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Apistogramma erythrura sp. n. – a new geophagine dwarf cichlid (Teleostei: Perciformes: Cichlidae) from the río Mamoré drainage in Bolivia

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> Abstract

Apistogramma erythrura sp.n. is described from the drainage of the lower río Mamoré in the province of Beni in Bolivia. It is most similar to *Apistogramma trifasciata*, but differs from this species by the complete absence of any abdominal markings below the lateral band. It can be distinguished from all the other described *Apistogramma* species by the following combination of characters: only two postlacrymal infraorbital lateralis canal pores, five dentary lateralis canal pores, a broad lateral band with even borders that widens posteriorly to a height of at least two and a half scales and extends into the caudal fin without a caudal spot. Adult males usually with a partly or even completely bright red colouration of their rounded caudal fin, extremely produced anterior dorsal-fin lappets and prolonged pelvic-fin filaments reaching the posterior end of the anal-fin base.

> Kurzfassung

Apistogramma erythrura sp. n. wird aus dem Fluss-System des unteren río Mamoré aus der Provinz Beni in Bolivien beschrieben. Die neue Art ist *Apistogramma trifasciata* am ähnlichsten, unterscheidet sich von jener Spezies jedoch durch das völlige Fehlen dunkler Zeichnungselemente unterhalb des Lateralbandes. Die neue Art lässt sich von allen anderen bisher beschriebenen *Apistogramma*-Arten durch die Kombination folgender diagnostischer Merkmale abgrenzen: nur zwei Infraorbitalporen, fünf Dentalporen, ein breites, gleichmäßig begrenztes Längsband, das sich nach hinten auf eine Höhe von zweieinhalb Schuppen verbreitert und sich ohne Schwanzwurzelfleck bis in die Schwanzflosse erstreckt. Adulte Männchen gewöhnlich mit einer teilweise oder sogar völlig kräftig rot gefärbten abgerundeten Schwanzflosse, stark verlängerten Membranen in der vorderen Rückenflosse sowie fädig ausgezogenen Bauchflossen, die bis zum hinteren Ende des Afterflossengrundes reichen.

> Key words

Systematics, ichthyology, ecology, reproductive behaviour, Cichlidae, Geophagini, new species, Bolivia.

Introduction

The South American genus *Apistogramma* Regan is one of the most species rich cichlid genera. At present there are almost 70 valid species. In addition more than 30 undescribed species are listed in the popular aquarium literature (Römer, 2006; Staeck, 2003a; Staeck & Linke, 2006). All *Apistogramma* species are small cichlid fishes for the male individuals, which are usually greater than females, generally have 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.

Staeck & Linke (2006) recorded Bolivian localities for 11 *Apistogramma* species. Since then two additional species have been collected in the drainages of the Amazon tributaries in the north of Bolivia (Staeck, 2007; 2008). The species described below from the drainage of the río Mamoré is an example of the many *Apistogramma* species which have become well-known in the popular aquarium literature long

before material was available for a formal description. It was introduced into the German aquarium trade in 1995 (STAECK, 1996) and provisionally referred to by the popular name *Apistogramma* sp. "Mamoré". Subsequently colour photos were frequently published in the aquarium literature. As now sufficient material of this species is available, the objective of this paper is to present its formal description.

Materials and Methods

Some type specimens were fixed in ethanol, others in formalin and later transferred into 75% ethanol. The holotype and paratypes 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. Numbers in brackets after counts indicate the number of specimens examined with that condition. Terminology and methods of measurements of jaws and teeth follow CASCIOTTA & ARRATIA (1993). Scale rows are numbered as described in KULLANDER (1990). The description follows the general format used by KULLANDER & FERREIRA (2005).

