Apistogramma cinilabra sp. n.: Description of a potentially endangered endemic cichlid species (Teleostei: Perciformes: Cichlidae) from the Departamento Loreto, Peru*

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> Abstract

A new species of *Apistogramma* is described from Peru, based on a total of 35 specimens collected in a small forest lake in the wider catchment of the Rio Itaya about 80 kilometres south of Iquitos, Departamento Loreto (approximately 73°35′W / 04°24′S). *Apistogramma cinilabra* sp. n. is separated from all other *Apistogramma* species by the combination of (in adult males) strikingly red base of pectoral, red spots on chest, (in aggression and display) light ash-grey lips, exceptionally short caudal peduncle, and disproportionately deep body. *Apistogramma cinilabra* sp. n. is thought to be a representative of the *Apistogramma eunotus* complex within the *Apistogramma regani* lineage.

> Resumen

Una nueva especie de *Apistogramma* esta descrita del Perú, sobre la base de un total de 35 muestras colectadas en una pequeña cocha en la cuenca del Rio Itaya, a unos 80 kilómetros al Sur de Iquitos, Departamento de Loreto (aproximadamente 73°35′W / 04°24′S) . *Apistogramma cinilabra* sp. n. está diferenciada de todas las otras especies de *Apistogramma* por la combinación -en los machos adultos- de aletas pectorales con borde rojo vivo y puntos rojos en el pecho, de los labios brillantes grises ceniza en postura agresiva en y cortejo, de un pedúnculo caudal excepcionalmente corto y de un cuerpo exageradamente alto. Se piensa que *Apistogramma cinilabra* sp. n. es un representante del complejo *Apistogramma-eunotus* a dentro del la linea systematico del *Apistogramma regani*.

> Kurzfassung

Eine neue *Apistogramma*-Art wird auf Basis von 35 Exemplaren beschrieben, die aus einem kleinen Urwaldsee im weiteren Einzugsgebiet des Rio Itaya etwa 80 Kilometer südlich von Iquitos, Departamento Loreto, Peru (nahe 73°35′W / 04°24′S) stammen. *Apistogramma cinilabra* sp. n. ist von allen anderen *Apistogramma*-Arten durch die Kombination von bei adulten Männchen auffälliger tiefroter Basis der Pectorale, roter Fleckenzeichnung auf der Brustregion, in Aggression und Balzstimmung hell aschgrauen Lippen, ungewöhnlich kurzer Schwanzwurzel und überproportional hohem Körper unterschieden. *Aposto-*

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gramma cinilabra sp. n. ist ein Vertreter des *Apistogramma-eunotus*-Komplexes innerhalb der *Apistogramma-regani*-Linie.

> Key words

Endangered species, endemism, ecology, freshwater, Neotropics, Rio Itaya System, new taxa, systematics

Introduction

In recent years numerous new *Apistogramma* species have been discovered from Peru, mostly taxa from the *Apistogramma cacatuoides* and *Apistogramma nijsseni* phylogenetic groups. Species related to *Apistogramma eunotus* have also become known to aquarists as well as scientists, but gained far less attention than other phylogenetic groups within the genus from this region.

During 2010 members of the LABORATOIRE MIXTE INTERNATIONAL (LMI), headed by IRD (INSTITUT DE RECHERCHE POUR LE DÉVELOPPEMENT), and IIAP (INSTITUTO DE INVESTIGATIONES DE LA AMAZONIA PERUANA), had the opportunity to visit several *Apistogramma* habitats in Peru and collect several species of these small neotropical cichlids there. During these activities Edgard PANDURO NORONHA (ORNAMENTAL AMAZON FISH AQUARIUM, Iquitos) indicated that a new species of *Apistogramma*, provisionally called *Apistogramma* sp. Roterpunkt by local fishermen, had been found in a small lake in the rainforest south of Iquitos. During two visits to this "*cocha*" we were able to collect sufficient material for ichthyological, behavioural, and genetic studies of this species. In this paper, one of the first results of our studies, we present the formal description of the 70th valid species of the genus *Apistogramma*.

Methods

Methods for counts and measurements are as detailed in RÖMER (2006), RÖMER & HAHN (2008), and RÖMER *et al*. (2003, 2004, 2006) except where otherwise stated. GPS locality data were taken using a GPSmap 76 CSx (Garmin Int. Inc., Lenexa, USA). Preservation of all specimens followed the "low temperature preservation protocol" (LTPP) described in detail by RÖMER & HAHN (2008). Fish were preserved in the laboratory after observing behaviour and colour patterns of specimens collected. Observations were made to ensure to the best possible standard that the sample used in this study is monospecific (for reasons see discussion). The description of preserved specimens is based on the holotype, supplemented by observations on all paratypes. Frequent problems occurred during examination of the black colour patterns of preserved specimens, as the abdomens of specimens preserved in the field were in most cases covered with a more or less intense white layer of preserved mucus. In such cases the black pattern may be masked and only partially visible during inspection. To solve this problem we modified a cleaning procedure for preserved fish originally described in detail by PIECHOCKI (1986), to get a better impression of the coloration of the abdominal and head regions. During "brushing" (as we term this process) the left side of all fish preserved in Peru was cleaned by carefully rubbing off the whitish layer of mucus with a soft (tooth) brush a few days after final preservation in 75 % ethanol. The right side of the body remained untreated, as examination of the mucus layer might prove necessary later on. Brushing made the black and brownish pattern clearly visible in all specimens treated (fig.1). The procedure is time-consuming, but is not usually necessary in specimens that have been cooled down slowly in the laboratory following the LTPP. The "mucus effect" usually appears only if the temperature drops too fast during LTPP.

As we are basically following the morphological-genetic cluster concept (M/GC) for species delimitation (*cf*. SITES & MARSHALL, 2004; also DAVIS & NIXON, 1992; WIENS & SERVEDIO, 2000), comparative statistical analysis of all data was performed using the PC program Statistica 6.0 for Windows (StatSoft Inc., Tulsa, USA). DNA samples were taken immediately after preserving the specimens by clipping the complete right pectoral fin, which is therefore missing in all voucher specimens. DNA samples were preserved and stored as described in RÖMER *et al*. (2010). Photographs of all specimens have been taken under standardised conditions: digital camera (Nikon D300; AF MicroNikkor, 60 mm, 1:2.8, stative), integrated flash, TTL mode, 1/60 sec., f.18, ISO 100; data storage: RAW file, maximum resolution. Specimens were placed in a small tank with a blue bottom covered by a 6 mm glass pane. Photos were taken of voucher specimens completely immersed in 95 % ethanol. Gill rakers and pharyngeal elements have been excluded from this study, as these form part of further investiga-

tions in progress. The description of live coloration of this species is based on observation and photographs of the type material taken in aquaria at the IIAP in Iquitos shortly before preservation, as well as of some specimens collected together with the type specimens and exported alive to Germany. Römer (2000, 2006) and Römer *et al*. (2003, 2004, 2006) have explained at length the reasons for giving precise descriptions of live coloration in *Apistogramma* species.

Apistogramma cinilabra sp. n.

Type material: 35 specimens.

