Apistogramma helkeri* in its unusual small size (max. SL 28.2 mm) and in having an oval or square caudal spot covering the whole caudal peduncle (Mesa & Lasso, 2011).

Acknowledgements

We are particularly indebted to Oliver Helker, who made this description possible by providing the type material, photos and valuable information. We thank Frans Vermeulen for giving the permission to use a photo and Axel Zarske (MTD F) for depositing the material in his institute.

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