Types of *Apistogramma erythrura* sp. n. are listed under species description. Comparisons were made with the following specimens of *Apistogramma trifasciata*: MTD F 31446–31447, 2 ex., 36.8-41.9 mm SL, Bolivia, Depto. Beni, drainage of the lower río Yata, vicinity of Riberalta, road to Guayaramerin, swamp a few km west of río Yata, *leg*. 2006, by W. Staeck; MTD F 31448–31453, 6 ex., 18.2-37.8 mm SL, Bolivia, Depto. Beni, drainage of río San Martin, small laguna approx. 30 km upstream of Bella Vista, *leg*. 2006, by W. Staeck; MTD F 31454–31465, 12 ex., 20.1-25.5 mm SL, Brazil, Mato Grosso, río Guaporé, vicinity of Vila Bela da Satissima Trinidade, *leg*. 1987 by W. Staeck; MTD F 31466–31468, 3 ex., 14.2-26.0 mm SL, Bolivia, Depto. Santa Cruz, drainage of río Paraguay, Lago Mandioré, *leg*. 1991 by W. Staeck & I. Schindler.

Abbreviations

AL premaxillary ascending arm length

CAD coulter area depth

CAW coulter area width

DL premaxillary dentigerous arm length

E1 row of scales in the horizontal series directly above the longitudinal row including the lower lateral line

MTD F Staatliche Naturhistorische Sammlungen Dresden, Museum für Tierkunde, Fischsammlung

SL standard length

Apistogramma erythrura sp. n.

(Figs 1–6 & 8–13, Tabs. 1–2)

Holotype. MTD F 31469, adult male, 34.8 mm SL, Bolivia, Depto. Beni, drainage of the río Yata, Laguna Larga (= Lago Largo), approx. 160 km northwest of Santa Ana de Yacuma, leg. 2007 by W. Staeck.
Paratypes. MTD F 31470–31476, 7 ex., 27.1-43.4 mm SL, collecting site like holotype, leg. 2006 by W. Staeck. MTD F 31477–31494, 18 ex., 16.8-33.4 mm SL, collecting data like holotype. MTD F 31495–31502, 8 ex., 18.2-27.2 mm SL, Bolivia, Depto. Beni, drainage of the río Itonamas, Laguna Mapawa, approx. 30 km north of Magdalena, leg. 2006 by W. Staeck. Not cataloqued: 2 ex, 20.2–32.4 mm SL (cleared & stained, partly dissected), collecting data like holotype.

Diagnosis. A small, relatively high-bodied (body depth 34–38% of SL) geophagine cichlid with a marked secondary sexual dimorphism, differing from other *Apistogramma* species by the combination of (1) only two postlacrymal infraorbital lateralis canal pores, (2) five dentary lateralis canal pores, (3) a broad lateral band with even borders that widens posteriorly to a height of at least two and a half scale rows and extends into the anterior half of the caudal fin without a caudal spot, (4) the absence of both an oblique dark stripe between the pectoral-fin base and the anal fin origin and of any other dark markings below the lateral band, and in adult males (5) usually a partly or even completely bright red rounded caudal fin, (6) extremely produced anterior dorsal-fin lappets (those of 4th to 6th spine longest) and (7) prolonged pelvic-fin filaments reaching the posterior end of the anal-fin base.

Etymology. The species epithet is a compound derived from the Greek *erythro* (= red) and *ura* (= tail). The name refers to the conspicuous colour of the caudal fin in the majority of adult males.

Description. Refer for general appearance and colour pattern to Figs. 1-6. Morphometric data of 14 speci-



Fig. 1. Male *Apistogramma erythrura* sp. n., holotype, seven months after fixation, MTD F 31469.



Fig. 2. Live topotypic adult male of the yellow colour morph of *Apistogramma erythrura* sp. n. immediately after capture in a photographic tank.

mens are summarised in Tab. 1. Description of osteological characters from two dissected paratypes.

Relatively high-bodied species (body depth 34.0–38.2% of SL). Predorsal and preventral contours about equally steep. Snout short, rounded in lateral and dorsal views. Mouth terminal, jaws equal 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 slightly deeper than long.

Dorsal fin in adult males with anterior lappets extremely elongated, those of 3rd to 5th spine longest. From 7th spine lappets immediately shorter, but still extending beyond tips of spines. Dorsal fin lappets in females rounded or slightly truncate. Soft dorsal and anal fin in males pointed, in females rounded. Caudal

Tab. 1. Body proportions of holotype (MTD F 31469) and 13 paratypes of *Apistogramma erythrura* (n=14): Measurements in percent of **SL** (except SL in mm); **min** = lowest value, **max** = highest value, **mean** = arithmetric mean, **sd** = standard deviation.