Holotype: (figs. 1 & 4–5) MUSM 39908, male, 53.7 mm SL, collected in a small *cocha* (lake) approximately 78 km south of Iquitos, about 1 km west of the road from Iquitos to Nauta, Departamento Loreto, Peru (04°00′46.2 S / 73°27′47.7 W), November 27th 2010, by François Bonhomme, Catalina Diaz Catchai, Fabrice Duponchelle, Gaillermo Huaratopohino Eanyo, Roger Mori Tamani, Jean-François Renno, and Uwe Römer. **Paratypes:** (figs. 2–3 & 20–21) 11 specimens: MUSM 39909, 1 male, 35.9 mm SL, 1 female, 33.2 mm SL; MUSM 39910, 1 male, 39.6 mm SL, 1 female, 34.5 mm SL; CAS 231138, 1 male, 35.1 mm SL, 1 female, 33.8 mm SL; CAS 231139, 1 female, 33.8 mm SL; FMNH 119706, 1 male, 34.4 mm SL; MTD F 32359, 1 female, 34.7 mm SL; MTD F 32360, 1 male, 33.8 mm SL; MTD F 32361, 1 female, 35.8 mm SL, cleared & stained; all specimens collected at the same location as given for the holotype, May 15th 2010, by Fabrice Duponchelle, François Kervarec, Roger Mori Tamani. 23 specimens: MUSM 39911, 2 males, 39.4–45.1 mm SL, 1 female, 28.7 mm SL; MUSM 39912, 2 males, 28.4 mm–31.5 mm SL, 1 female, 39.2 mm SL; CAS 231140, 2 males, 44.2 mm – 31.8 mm SL, 1 female, 39.9 mm SL; FMNH 119705, 1 male, 36.1 mm SL, 1 female, 30.6 mm SL; FMNH 119707, 1 female, 34.0 mm SL; MTD F 32362, 1 male, 45.9 mm SL, 1 female, 32.4 mm SL; MTD F 32363**,** 1 male, 25.6 mm SL, 1 female, 37.9 mm SL**;** MTD F 32364, 1 male, 27.3 mm SL, cleared & stained; MTD F 32365, 1 male, 28.2 mm SL, cleared & stained; MTD F 32366, 1 female, 33.0 mm SL, cleared & stained; MTD F 32367, 1 male, 37.2 mm SL, 1 female, 35.9 mm SL; MTD F 32368**,** 1 male, 49.9 mm SL, 1 female, 35.4 mm SL; collection data for all specimens as given for the holotype.

Comparative material. As listed in Römer (1994, 1997, 2006), Römer & Hahn (2008), Römer & Warzel (1997), and Römer *et al*. (2003, 2004, 2006).

Diagnosis. *Apistogramma cinilabra* sp. n. can be distinguished from all other *Apistogramma* species known to date on the basis of the combination of the following characters: adult males with striking bright red-orange base of pectoral fins; red markings on chest, gill covers, and (in very large specimens) cheek; extremely short caudal peduncle (only approximately 10 % of SL); light ash-grey lips in live aggressive or displaying specimens; (4 to) 5 single scale lateral spots on longitudinal lateral band occupying intervals between vertical bars when latter completely faded (reverse pattern), and upright oval spot covering almost complete height of caudal peduncle.

Apistogramma cinilabra sp. n. is a moderately large (males up to 54 mm, females to 40 mm SL), high-backed, laterally compressed, only slightly elongate *Apistogramma* species with a rather robust body, exhibiting pronounced sexual size dimorphism and sexual dichromatism. This new species exhibits no reduction in the number of head pores. Caudal fin rounded (even in largest males), immaculate in females and most smaller males, with two to three central vertical lines of faint, inconspicuous, hyaline spots (in very large males only), more frequently with light orange sheen on unscaled distal part. Caudal-peduncle spot upright oval, narrow, covering about three quarters to full height of caudal peduncle, height about one quarter less in females. Lateral band, easily one scale wide, slightly wider in caudalmost part, extending to vertical band 7 and terminating clearly before caudal-peduncle spot. Most adult females with roundish caudal spot, some with unique black pattern on caudal base: caudal spot merging into partially reduced vertical bar 7, forming double spot on caudal peduncle and caudal-fin base. In aggression this spot pronounced silvery white contrasting with intensified black lateral band. Adult females with lateral band reduced to up to six lateral spots, partially black chest, and midventral stripe.

Description: Morphological characters: (n = 35; 25.6 to 53.7 mm SL); (for biometric data see tables 1 & 2, for morphometric data see table 3).

Habitus (figs. 1–28): Body moderately elongate in small males and females and (especially in larger specimens) strikingly deep (33.2 to 43.1 % SL, mean 37.0 % SL), strongly compressed laterally, about twice as deep as wide, head moderately long (33.7 to 40.8 % SL, mean 35.7 % SL), caudal peduncle extremely short (7.1 to 12.4 % SL, mean 9.5 % SL), these proportions in combination giving this species an impressively robust appearance. No statistically significant meristic differences in morphometrics between sexes except size of adult males usually about 20 % greater than that of females. With increasing size, value of pre-dorsal length relative to SL is reduced, relative values of head depth, cheek depth, and length of dorsal fin base increase. Upper head profile regularly convex, continuous with upper contour of body to distal end of dorsal-fin base, degree of curvature increasing progressively with increasing size of specimen; lower head profile strongly convex in very large males, only slightly in most medium to large males and some larger females, virtually straight from lip

Fig. 1. *Apistogramma cinilabra* sp. n., holotype, MUSM 39908, male, 53.7 mm SL, *top*: three weeks after preservation, before brushing (for explanation see text); *bottom:* 3 months after preservation, brushed.

to posterior margin of lower jaw in most smaller and some medium-sized specimens. Mouth terminal, tip of snout rounded, appearing slightly pointed in some larger males, jaws not enlarged; lips not hypertrophied; maxillary extending to point in front of vertical below frontal margin of eye; eye relatively large for species of this phylogenetic group (diameter 11.2 to 14.1 % SL, mean 12.3 % SL); cheek completely scaled, scale pattern at first sight comparable to that given for *Apistogramma cruzi* in KULLANDER (1986, fig. 51), but significantly more developed, more scales covering cheeks forward to close to posterior angle of jaw; 5 dentary and 4 infraorbital pores; gill covers completely scaled. Ventral [V I.4 (n = 1), V I.5 (n = 34)] pointed, slightly prolonged in smaller individuals, extending to base of caudal fin in adult males. Pectoral [11 (n = 1), 12 (n = 32], 13 (n = 2] rounded, extending back to above base of third anal-fin spine in adult males, back to anal opening to base of first anal-fin spine in females. Dorsal fin [D. XIV.8 (n = 2), XV.6.i (n = 1), XV.7 (n = 5), XV.7.i (n = 7), XV.8 (n = 9), XVI.6 (n = 2), XVI.7 (n = 7), XVI.8 (n = 2)] with spines increasing in length from D1 to last, but significantly less from D5 or D6, last dorsal spine normally longest; in large males dorsal membranes slightly pointed and slightly prolonged past tips of spines; in adult males extensions of membranes from D2 to D4 about 30 % longer than spines, from D5 to D15

Table 1. Biometric data of *Apistogramma cinilabra* sp.n. type specimens (as % of SL; SL given in mm).