Measurement	min	max	mean	sd
Total length	125.6	139.8	132.3	4.01
SL (mm)	23.5	43.4	31.83	6.36
Head length	30.6	36.4	33.7	1.76
Snout length	5.6	7.5	6.7	0.51
Body depth	34.0	38.2	35.9	1.26
Eye diameter	10.5	12.9	11.7	0.75
Interorbital width	8.1	10.0	9.1	0.52
Preorbital depth	2.7	3.8	3.4	0.36
Caudal peduncle depth	14.8	17.1	15.7	0.52
Caudal peduncle length	10.9	15.3	13.7	1.29
Length of pectoral fin	22.7	29.3	25.8	1.78
Length of pelvic fin	31.2	63.6	45.0	1.90
Length of dorsal-fin base	55.1	63.1	59.5	2.18
Length of anal-fin base	19.1	22.1	20.6	0.98
Length of last D spine	13.3	18.4	15.9	2.11

fin in males and females rounded, comparatively short (29–38% of SL in males, 25–28% of SL in females), with 3 procurrent and 8 principal rays in each lobe. Pelvic fins pointed, first ray in males extremely elongated (up to 64% of SL). Pectoral fins rounded (pectoral-fin length about 25% of SL). Dorsal fin XIV.7(1), XV.6(5), XV.7(6) or XVI..6(2). Anal fin: III.6(9) or III.7(5).

E1 row scales 21(3), 22(9) or 23(2). Cheeks anteriorly naked or completely scaled, with 3 horizontal scale rows. Lateral line scales 10/7(1), 11/5(1), 11/6(2), 11/7(4), 12/7(2), 13/7(3) or 14/5(1), of which 10-14/2-6 have tubes. About ¼ of caudal fin scaled on its base, all the other fins naked.

Preopercle (Fig. 8) with six pores; posterior margin of ascending limb smooth. Supracleithrum and posttemporal with smooth margines. Lacrymal bone (Fig. 9) narrow (length/depth ≈ 2.1), with 4 lateral line canal openings. Two infraorbitals with 2 (instead of 3) postlacrymal pores; second infraobrital with anterior upward directed elongation (in one speciemen this extension is separated from the second infraorbital); dentary lateral canal with 5 pores (Fig. 10); no complete bony anguloarticular canal.

Jaw teeth caniniform, uniscupid, linguad curved; 27/29 in outer hemiseries of upper and 25/27 of lower jaw. Outer row series extending along entire jaw margin. Length of dentigerous arm of premaxilla (Fig. 11) shorter than length of ascending arm (AL/DL ≈ 1.3); width of the ascending arm about 16% of its length. Angle formed by confluence of both arms about 84°. Lower jaw (Fig. 12) long and comparatively low (anguloarticular depth about 58% of length; alpha-angle about 26°). Coulter area wider than deep (CAD/CAW ≈ 0.7). Gill rakers externally on first gill arch, one in angle and 0(2), 1(7) or 2(2) on ceratobranchial; gill rakers on lower pharyngeal tooth plate 9(1) or 10(1). Lower pharyngeal tooth-plate (Fig. 12) wider than long (length 72%-75% of width); 18 to 22 teeth in posterior row, 4 to 6 teeth in median row. Medioposterior teeth largest; teeth gradually decreasing in length in rostrad and laterale direction. Medioposterior teeth and teeth in the posterior rows bicuspid (Figs. 13A, 13B), laterally compressed; lateral and rostral teeth slender, uniscupid. Upper pharyngeal jaw formed by the 2nd, 3rd and 4th pharyngobranchial; 2nd pharyngobranchial slightly curved, stick like; tooth plate with 4 conical, unicuspid teeth. Third pharyngobranchial largest, in ventral view trapezoid, with 35 or 36 teeth; anterior-rostral teeth largest (Fig. 13C), laterally compressed, bicuspid, strongly curved and pointed; caudalmost teeth simple, laterally less compressed. Fourth pharyngobranchial with triangular shape, 33 or 35 teeth and a single frayed zone.

Vertebrae 12+13; 9 pleural rips; 13 or 14 epipleural rips; 1 supraneural spine. 1st to 5th hypural spines separate; in the larger specimen the 5th and 4th hypural spine very close, apparently partly fused. Caudal skeleton arrangement of principal caudal-fin rays (from dorsal to ventral): one between epipural and 5th hypural, one on 5th hypural, four on 4th hypural, two on 3rd hypural, one on 2nd hypural, one between 2nd and 1st hypural, three on 1st hypural, two on parhypural and one between parhypural and last hemal spine (hemapophysis).

Colouration in life. Based on observations immediately after capture and on specimens kept in aquarium.

As *Apistogramma erythrura* is an exceptional example of distinct polychromatism in males of the same population, variation of the live colouration is notable among adult males of this species. Basically there are two different colour morphs having either a blue or a yellowish ground colour. Blue males are characterized by a predominantly light blue body. Forehead, nape and dorsal region dark grey; cheeks, operculum, breast and ventral region whitish. In some specimens, however, the lower region of the head is yellow with a number of blue dots instead of whitish. Lower portion of infraorbital stripe usually reduced to a conspicuous spot in the corner of the preopercle. This mark is bright red in some specimens, in others black. All these colour variations occur in the same population.

Dorsal, anal and pelvic fins blue. Dorsal fin usually with a dark base and a narrow yellowish margin. Caudal fin either completely or only in its lower portion bright red and with several ill-defined tiny dark vertical spot-stripes in its distal part. But in all the populations examined a fraction of the male individuals had a completely hyaline caudal fin with a reticulated pattern of tiny dark vertical spot-stripes.

The yellow colour morph has a yellowish ground colour ranging from dull in the dorsal to light yellow in the ventral region and the lower portion of the head. A number of light blue dots on cheeks and operculum. Above the lateral band some scales often with a maroon dot in their centre. Anal fin and ventrals yellowish. Dorsal fin grey with darker base and narrow orange margin. Colouration of caudal fin as described for blue morph.

All colour morphs with broad lateral band with sharp borders. It is usually more intense posteriorly, widens from postorbital stripe posteriorly to a height of at least two and a half scale rows and extends into the anterior half of the caudal fin without a caudal spot. Inner margin of iris bright red in all morphs and in both sexes.

Females beige-coloured with yellow head, grey dorsal, anal and pelvic fins, hyaline caudal fin and conspicuous dark lateral band. During brood care body lemon yellow, with black spot in the corner of the preopercle and lateral band usually reduced to lateral spot. First two anterior dorsal-fin membranes and anterior portion of ventral fins black.

All the colour varieties occur independently of each other and in different combinations among the males of the same population. Experience gained from several broods raised in aquaria confirms that the different phenotypes may even occur in a single brood.

Among one brood of a pair of *Apistogramma erythrura* from the Laguna Piranha there were 34 females and 31 males. The male parent was a specimen of the blue morph with a yellow head, a red mark in the corner of the preopercle and a hyaline caudal fin.

Tab. 2. Different colour varieties (**R** = red caudal fin, **H** = hyaline caudal fin, **Y** = yellow head, **W** = white head, **P** = preopercle with red mark, **B** = preopercle with black mark) among the males (n = 31) of a single brood of *Apistogramma erythrura*.

Male phenotype	Number of individuals
R Y P	4
R Y B	7
R W P	4
R W B	5
H Y P	4
H Y B	6
H W P	---
H W B	1

Among its offspring there were 20 males with a red and 11 with a hyaline caudal fin, 21 males with a yellow and 10 with a white head; 19 males had a black, 12 a red mark in the corner of their preopercle (see Tab. 2). Polychromatism of males is not uncommon in the genus *Apistogramma* (see Kullander & Staeck; 1988; Staeck, 2003b).