		all specimens						females						males					abbreviations
	HT	**(n)**	**mean**	**min.**	**max.**	**st.dev.**		**(n)**	**mean**	**min.**	**max.**	**st.dev.**		**n)**	**mean**	**min.**	**max.**	**st.dev.**	HT = Holotype / PT = Paratype
SL	53.7	35	35.9	25.6	53.7	6.15		16	34.6	28.7	39.9	2.90		19	37.0	25.6	53.7	7.85	standard length
TL	73.9	34	135.6	130.3	141.6	2.85		19	136.5	131.7	141.6	2.76		15	134.4	130.3	139.5	2.58	total length
TLS	73.9	34	135.6	130.3	141.6	2.82		19	136.5	131.7	141.6	2.73		15	134.4	130.3	139.5	2.58	total length plus streamer
HL	19.7	35	35.7	31.7	40.8	1.83		19	36.0	32.1	38.3	1.50		16	35.4	31.7	40.8	2.17	head length
HD	17.7	35	28.7	25.0	33.0	1.84		19	29.2	26.2	33.0	1.95		16	28.2	25.0	31.2	1.59	head depth
BD	23.2	35	37.0	33.2	43.1	2.42		19	37.4	34.0	43.1	2.43		16	36.5	33.2	41.7	2.39	body depth
HW	10.9	35	18.5	15.6	21.5	1.51		19	18.5	16.6	20.7	1.39		16	18.5	15.6	21.5	1.70	head width
PDL	18.9	35	36.0	32.3	39.6	1.42		19	36.1	32.3	39.6	1.72		16	35.9	34.2	38.5	1.00	pre-dorsal length
TDL	49.8	35	91.1	86.7	94.4	1.80		19	91.5	88.6	94.4	1.49		16	90.5	86.7	93.0	2.01	trans-dorsal length
PVL	21.4	35	42.5	38.0	50.4	2.59		19	42.8	38.0	50.4	2.78		16	42.2	38.1	46.5	2.39	pre-pelvic length
PAL	37.7	35	77.5	73.4	82.0	1.73		19	77.4	74.0	79.6	1.51		16	77.6	73.4	82.0	2.01	pre-anal length
TAL	48.9	35	89.8	85.9	93.6	1.62		19	89.8	85.9	93.6	1.50		16	89.8	86.7	92.3	1.80	trans-anal length
Eye	6.7	35	12.3	11.2	14.1	0.67		19	12.3	11.2	13.3	0.65		16	12.2	11.3	14.1	0.70	eye diameter
SNL	4.5	35	9.4	6.6	11.6	1.18		19	9.5	7.8	11.6	1.08		16	9.2	6.6	11.4	1.29	snout length
CHD	6.4	35	8.3	6.9	12.0	1.21		19	8.6	7.2	12.0	1.33		16	8.1	6.9	10.1	1.03	cheek depth
POD	2.5	35	3.1	2.5	4.6	0.50		19	3.1	2.5	4.6	0.51		16	3.2	2.6	4.1	0.51	pre-orbital depth
IOW	5.4	35	8.4	6.5	10.3	0.79		19	8.6	7.5	10.3	0.82		16	8.2	6.5	9.7	0.73	inter-orbital width
UJL	6.0	35	9.5	7.3	11.4	0.92		19	9.6	8.5	11.4	0.94		16	9.4	7.3	10.8	0.90	upper jaw length
LJL	7.3	35	12.5	9.1	14.5	1.00		19	12.4	9.1	14.5	1.15		16	12.6	10.3	14.2	0.82	lower jaw length
CPD	9.3	35	16.2	14.7	18.1	0.73		19	16.4	15.4	18.1	0.72		16	16.0	14.7	17.1	0.69	caudal peduncle depth
CPL	3.8	35	9.5	7.0	12.4	1.30		19	9.7	7.0	12.4	1.36		16	9.2	7.1	12.4	1.21	caudal peduncle length
DFB	35.3	35	59.3	38.8	65.7	4.30		19	59.2	38.8	65.7	5.53		16	59.5	54.4	62.4	2.29	dorsal fin base length
AFB	11.7	35	20.6	18.3	22.9	1.24		19	21.0	18.8	22.9	1.00		16	20.2	18.3	22.8	1.42	anal fin base length
PecL	19.6	33	31.9	20.6	36.6	2.83		18	32.3	20.6	36.6	3.48		15	31.5	28.9	34.1	1.81	pectoral fin length
PelL	19.1	34	31.4	24.6	42.8	3.87		19	32.4	26.5	42.8	4.23		15	30.1	24.6	34.7	2.99	pelvic fin length
PelSL	9.8	35	15.9	13.1	19.0	1.22		19	16.2	14.2	19.0	1.20		16	15.6	13.1	17.4	1.18	pelvic fin spine length
LDS	9.1	35	17.2	11.2	20.9	1.89		19	17.8	14.2	20.9	1.76		16	16.6	11.2	19.2	1.91	last dorsal spine length
LAS	10.6	35	17.3	14.0	19.8	1.36		19	17.5	14.9	19.8	1.39		16	1.70	14.0	18.9	1.33	last anal spine length

Table 2. Biometric data taken from *Apistogramma cinilabra* sp. n. type specimens (given in mm; for abbreviations see table 1).