Colouration in alcohol. Based on holotype and paratypes. Body and fins yellowish grey, with dark grey markings; forehead, nape, back close to dorsal fin and basal dorsal fin darker. Lateral band in males with sharp edges, more intense posteriorly, extending into the anterior half of the caudal fin without a caudal spot and broadening to a height of at least two and a half scales from postorbital stripe to caudal peduncle. No abdominal stripes or markings. Roundish lateral spot (if visible) not extended beyond lateral band. Caudal spot replaced by continuation of dark lateral band to middle portion of caudal fin. Anterior two dorsal-fin membranes dark grey. Caudal fin either with reticulated pattern of dark vertical stripes of tiny spots or only with ill-defined stripes in its distal part. Infraorbital stripe usually reduced to a spot in the corner of the preopercle.

Geographical distribution. *Apistogramma erythrura* is known from several localities in the drainage of the lower río Mamoré in the province of Beni in Bolivia. Confirmed collecting sites are situated between the drainage of the río Yata in the west (Laguna Larga and Laguna Piranha in the northwest of Santa Ana de Yacuma) and the drainage of the río Itonamas (Laguna Mapawa in the north of Magdalena) in the east of Bolivia. In addition the species is also said to be exported for the aquarium hobby from the Lago das Cobras in the drainage of the Río Pacaás Novos in the southeast of the town Guajará-Mirim in the state of Rôndonia in Brazil (Koslowski, 2002).



Fig. 3. Adult male of *Apistogramma erythrura* sp. n. (phenotype RWP; see Tab. 2) from type locality photographed in aquarium.



Fig. 4. Adult male of *Apistogramma erythrura* sp. n. (phenotype HYP; see Tab. 2) from type locality photographed in aquarium.

Ecological notes. All our collecting sites of *Apistogramma erythrura* are typical clear-water habitats with acid, very soft transparent and colourless water. The following water data were gathered in July, Au-



Fig. 5. Adult female of *Apistogramma erythrura* sp. n. from type locality photographed in aquarium.



Fig. 6. Adult female of *Apistogramma erythrura* sp. n. from type locality during brood care in aquarium.

gust or September of different years at the localities above mentioned: pH 5.2–6.4; electrical conductivity <10–20 μS/cm; total and temporary hardness < 1 °dH; water temperature 25.1–31.0 °Celsius.



Fig. 7. Collecting sites of *Apistogramma erythrura* sp. n. in the Laguna Mapawa, drainage of the río Itonamas, approx. 30 km north of Magdalena.

The fish were exclusively collected in dense macrophyte vegetation along the banks of lakes and sometimes small rivulets. *Apistogramma erythrura* is most abundant in floating meadows where the fish hide inside the dense carpet of large crops of *Eichhhornia azurea* mixed with floating *Paspalum repens, Cabomba furcata* or *Utricularia* spp. When scared they jump out of the water and often lie motionless for ten or twenty seconds on the surface of emersed leaves of the vegetation. In a few cases the dwarf cichlids were also found in extremely shallow water in the submerged grass-like terrestrial vegetation extending into the water or in a layer of dead leaves covering the bottom of the bank side.

According to our under water field observations in the floating meadows the associated fish fauna includes *Moenkhausia australis*, *Hyphessobrycon elachys, Hyphessobrycon meglopterus, Hyphessobrycon herbertaxelrodi, Nannostomus trifasciatus* and *Nannostomus unifasciatus*. In the adjacent deeper water the cichlid *Mesonauta festivus* was observed.

Intestinals (length about 75 % of SL) of three specimens (20.9-30.8 mm SL) from the Laguna Larga were used for diet analyses. Arrangement of the stomach-intestinal tract is similar to stage C in ZIHLER (1982). In stomachs and adjacent intestines anomopod cladocera were the dominant food item. A few copepoda, some mites (acari) and different insect larvae (nematocera and other not identified insects) were additional major food matter. These observations suggest that *Apistogramma erythrura* feeds mainly on small autochthonous invertebrates.

Reproductive behaviour. Observations under aquarium conditions revealed *Apistogramma erythrura* to be a polygynous secretive spawner. Males defend a territory containing several potential spawning sites. Each of them may serve as the focus of a smaller territory occupied by a female. Like most cave brooders these dwarf cichlids place their eggs on the bottom side of a horizontal surface. The preferred spawning site is the underside of a stout plant leaf.

At 27 °Celsius hatching occurs about three days postspawning, and the fry attempt swimming approximately five days thereafter. After spawning the female drives the male energetically from the close proximity of the spawning site. Parental care is exclusively maternal in this species, although the male may indirectly assist by defending the territory against predators.

Discussion

Apistogramma erythrura is most similar to *A. trifasciata* (EIGENMANN & KENNEDY, 1903). KULLANDER (1982, 2003) tentatively synonymized *Heterogramma*

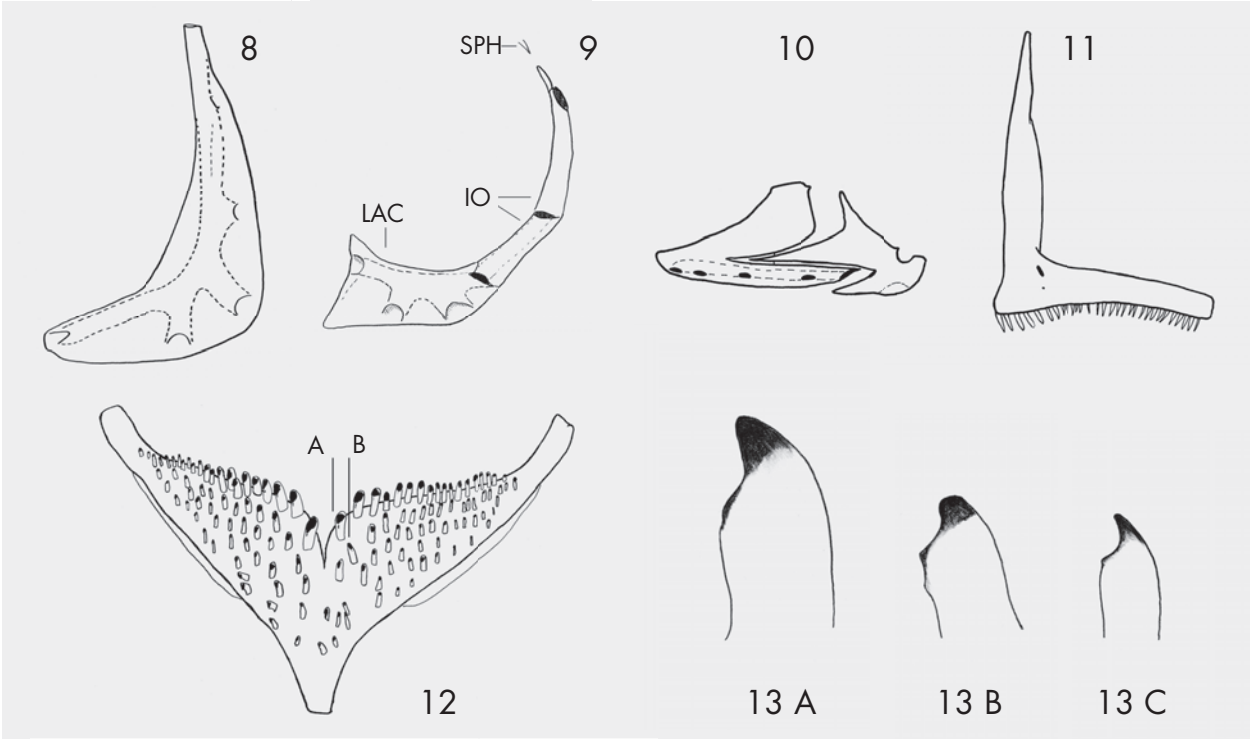


Fig. 8. Lateral view of left preopercle (smooth posterior margin on the right) of *Apistogramma erythrura*.

Fig. 9. Left suborbital series of *Apistogramma erythrura* sp. n. **IO =** infraorbitals, **LAC** = Lacrymal bone, **SPH** = tip of sphenotic.

Fig. 10. Lower jaw (lateral view) of *Apistogramma erythrura* sp. n.

Fig. 11. Premaxilla (lateral view) of *Apistogramma erythrura* sp. n.

Fig. 12. Lower pharyngeal tooth-plate of *Apistogramma erythrura* sp. n.; A and B indicate teeth pictured in Fig. 13A & 13B.