Coll.No.	Sex	Status	SL	TL	TLS	HL	HD	BD	HW	PDL	TDL	PPL	PAL	TAL	Eye	SNL	CHD	POD	IOW	UJL	LJL	CPD	CPL	DFB	AFB	PecL	PelL	PelSL	LDS	LAS
MUSM 39908	m	HT	53.7	73.9	73.9	19.7	17.7	23.2	10.9	18.9	49.8	21.4	37.7	48.9	6.7	4.5	6.4	2.5	5.4	6.0	7.3	9.3	3.8	35.3	11.7	19.6	19.1	9.8	9.1	10.6
MTD F 32368	m	PT	49.9	70.6	70.6	16.9	14.5	18.5	9.1	16.1	44.2	22.4	34.5	44.9	5.6	4.6	5.1	1.5	4.3	5.3	6.5	8.1	5.5	19.4	11.4	16.7	17.0	8.0	10.4	9.7
MTD F 32362	m	PT	45.9	63.2	63.2	15.9	14.1	18.4	7.77	16.1	41.8	18.5	32.0	40.8	5.5	4.3	3.9	1.5	3.8	4.0	5.45	7.6	4.5	29.1	9.7	15.0	16.3	7.8	9.1	7.9
MUSM 39911	m	PT	45.1	62.7	62.7	16.5	13.5	18.2	8.17	15.5	41.9	20.3	32.2	40.7	5.3	5.1	4.0	1.4	3.7	5.2	6.5	7.5	3.9	28.0	9.4	14.2	19.3	7.3	8.8	7.6
CAS 231140	m	PT	44.2	62.2	62.2	15.8	14.0	18.4	7.7	15.9	40.4	18.4	31.3	39.1	5.7	3.5	4.4	1.9	3.8	3.8	5.0	8.0	4.3	27.4	10.1	15.4	15.4	7.3	8.3	8.5
CAS 231140	f	PT	39.9	52.6	52.6	13.9	11.4	15.3	8.2	14.2	35.5	15.9	28.1	34.8	4.8	3.9	3.4	1.6	3.1	3.1	5.0	6.5	5.0	24.3	7.7	12.8	13.6	5.2	6.6	6.6.
MUSM 39910	m	PT	39.6	53.6	53.6	14.0	10.9	14.5	7.5	14.1	35.4	20.0	28.1	35.5	4.8	4.4	3.2	1.2	3.9	4.3	5.3	6.4	3.8	22.8	7.9	12.9	1.5	5.7	7.8	7.1
MUSM 39911	m	PT	39.4	53.7	53.7	14.6	12.4	14.7	7.7	14.2	36.1	16.9	28.1	35.7	5.15	4.0	3.3	1.1	3.3	3.38	5.3	6.1	4.0	24.1	8.2	12.6	12.8	6.6	6.9	6.4
MUSM 39912	f	PT	39.2	53.0	53.0	14.0	12.1	16.1	7.5	14.2	36.3	15.7	28.4	35.8	5.6	3.0	3.2	1.6	3.3	3.55	5.0	6.7	3.6	24.4	7.7	11.5	12.9	6.0	6.0	7.4
MTD F 32363	f	PT	37.9	49.4	49.4	13.0	10.5	14.1	6.7	12.9	34.0	15.3	26.8	33.5	4.6	3.9	3.8	1.5	3.1	3.5	4.8	6.0	3.9	22.9	7.4	11.9	11.1	5.5	4.2	6.1
MTD F 32367	m	PT	37.2	49.5	49.5	13.1	10.3	13.8	7.7	13.8	34.1	16.6	26.6	33.7	4.36	3.7	2.9	1.2	3.2	3.3	4.2	5.9	3.8	21.5	7.8	13.3	13.1	5.9	5,3	5.5
FMNH 119705	m	PT	36.1	49.7	49.7	13.4	9.6	13.1	6.1	13.1	32.9	14.9	25.6	32.8	4.6	4.2	3.9	1.0	2.7	3.1	4.4	6.3	4.4	21.5	7.7	9.8	11.8	5.7	6.0	5.7
MUSM 39909	m	PT	35.9	49.1	49.1	13.6	9.6	13.2	6.57	12.4	32.8	15.0	25.2	32.2	4.7	3.5	2.8	1.0	2.7	3.7	4.3	5.7	3.0	21.6	7.8	11.8	11.4	5.1	7.2	6.4
MTD F 32367	f	PT	35.9	48.0	48.0	14.7	10.1	12.2	6.6	13.8	33.2	16.7	25.6	32.8	4.5	3.4	2.7	1.1	3.1	3.4	4.5	5.9	3.3	20.9	7.4	12.0	8.9	6.2	6.2	6.5
MTD F 32361	f	PT	35.8	def.	def.	11.4	9.0	12.3	6.0	12.9	31.0	13.6	23.9	32.9	4.2	3.2	2.5	1.1	2.3	3.1	4.2	5.4	3.3	19.5	7.8	def.	def.	5.1	5.9	5.7
MTD F 32368	f	PT	35.4	46.3	46.3	12.2	9.9	12.5	6.9	12.6	32.5	15.1	25.7	31.7	4.0	4.0	3.1	0.9	2.9	2.6	3.7	5.4	3.2	21.5	6.8	11.7	10.4	5.4	4.9	4.9
CAS 231138	m	PT	35.1	48.2	48.2	12.9	10.4	12.7	6.7	13.9	32.0	15.1	23.6	31.3	4.7	3.3	2.6	1.0	3.0	3.4	4.4	5.7	3.4	20.6	7.5	12.0	11.9	6.1	6.9	6.7
MTD F 32359	f	PT	34.7	47.5	47.5	12.9	10.1	12.6	6.6	12.7	31.8	15.1	24.7	31.3	4.1	3.4	3.1	1.2	3.0	3.5	4.6	5.6	3.2	20.9	7.0	11.8	11.1	6.0	6.3	6.3
MUSM 39910	f	PT	34.5	48.2	48.2	13.6	10.1	13.1	7.0	12.7	32.1	15.7	25.7	31.9	4.2	3.3	3.3	1.0	2.9	3.4	4.4	5.4	3.2	20.6	6.5	11.6	12.0	5.7	6.1	5.6
FMNH 119706	m	PT	34.4	47.5	47.5	12.4	10.1	13.0	6.9	11.9	32.4	14.9	24.6	32.2	4.0	3.4	2.9	1.0	2.8	3.6	4.3	5.7	2.5	21.5	7.2	11.3	13.1	6.5	5.8	6.2
FMNH 119707	f	PT	34.0	45.0	45.0	11.8	8.8	11.5	5.7	12.4	30.6	15.2	23.8	29.5	3.95	3.6	2.56	1.1	2.7	3.1	3.9	5.0	3.2	19.6	6.2	10.5	8.8	4.9	5.8	5.3
CAS 231139	f	PT	33.8	45.5	45.9	11.7	9.4	12.2	6.8	11.9	31.1	14.7	23.4	30.4	4.4	3.0	2.4	1.0	2.9	3.2	4.3	5.5	3.0	20.5	7.3	9.8	967	5.5	5.7	5.6
CAS 331138	f	PT	33.8	45.2	45.2	11.6	9.1	11.2	5.3	12.0	29.9	13.9	23.2	30.5	4.2	3.3	2.4	0.9	2.5	3.5	4.3	5.1	3.35	19.0	7.5	10.0	9.6	5.6	6.2	6.1
MTD F 32360	m	PT	33.8	44.9	44.9	116	8.9	11.5	5.7	12.2	30.7	12.8	23.3	30.2	4.0	2.6	2.7	1.0	2.9	3.3	4.1	5.4	3.6	19.9	6.9	11.2	10.7	5.6	6.1	6.2
MUSM 39909	f	PT	33.2	44.4	44.4	12.0	8.9	12.2	6.1	11.6	29.5	13.9	23.7	29.3	4.1	2.8	2.28	0.9	2.6	3.2	4.2	5.5	3.2	19.1	6.1	10.6	10.0	5.6	5.5	5.6
MTD F 32366	f	PT	33.0	44.5	44.5	11.5	9.57	11.6	6.16	11.5	28.7	13.6	22.9	29.2	4.3	3.3	2.7	1.0	2.9	3.4	4.7	5.4	3.1	19.1	6.5	9.6	9.4	4.8	6.3	6.1
MTD F 32362	f	PT	32.4	43.8	43.8	10.9	9.1	11.7	5.2	11.9	29.3	12.7	22.4	28.6	3.8	2.2	2.5	1.0	2.5	3.2	4.1	5.4	2.3	19.8	6.6	10.3	9.0	5.0	5.8	5.4
CAS 231140	m	PT	31.8	42.7	42.7	10.2	8.3	11.2	5.35	11.0	29.5	13.3	21.6	27.3	3.7	2.6	2.9	1.0	2.4	2.8	2.9	5.0	3.9	20.4	6.4	10.5	9.9	4.8	5.2	5.2
MUSM 39912	m	PT	31.5	43.8	43.8	11.4	9.3	10.8	5.2	11.9	28.6	13.4	21.9	28.2	4.0	3.2	2.5	0.9	2.9	3.2	4.3	5.4	3.1	18.2	6.7	6.5	8.6	5.2	5.4	5.9
FMNH 119705	f	PT	30.6	42.3	42.3	11.0	9.5	12.7	6.58	11.0	28.2	13.5	21.8	28.2	3.6	2.2	2.9	1.1	2.8	3.3	3.9	5.1	2.2	19.1	6.7	10.3	10.1	4.9	5.2	5.4
MUSM 39911	f	PT	28.7	39.0	39.0	10.0	8.3	10.6	5.1	10.4	26.5	12.2	20.1	26.1	3.4	2.5	2.1	0.8	2.8	2.7	3.8	4.6	2.4	17.7	6.6	8.5	9.2	4.5	4.9	5.2
MUSM 39912	m	PT	28.4	38.1	38.1	10.4	8.5	10.4	5.7	10.9	26.8	12.2	20.0	25.4	3.7	2.8	2.1	0.9	2.4	2.4	3.4	4.4	2.9	17.1	5.9	9.3	7.6	4.4	4.6	4.9
MTD F 32365	m	PT	28.2	37.3	37.3	10.5	8.1	10.0	5.1	10.4	25.2	12.3	20.4	25.2	3.3	2.5	2.0	0.8	2.2	2.6	3.3	4.7	2.5	16.0	5.5	Def.	8.1	4.7	4.8	4.8
MTD F 32364	m	PT	27.3	36.0	36.0	9.9	7.8	9.7	5.2	10.1	25.1	10.6	19.7	24.2	3.5	2.4	2.0	0.7	2.6	2.5	3.6	4.4	2.7	15.8	5.2	9.0	7.4	4.3	4.3	4.6
MTD F 32363	m	PT	25.6	35.4	35.4	9.8	8.0	9.9	5.2	9.77	23.7	11.7	18.2	23.4	3.3	2.5	2.0	0.7	2.6	2.5	3.3	4.3	2.5	15.2	5.4	8.1	7.8	3.8	4.3	4.0

membranes as long as spines; in adult females tips of lappets from D1 to D4 slightly pointed, others usually rounded, in some cases rectangular, extensions of lappets beyond spines less than 10 % of spine length; in adult males soft dorsal fin noticeably pointed, 3rd and / or 4th ray longest, extending significantly past posterior margin of caudal fin in largest males. Anal fin [A. III.6 (n = 19), III.7 (n = 15), III.8 (n = 1)] pointed, soft portion extending to posterior edge of caudal fin in adult males; pointed in larger females and medium-sized males, rounded in smaller females and males, when folded extending barely to first third of caudal fin. Caudal fin with 15 (n = 2), or 16 (n = 33) principal soft rays; posterior edge rounded in all specimens examined; in both sexes first quarter to first third scaled. Caudal peduncle in adult specimens significantly deeper than long, in large specimens nearly 250 % of length (range 127 % to 247 %, mean 175 %, n = 35). Squamation as given for *Apistogramma cruzi* in KULLANDER (1986); scales in median longitudinal row 21 (n = 7), 22 (n = 24), or 23 (n = 4); upper lateral line canals 11 – 16 (mean 14.4, standard deviation 1.29, n = 35), lower lateral line canals 3 – 9 (mean 6.4, standard deviation 1.54, n = 35); 16 scales around caudal peduncle (n = 35). Jaw teeth deeply embedded in fleshy skin tissue; two comparatively regular series in both jaws, but series across anterior part of lower jaw irregular in largest specimens; in some large specimens tendency to form third series; unicuspid caniniform, normally almost straight to (rarely) slightly recurved in basal two thirds, distal third recurved, with brown or reddish outer tip. Gill rakers, pharyngeal elements, and dentition have been excluded from this study, as these form part of further investigations in progress.

Coloration of preserved specimens: (after 4 months in 75% ethanol) (figs. 1 – 3) Basic colour of body predominantly grey (males) or brownish (females), several specimens of both sexes also reddish brown, coloration darker on three dorsalmost scale rows,

Table 3. Meristric data of *Apistogramma cinilabra* sp. n. type specimens (SL given in mm; for abbreviations see last column of table).

Coll.No.	sex	SL	DF (h)	DF (s)	DF (i)	AF (h)	AF (s)	PF (h)	PF (s)	PecF	CF	
MUSM 39908	m	53,7	15	8	0	3	8	1	5	12	15	
MTD F 32368	m	49.9	15	8	0	3	7	1	5	12	15	
MTD F 32362	m	45.9	14	8	0	3	6	1	5	12	16	DF
MUSM 39911	m	45.1	16	7	0	3	7	1	5	13	16	dorsal fin
CAS 231140	m	44.2	14	8	0	3	7	1	5	12	16	
CAS 231140	f	39.9	16	7	0	3	6	1	5	12	16	CF
MUSM 39910	m	39.6	15	7	0	3	6	1	5	12	16	caudal fin
MUSM 39911	m	39.4	15	7	1	3	7	1	5	12	16	
MUSM 39912	f	39.2	15	8	0	3	7	1	5	13	16	PecF
MTD F 32363	f	37.9	15	8	0	3	6	1	5	12	16	pectoral fin
MTD F 32367	m	37.2	15	7	1	3	7	1	5	12	16	
FMNH 119705	m	36.1	15	8	0	3	6	1	5	12	16	PF
MUSM 39909	m	35.9	15	7	1	3	6	1	5	12	16	pelvic fin
MTD F 32367	f	35.9	15	7	0	3	6	1	5	12	16	
MTD F 32361	f	35.8	15	7	1	3	6	1	5	12	16	AF
MTD F 32368	f	35.4	16	8	0	3	7	1	5	12	16	anal fin
CAS 231138	m	35.1	15	7	0	3	7	1	5	12	16	
MTD F 32359	f	34.7	15	8	0	3	6	1	5	12	16	(h)
MUSM 39910	f	34.5	15	7	1	3	6	1	5	12	16	hard rays (spines)
FMNH 119706	m	34.4	15	8	0	3	6	1	5	11	16	
FMNH 119707	f	34.0	16	7	0	3	7	1	5	12	16	(s)
CAS 231139	f	33.8	15	7	0	3	6	1	5	12	16	soft rays
CAS 331138	f	33.8	16	6	0	3	6	1	5	12	16	
MTD F 32360	m	33.8	16	6	0	3	6	1	5	12	16	minor soft rays
MUSM 39909	f	33.2	16	7	0	3	6	1	5	12	16	(i)
MTD F 32366	f	33.0	15	7	1	3	6	1	5	12	16	
MTD F 32362	f	32.4	16	7	0	3	7	1	5	12	16	
CAS 231140	m	31.8	16	8	0	3	7	1	5	12	16	
MUSM 39912	m	31.5	15	7	0	3	6	1	5	12	16	
FMNH 119705	f	30.6	15	8	0	3	7	1	5	12	16	
MUSM 39911	f	28.7	15	8	0	3	7	1	4	12	16	
MUSM 39912	m	28.4	16	7	0	3	7	1	5	12	16	
MTD F 32365	m	28.2	15	7	1	3	6	1	5	12	16	
MTD F 32364	m	27.3	15	6	1	3	6	1	5	12	16	
MTD F 32363	m	25.6	16	7	0	3	7	1	5	12	16	

Fig. 2. *Apistogramma cinilabra* sp. n., paratype males: *top:* 1. CAS 231140, male, 39.9 mm SL; *bottom:* MTD F 32363, male, 25.6 mm SL.

somewhat paler in some smaller specimens, margins of body scales with light grey (rarely whitish) edgings. Lips of mature males homogenous creamy whitish to grey, of mature females dusky grey, in smallest specimens pale yellowish white. Lower jaw, unscaled parts of cheeks, chin, and central parts of branchiostegal membranes light grey to whitish in males, in females slightly yellowish. Breast between bases of pectoral fins, ventral fins and posterior part of branchiostegal membranes greyish or with orange to red spots in males, white with few black chromatophores in females. Mid-ventral region pale greyish in males, whitish or yellowish in females; in males with narrow dark greyish, in females with distinct blackish, anal stripe. Pectoral-fin base red to orange in males, porcelain white to (rarely) pale grey in females. No distinct interorbital stripe, but round darker spot present in holotype and some female specimens filling about half of interorbital space. Operculum light coffee brown with wine-red markings in largest males, light to dark grey in medium-sized specimens, usually paler in females, in most specimens clearly contrasting with significantly paler suboperculum, in some females completely porcelain white. Cheek in large males dark brown to wine red, cheek stripe blackish, roughly as wide as pupil, usually one fifth wider in males, beginning between foramina 1 and 2 of posterior orbital of suborbital series (for terminology see KULLANDER

Fig. 3. *Apistogramma cinilabra* sp.n., paratype females: *top:* MUSM 39912, female, 39.2 mm SL; *bottom:* CAS 231140, female, 31.8 mm SL.

1987), when complete running backwards in straight line between lateral canal foramina (LCF) 10 and 11 across posterior half of cheek to lower posterior margin of preoperculum and to posterior tip of interoperculum, but in several specimens distinct fragments restricted to cheek and preoperculum. Blackish snout stripe straight, about half as wide as cheek stripe in all specimens, wider on occlusal than on buccal end of snout. Upper head and nape from interorbital to dorsum below first dorsal spine dark blackish brown. Frontal part of head from interorbital to lips either pale grey or in most specimens same dark colour as adjacent upper head and nape. Dorsal spots only small and diffuse, basal to dorsal fin in larger specimens, absent in most specimens. Some small specimens with only faint narrow blackish-brown stripe below dorsal-fin base. Dorsal fin with dark grey to blackish spots on basal fifth of fin membranes. Iris dark, blackish grey, in fresh material with golden yellow outer rim. Seven vertical bars expressed in several, but not all specimens, not divided, in males hardly visible, in females with narrow but distinct interspaces (width about less than half scale width), visible only partially in larger specimens, more frequent in females than in males, completely visible in smallest individuals. All vertical bars vertical to longitudinal axis of body or at right angles to lateral band. Vertical bars 1 to 3 restricted to upper half of body, bars 4 to 7 complete.

Fig. 4. *Apistogramma cinilabra* sp. n., holotype, MUSM 39908, live coloration shortly after capture, protruding jaws during slight aggressive yawning.

Independent of sex, several specimens including holotype exhibiting two to four more or less distinct continuous abdominal stripes composed of horizontal rows of grey dashes, occupying approximately central two thirds of height of scales of L-1 row, central third of L-2 row, central fifth of L-3 row, and central tenth of L-4 row. In some specimens of both sexes, but more frequently in males, these stripes replaced by regular rows of round spots occupying centres of grey or (in large males) orange scales. Stripes more distinct between ventral and anal fins than on caudal peduncle, rows of spots the reverse. Lateral band virtually straight, one scale high, covering L+1 scale row and upper third or (less frequently) upper half of L scale row, only half as wide anterior to vertical bar 2, stretching from posterior edge of orbital to 7th vertical bar on caudal peduncle. In females lateral band posterior to vertical bar 4 wider than in males, covering L+1 scale row and upper half of L scale row. In some specimens pigmentation more intense where intersecting vertical bars, giving impression of row of six lateral spots. No distinct separate lateral spot, but in some specimens significantly darker areas where lateral band intersects vertical bars 2 and 3, giving impression of two lateral spots; exceptionally in small number of larger females third darkened area where lateral band intersects vertical bar 4, giving impression of three indistinct lateral spots overall. Distinct single dark grey to blackish caudal-peduncle spot, upright oval in males, rounded in females, covering about half (females) or two thirds to about 90 % (males) of height of caudal peduncle. All unpaired fins dusky grey on tips of membranes, grey along spines as well as soft rays; remainder of membranes of dorsal, anal, and caudal fin mostly whitish in males, pale yellow to orange in mature females. Scaled portion of caudal fin darker grey than rest of fin. Under microscope all fins with regular dense pattern of small round light greyish chromatophores, less frequent on anal fin. Largest males with up to six vertical rows of dusky spots on distal part of caudal fin. Pectorals hyaline whitish, transparent, with few small spots of greyish pigment along fin rays, but mostly absent on membranes. Ventral fin with dark grey to black spine, membranes whitish grey except in most male specimens first membrane dark grey, in some black, black in all females with black zone covering up to first two membranes; holotype and some large males with red coloration along distal three quarters of first ray and adjacent membrane; in females all non-blackish parts of fin more or less intense orange. Anal fin in males without, in females with, blackish outer margin from base of first spine to tip of longest soft ray. Coloration of dorsal fin basically whitish to light grey, dark grey to black markings absent along spines and only inconspicuous along soft rays; tip of soft portion of dorsal fin pointed in males, orange or reddish; in females basal fifth of each membrane of dorsal fin with dark grey zone; first two spines and membranes of dorsal fin in most males blackish, in females also basal half of third membrane; rarely whole third and lower half of fourth membrane blackish independent of sex. Soft portion of dorsal and anal fins with inconspicuous rows of hyaline spots in few large males only. Scales on body in males grey to brownish with light whitish or cream edges, in females with darker grey edges.