Figs. 13 A–C. Selected teeth (medial aspect) of lower and upper pharyngeal tooth-plate of *Apistogramma erythrura* sp. n.; **A** and **B** are in correspondence with indicated teeth of lower pharyngeal tooth-plate in Fig. 12; **C** = largest tooth of 3rd pharyngobranchial.

trifasciatum maciliense Haseman, 1911 and *Apistogramma trifasciatum haraldschultzi* Meinken, 1960, which both were described from the río Guaporé, with *Apistogramma trifasciata*.

Apistogramma trifasciata haraldschultzi was based on aquarium material. According to Meinken (1960) in alcohol preserved specimens of this dwarf cichlid possess an oblique dark stripe between the pectoral axilla and the origin of the anal fin ("Eine dunkle, schräge Binde vom Kiemendeckel zum Ansatz der der Afterflosse, wie sie die Spritexemplare als typisches Farbmerkmal aufweisen…"). This oblique stripe is unique in the genus and a diagnostic feature of *Apistogramma trifasciata,* but never visible on live or preserved specimens of *Apistogramma erythrura*.

The syntypes of *Apistogramma trifasciata maciliensis* (Haseman, 1911) are in a rather poor conditions, for they have the fins partly damaged and are almost completely discoloured (cf. http://research.calacademy.org/Image_db/IchTypes/Photo/Med/33722-p.jpg). There are also no traces of the dark markings pictured in the original description by Haseman (1911: plate LXII, fig. 2). However, Haseman (1911) describes that in the type series of *A. trifasciata maciliensis* the largest of the four fishes, which has a length of 31 mm, has the colour pattern ("a very faint stripe from the pectorals to the anal") and fin shape characterizing *Apistogramma trifasciata*. Hence, in agreement with Kullander (1992, 2003) and Koslowski (2002) we treat both, *Heterogramma trifasciatum maciliense* Haseman, 1911 and *Apistogramma trifasciatum haraldschultzi* Meinken, 1960 as synonyms of *A. trifasciata* (Eigenmann & Kennedy, 1903).

The development of the oblique dark stripe from the pectoral to the origin of the anal fin in *Apistogramma trifasciata* depends on collecting site, mood, size and age (Haseman, 1911; Koslowski 2002; pers. obs.). In live and preserved specimens of *Apistogramma trifasciata* from the drainage of the lower río Yata in the vicinity of Riberalta the stripe is very faint or in some specimens even missing. Nevertheless this marking is a diagnostic feature distinguishing adult specimens of *Apistogramma trifasciata* from all its congeners.

Apistogramma erythrura differs from *A. trifasciata* by a slightly deeper body (body depth 34–38%, mean

36.1% of SL in adult males of *A. erythrura* vs. 32–34%, mean 33.4% of SL in the comparative material of *A. trifasciata*), absence of any abdominal markings below the lateral band (vs. dark oblique stripe from lower margin of pectoral fin to anal-fin origin), reduction of infraorbital stripe to a black spot on the lower posterior edge of the gill cover in breeding females (KOSLOWSKI, 2002) or to a bright red spot in some males (vs. no reduction of infraorbital stripe), the at least partly bright red caudal fin in the majority of adult males and by a broader lateral band that widens posteriorly to a height of at least two and a half scale rows (vs. max. height one and a half to two scales) and usually covers almost the whole caudal peduncle.

The relationships of *Apistogramma erythrura* and *A. trifasciata* with their congeners are not clear, for there are several possible relationship hypotheses (KULLANDER, 1982; KOSLOWSKI, 2003; RÖMER, 2006). With regard to derived character states (e. g. pronounced sexual dimorphism and dichromatism, 2 postlacrymal infraorbital lateralis canal pores, produced anterior dorsal-fin membranes in males) the similarity of both seems strongest with species of the *Apistogramma cacatuoides* and *Apistogramma nijsseni* species groups (KOSLOWSKI, 2003; RÖMER, 2006). But unlike most of those species *Apistogramma erythrura* and *A. trifasciata* have a rounded caudal fin (vs. produced marginal caudal fin rays). Only four species of theses two species groups also have a rounded caudal fin and produced anterior dorsal-fin membranes, viz. *Apistogramma atahualpa* RÖMER, 1997, *A. baenschi* RÖMER *et al*., 2004, *A. norberti* STAECK, 1991 and *A. rositae* RÖMER *et al*., 2006. Apart from other character states *Apistogramma erythrura* differs from them in the absence of conspicuous dark dorsal markings, vertical bars and a wide suborbital stripe. In contrast to the occurrence of *Apistogramma erythrura* the distribution of these four species is restricted to the upper drainages of the Amazon river in Peru.