Coloration of live specimens: (figs. 4–28) The live coloration of adult male *Apistogramma cinilabra* sp. n. is – depending on mood – highly variable and unique within the genus. As the species is presented here for the first time, several photographs of typical specimens in different moods and situations have been included in this paper to enable accurate identification of the species. The information given in this text will therefore be restricted to highlighting diagnostic elements of live coloration.

Most striking and unique colour pattern of male *Apistogramma cinilabra* sp. n. is combination of creamy white to light grey central parts of lips, in some specimens looking like lipstick (figs. 16–17), bright red coloration of pectoral base and adjacent areas on abdomen, gill covers, cheeks and breast, variable (figs. 4–9, 11–12, 14, 18, & 27); no other species known exhibits comparable colour pattern. Several subadult males with (partially) yellow cheeks, gill covers, and breast. Some mature males with bright yellow to light orange zone on unscaled part of caudal fin (figs. 7). Dorsal fin in females with narrow but conspicuous light blue submarginal stripe, distally framed by thin black or dark grey margin (figs. 13, 15, 23, & 25). Similar but copper red to light blue stripe frequently visible in most males during display only (figs. 6–9, 11, & 27). Ventral fins in males transparent whitish blue to yellowish green (figs. 4–9, 11–12, 18,

Fig. 5. *Apistogramma cinilabra* sp.n., holotype, MUSM 39908, live coloration shortly after capture, dominant, after confrontation with another subdominant male.

Fig. 6. *Apistogramma cinilabra* sp.n., non-type, male, not preserved, live coloration shortly after capture, with continuous lateral band, subdominant, aggressive.

Fig. 7. *Apistogramma cinilabra* sp.n., non-type, male, not preserved, live coloration shortly after capture, with interrupted lateral band, subdominant, highly aggressive.

Fig. 8. *Apistogramma cinilabra* sp.n., non-type, male, not preserved, live coloration shortly after capture, with inconspicuous lateral spots, subdominant, aggressive, preparing for lateral threat.

Fig. 9. *Apistogramma cinilabra* sp.n., non-type, male, not preserved, live coloration in the aquarium, with typical vertical bars, lateral spots at intersections with lateral band, neutral mood.

Fig. 10. *Apistogramma cinilabra* sp.n., non-type, female, not preserved, live coloration in the aquarium, with typical vertical bars, lateral spots at intersections with lateral band, ventral stripes, neutral mood.

& 27), in dominant territorial specimens with orange tips (figs. 1–2, 4–5, 11–12, 14, 18, & 27); in females black or dark grey at base and anteriorly along hard ray, bright yellow to deep red-orange posteriorly (figs. 12–13, 15, & 20–28). Anal fin of mature males with greenish to bluish coloration on basal third to half, exceptionally on complete fin (figs. 4–9, 18, & 27). Mature females with light brownish to yellowish brown

Fig. 11. *Apistogramma cinilabra* sp.n., non-type, male, not preserved, live coloration in the aquarium, with inconspicuous lateral spots, dominant, during lateral display (basic colour lighter than in aggressive context).

Fig. 12. *Apistogramma cinilabra* sp.n., non-types, not preserved, live coloration in the aquarium, male displaying in front of female, with typical lateral spots and ventral stripes, aggressive female with reduced black pattern on head and lateral side.

Fig. 13. *Apistogramma cinilabra* sp.n. non-type, female, not preserved, live coloration in the aquarium, dominant, highly aggressive lateral threat, with typically intense lateral band, snout stripe, and narrow infraorbital band, faded cheek stripe and caudal spot.

Fig. 14. *Apistogramma cinilabra* sp.n. non-type, male, not preserved, live coloration in the aquarium, dominant, typical large lateral spots of brood-care coloration.

Fig. 15. *Apistogramma cinilabra* sp.n. non-type, female, not preserved, live coloration in the aquarium, dominant, typical large lateral spots of aggressive brood-care coloration.

body and inconspicuous vertical bars on flanks (figs. 22–23, & 25); lateral band reduced to four to six mid-lateral spots coinciding with intervals between vertical bars when latter not expressed (figs. 10, 24, & 28). Adult specimens with conspicuous black (females) or grey (males) midventral stripe, usually shorter and less distinct in males; females usually without anal spot, but mostly with irregular-shaped black area between ventral fin bases, generally absent in males (figs. 18–19). Usually no distinct pectoral spot in females (figs. 15, 21–23, 25, & 27), but in some highly aggressive individuals very small black dot on dorsal edge of fin (figs. 13 & 24). Body of breeding females lemon yellow with white chest and series of six broad lateral spots at intersections of vertical bars 2 to 7 with lateral band (fig. 15, & 25–27), and, in most cases, series of five to six dorsal spots along dorsal fin base (figs. 15, 25, & 27), depending on stage of agression body scales with thin dark grey distal seam (figs. 15, 20–22, & 26). Aggressive females with series of three to six small lateral spots coinciding with position of lateral band and with intervals between vertical bars when these markings faded (figs. 24–25). Territorial

Fig. 16. *Apistogramma cinilabra* sp. n. non-type, male, not preserved, live coloration in the aquarium, lateral portrait, typical coloration of lips and head of brood-caring males.

Fig. 17. *Apistogramma cinilabra* sp. n. non-type, male, not preserved, live coloration in the aquarium, frontal portrait, typical coloration of lips and head of brood-caring males; body laterally compressed.

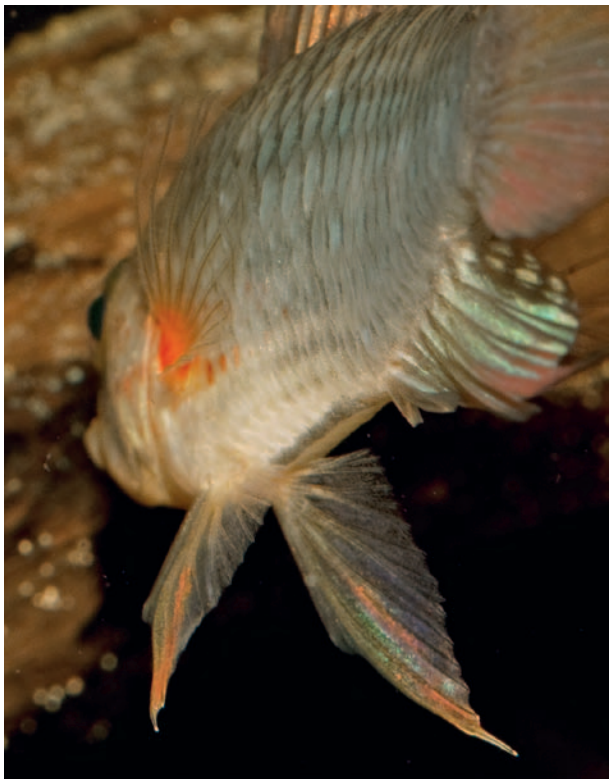

Fig. 18. *Apistogramma cinilabra* sp. n. non-type, male, not preserved, live coloration in the aquarium, greyish mid-ventral stripe during brood care.

Fig. 19. *Apistogramma cinilabra* sp. n. non-type, female, not preserved, live coloration in the aquarium, black mid-ventral stripe and breast spot during brood care.

Fig. 20. *Apistogramma cinilabra* sp. n., paratype, MUSM 39912, female, 39.2 mm SL, live coloration shortly after capture, subdominant, not territorial, neutral mood.

Fig. 21. *Apistogramma cinilabra* sp. n., paratype, CAS 231140, female, 31.8 mm SL, live coloration shortly after capture, neutral mood, not territorial, protruding jaws during yawning.