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References

CASCIOTTA, J. R. & G. ARRATIA (1993): Jaws and teeth of American Cichlids (Pisces: Labroidei). – Journal of Morphology, **217**: 1–36.

HASEMAN, J. D. (1911): An annotated catalog of the cichlid fishes collected by the expedition of the Carnegie Museum to central South America, 1907-1910. – Annals of the Carnegie Museum, **7**(3-4): 329–373.

KOSLOWSKI, I. (2002): Die Buntbarsche Amerikas. Band 2 – Apistogramma & Co. Ulmer Verlag, Stuttgart, 318 pp.

KULLANDER, S.O. (1980): A taxonomical study of the genus *Apistogramma* Regan, with a revision of Brazilian and Peruvian species (Teleostei: Percoidei: Cichlidae). – Bonner Zoologische Monographien, No. **14**: 1–152.

KULLANDER, S.O. (1982): Cichlid fishes from the La Plata Basin. Part IV. Review of the *Apistogramma* Species, with description of a new Species (Teleostei, Cichlidae). – Zoologica Scripta, **11**(4): 307–313.

KULLANDER, S.O. (1986): Cichlid fishes of the Amazon River Drainage of Peru. – Swedish Museum Natural History. Stockholm, 431 pp.

KULLANDER, S. O. (1990): *Mazarunia mazarunii* (Teleostei: Cichlidae), a new genus and species from Guyana, South America. – Ichthyological Exploration of Freshwaters, **1**(1): 3–14.

KULLANDER, S.O. (2003): Family Cichlidae (Cichlids), in REIS, R.E., S.O. KULLANDER & C.J. FERRARIS, Jr. (eds.): Check List of the Freshwater Fishes of South America and Central America: 605–654. – EDIPUCRS, Porto Alegre, Brazil.

KULLANDER, S.O. & NIJSSEN, H. (1989): The Cichlids of Surinam. – Leiden. Brill, 256 pp.

KULLANDER, S.O. & E. J. G. FERREIRA (2005): Two new species of *Apistogramma* Regan (Teleostei: Cichlidae) from the rio Trombetas, Pará State, Brazil. – Neotropical Ichthyology, **3**(3): 361–371.

MEINKEN, H. (1960): *Apistogramma trifasciatum haraldschultzi* subspec. nov. – Aquarien Terrarien **7**(10): 291–294.

RÖMER, U. (ed.) (2006): Cichlid Atlas 2. – Mergus Verlag. Melle, 1319 pp.

STAECK, W. (1996): Neu importiert: *Apistogramma* aus dem Mamoré. – Die Aquarien- und Terrarien Zeitschrift, **49**(9): 548–549.

STAECK, W. (2003a): Südamerikanische Zwergbuntbarsche, Cichliden-Lexikon, Teil 3. – Dähne Verlag. Ettlingen, 219 pp.

STAECK, W. (2003b): Zum Polychromatismus von Zwergcichliden der Gattung A*pistogramma*. – Aquaristik aktuell, **11**(1): 62–67.

STAECK, W. (2007): Neue Farbvariante von *Apistogramma resticulosa* aus Bolivien. – Aquaristik Fachmagazin, **39**(5): 30–31.

STAECK, W. (2008): Neue Nachweise für Zwergbuntbarsche in Bolivien. – Aquaristik Fachmagazin, **40**(4): 100.

STAECK, W. & H. LINKE (2006): Amerikanische Cichliden I: Kleine Buntbarsche. – Tetra Verlag. Berlin-Velten, 296 pp.

ZIHLER, F. (1982): Gross Morphology and configuration of digestive tracts of Cichlidae (Teleostei, Perciformes): phylogenetic and functional significance. – Netherlands Journal of Zoology, **32**: 544–571.