Fig. 22. *Apistogramma cinilabra* sp. n., non-type, female, not preserved, live coloration in the aquarium, subdominant, not territorial, colour pattern in presence of aggressive dominant male.

Fig. 23. *Apistogramma cinilabra* sp. n., non-type, female, not preserved, live coloration in the aquarium, subdominant, incipient territoriality, early brooding coloration.

males in presence of heterospecific intruders with pattern of six (to seven) distinct vertical bars, first visible only on upper half of body; conspicuous dark triangular nape spot, preorbital stripe and cheek stripe (fig. 9). Displaying males with series of four striking black stripes on flanks below lateral band (fig. 12). Displaying females frequently with less prominent black stripes on flanks below lateral band, series of five to six broad lateral spots, and very broad black cheek stripe and centre of chin. Dominant aggressive brood-caring males exhibit faded vertical bars and four (rarely five) distinct, broad, and near-oval blackish lateral spots at intersections of lateral band with vertical bars 2 to 5 (or rarely 6) (fig. 14). Mature males, juvenile and sexually inactive females with dark edges to body scales. In brooding females yellow on scale edges more intense than on centres. Subordinate individuals with pattern of light grey centres and dusky grey edges to scales, more or less distinct pattern of five lateral spots, three to four longitudinal stripes on flanks, broad cheek stripe, and overall darker colours (figs. 10, 23, & 28).

Systematic relationships: *Apistogramma cinilabra* sp.n. is apparently a member of the *Apistogramma regani* lineage but its position remains uncertain (nomenclature following RÖMER, 2006c). In particular the double spot pattern frequently appearing on the caudal peduncle of adult females in breeding coloration gives rise to doubt, as this type of pattern is otherwise known only from species related to the *Apistogramma linkei* supercomplex (cf. RÖMER, 2006), but has been found in some other species of other systematic subgroups, for example *Apistogramma atahualpa* RÖMER, 1997 or *A. huascar* RÖMER, 2006 (*Apistogramma steindachneri* lineage) collected from the same region in Peru. Detailed analysis of relationships within the genus is in progress and will be published in due course (RENNO *et al.*, in preparation).

Etymology: The species epithet *cinilabra* is a compound adjective derived from Latin *cinis*, *cineris* (= ashes) and the derived adjective *cinereus* (grey) and *labrum* (= lip). The name refers to the fact that adult territorial males of this species regularly exhibit light

Fig. 24. *Apistogramma cinilabra* sp. n., non-type, female, not preserved, live coloration in the aquarium, dominant, territorial, aggressive S-shape display coloration presented to male during spawning.

Fig. 25. *Apistogramma cinilabra* sp. n., non-type, female, not preserved, live coloration in the aquarium, subdominant, territorial, coloration after loosing eggs.

Fig. 26. *Apistogramma cinilabra* sp. n., non-type, female, not preserved, live coloration in the aquarium, dominant, territorial, aggressive coloration during hatching of larvae (on bottom) from eggs (upper left side).

Fig. 28. *Apistogramma cinilabra* sp. n., non-type, male, not preserved, live coloration in the aquarium, reversed dark stress coloration, typical of subdominant individuals attacked by dominant.

ash-grey lips in aggression and during mating display, a unique distinguishing feature of this species within the genus.

Distribution and Ecology: The type locality of *Apistogramma cinilabra* sp.n. (fig. 30–32), an isolated *cocha* (lake) about 1 km from the road from Iquitos to Nauta, according to our studies, is the only known collection site of the species. On the basis of information from local fishermen, the reference material collected by ourselves, and the material that we have been able to inspect in various collections, the new

Fig. 27. *Apistogramma cinilabra* sp.n., non-type, pair (male: front right; female: background left), not preserved, live coloration in the aquarium, dominant, territorial, aggressive coloration during brood-care of small fry in presence of intruding potential predator (Guppy, *Poecilia reticulata*).

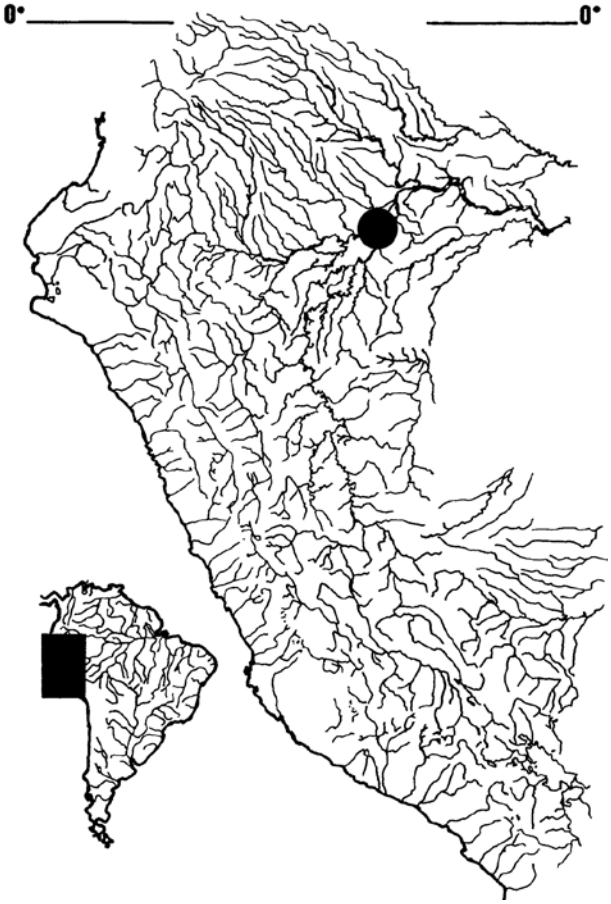

Fig. 29. Map of Peru, showing distribution of *Apistogramma cinilabra* sp. n., type locality indicated by ●.

Fig. 30. View of the type habitat of *Apistogramma cinilabra* sp. n., Carreteira Iquitos – Nauta km 78, 27th November 2010, about 12.15 p.m. local time.

Fig. 31. View of the type habitat of *Apistogramma cinilabra* sp. n., growth of plants on fallen trees in the lake indicates long-term stable water levels, 27th November 2010, about 12.45 p.m. local time.

Fig. 32. View of the type habitat of *Apistogramma cinilabra* sp. n., close-up of a shallow part of the lake, light brownish water with submerged moss, algae, and a thick layer of fallen leaves, driftwood, and fine detritus, 27th November 2010, about 12.20 p.m. local time.

species has apparently been found nowhere else, either within or outside the Peruvian Departamento Loreto.

The species is apparently endemic to this little lake situated in dense, probably primary forest. Geologically this small isolated *cocha* is sited within the Iquitos palaeoarch, surrounded by comparatively steep hills giving a somewhat crater-like impression. The bed of a short, narrow feeder brook was hardly visible in the field. During our visit its shallow water was

draining into the ground before reaching the lake. No affluent structure was visible.

The lake covered an area of less than approximately 1 ha in total.

The water of the *cocha* was light brownish translucent with a visibility of approximately 1 to 1.5 m (fig. 32). Water conditions measured on 25th May 2010 were as follows: temperature 29.7 °C, pH 4.1, oxygen 1.8 mg/l, light 70 to 80 lux. On 25th March 2011 data on water conditions were taken from three different depth levels (0.1, 0.5, & 1 metre below the surface) at two points (A & B) in the lake (tab. 4). Point B (in the centre of the lake) was significantly more exposed to sunlight compared to point A (in the peripheral part of the lake). The oxygen levels measured in the deeper strata of the lake are at first sight extremely low, but such levels are typical of many tropical waters characterised by rotting plant matter such as the thick layers of leaf litter that form the typical habitat of most *Apistogramma* species (Römer, 2000, 2001, 2006). The oyxgen levels in the samples taken at point B (close to one of the deepest points in the lake) are probably more stable due to the larger volume of water and higher exposure to the sun. Photosynthesis by a relatively larger population of planktonic algae may also contribute to higher oxygen levels, but specific data are not yet available. Nevertheless, low oxygen levels in different parts of the lake may restrict access for fish to certain areas within the lake and thus may also limit population growth. The pH levels in the habitat of *Apistogramma cinilabra* sp.n. appear to be remarkably low for species from this biogeographical region (Römer, 2000, 2001, 2006), but are typical for clear- and blackwater species all over the Neotropics.

Compared to other known *Apistogramma* habitats, the water level appears to be extremely stable, and may vary by less than about 20 cm between the dry and the rainy seasons. This information, basically acquired from local fishermen, and verified by our visits and collections during three different hydrological periods (May 2010 – high water season, November 2010 – low water season, and March 2011 – intermediate season), is also supported by observation of the forest vegetation around the lake (fig. 31). None of the trees on the lakeside exhibited high water marks as is usually the case in habitats with fluctuating water levels. The observed fluctuation in water levels was less than 10 cm between our visits.

The depth of the lake has been measured as up to 2.8 metres, but it may be slightly deeper overall. Its bottom was covered with a thick layer of fallen leaves (depth approximately 50 to 80 cm), twigs, branches, fallen trees, and a layer of fine brownish detritus. In some areas we found patches of algae and a drifting undetermined grass- or moss-like plant (fig. 31). The specimens used for our investigations were collected exclusively from a 70 m strip extending from the bank to about 3 to 5 m out into the lake. Thus less than about 1 % of the area was sampled. However, the fishermen, who have fished several times all around the lake, state there is no other *Apistogramma* species present. Several specimens of a still undescribed blue characid, probably a *Hyphessobrycon* species, and one individual of an eel-like Atinga, *Symbranchus* (probably *Symbranchus marmoratus* Bloch, 1795) were collected together with the *Apistogramma*. No other fishes have been reported from the lake to date.

Table 4. Data on water conditions taken from type location of *Apistogramma cinilabra* sp.n., taken by François Kervarec on 25th of March 2011.

mesuring point	**A**			**B**		
depth of data sample (m)	0.1	0.5	1.0	0.1	0.5	1.0
temperature (°C)	26.5	26.10	25.8	27.0	26.5	26.1
acidity (pH)	5.0	4.9	5.3	4.9	4.8	5.2
oxygen level (mg/l)	8	1.5	1.6	7.8	5.5	4.6
conductivity (µS/cm)	8	11	13	10	10	13
maximum depth (m)	2.8			1.0		

Biology: There is no field report available on the biology of *Apistogramma cinilabra* sp. n., but on the basis of our preliminary observations in the aquarium it seems to be a typical representative of the genus. The species is generally polygamous, but monogamy has also been observed to occur in captivity. Adult males monopolise resources and females within large territories which are guarded highly aggressively against any potential conspecific male competitor. Maintenance in captivity has turned out to be comparatively difficult, as the species is highly sensitive to changes in water-chemistry parameters, which may be the result of long-term adaptation to a comparatively stable environment in the wild. The species has repeatedly been bred successfully in captivity (fig. 26–27) by UR and exhibited typical behavioural elements known from several other basically polygamous species of the genus (*cf*. Römer, 2000, 2006). Only the extreme aggression of both males and females while guarding fry is considered important enough to be mentioned here. More detailed studies of the behaviour of this new species are in progress, and the results will be published elsewhere in due course (Römer *et al*., in prep.).

Discussion: *Apistogramma cinilabra* sp. n. is a sexually dimorphic species. Differences in size between the sexes are diagnostic. We have observed a high degree of polychromatism in males and several different colour morphs have been identified (fig. 4–9, 11–12,

& 27). At present it is not clear whether colour polymorphism in males is based on differences in diet, age, social status, or simply genetic factors, but this colour polymorphism is thought to have significant function during reproduction. Female *Apistogramma* in general are selective in the matter of mate choice (RÖMER, 2001; RÖMER & BEISENHERZ, 2005, 2006; READY *et al*. 2006), probably to ensure optimum reproductive success under given circumstances such as environmental or social factors (*cf*. literature and discussion in ENGELKING *et al*., 2010). It has been argued for many species that high variability in coloration may give females the opportunity to select the "optimal partner" for reproduction using colour as an indirect indicator of the genetic and ecological abilities of a potential partner (overview in BARLOW, 2000, and ENGELKING *et al*., 2010). In the case of *Apistogramma cinilabra* sp. n., however, this biological phenomenon leaves us with the problem of distinguishing this highly variable species from other, generally similar species of the genus. When KULLANDER published his revision of Peruvian cichlid fishes in 1986, he described four new *Apistogramma* species, namely *Apistogramma cruzi* KULLANDER, 1986, *A. juruensis* KULLANDER, 1986, *A. payaminonis* KULLANDER, 1986, and *A. urteagai* KULLANDER, 1986. *Apistogramma juruensis* and *A. payaminonis* are completely different from *Apistogramma cinilabra* sp. n. in overall morphology and coloration and cannot be mistaken for that species, while *A. cruzi* and *A. urteagai* are generally similar to the new species described here.

In addition to the above-mentioned taxa, another species of the genus, *A. eunotus* KULLANDER, 1981, may be easily mistaken for *Apistogramma cinilabra* sp. n.. But surprisingly no indisputable identification of live *Apistogramma eunotus* or *Apistogramma cruzi* has so far been presented based on comparative studies with the type material. STAECK (2003) presented a report on live specimens of the overall similar *Apistogramma urteagai*. But he seems to have based his identification (including the labelling of photographs of live specimens) on overall comparison with the original description of the species as has been historically been the practice of most authors, for example KOSLOWSKI (2002), LINKE & STAECK (2006), MAYLAND & BORK (1997), or RÖMER (2000, 2006). This strategy was arguably acceptable when the number of species was limited, but the situation has by now changed completely. The continual and increasing discovery of new forms and potential new species of *Apistogramma* from different areas in Peru and other parts of the Neotropics has produced a significant need for more detailed discussion of the identity of *Apistogramma eunotus* and *Apistogramma cruzi* in particular.

Apistogramma cinilabra sp. n. may be distinguished from *A. eunotus* by a significantly broader lateral band (fig. 4–9, 13, & 22), a midventral stripe in both sexes (fig. 18–19), a much larger spot on the caudal peduncle (fig. 1–9, & 22), cheek stripe ending broad and blunt (not narrow and pointed) at the lower distal edge of the operculum (fig. 1–3, 15, 19, & 25). Even in the largest specimens the vertical bars are never divided as in adult *Apistogramma eunotus* (fig. 9–10, 23, 25, & 28) (*cf*. KULLANDER, 1981). The relatively shorter caudal peduncle of *Apistogramma cinilabra* sp. n. (length only about 59 % of depth versus about 77 % on average in *Apistogramma eunotus*; [data from KULLANDER, 1981]), the on average significantly longer snout (5.8 % versus 9.4 % of SL), and the significantly higher number of scales with lateral line canals in upper (UL) as well as lower (LL) lateral line (14.4 UL / 6.4 LL versus 11.1 / 3.5) are useful distinguishing morphological characters that can be ascertained not only from preserved specimens but also from photographs of live ones.

Apistogramma cruzi is morphologically distinguished from *Apistogramma cinilabra* sp. n. by a longer snout, higher cheek, shorter caudal peduncle, and shorter last anal- and dorsal-fin spines. As regards colour pattern, the larger and undivided spot on the caudal base, in combination with the wide lateral band, is of particular diagnostic value and also unmistakably distinguishes *Apistogramma cinilabra* sp. n. from several other species such as *Apistogramma moae* KULLANDER, 1980, *A. resticulosa* KULLANDER, 1980, *A. taeniata* (GÜNTHER, 1862), and *A. urteagai*. *A. cinilabra* sp. n. can be distinguished from all other generally similar species, for example *Apistogramma regani* KULLANDER, 1980, by the caudal-fin pattern usually lacking any form of regular vertical pattern of stripes or lines. Only the unscaled parts may occur in pale yellow, orange, or (exceptionally) dull red (especially in mature live males).

Interestingly READY *et al*. (2006) have published a report on colour morphs of *Apistogramma* and mate choice in females. DNA analyses and mate-choice experiments indicate that colour morphs of *Apistogramma* may represent distinct species. Experimental results already published (RÖMER & BEISENHERZ, 2005; ENGELKING *et al*., 2010) and work in progress support this hypothesis based on a strong experimental background.

The basic information resulting from this work was, of course, not known to KULLANDER (1980, 1981, 1986) when, more than a quarter of a century ago, he revised the *Apistogramma* species from Peru and neighbouring countries. He used material from several locations spread over a wide region within the upper Amazon basin. Some collecting sites were situated more than 1400 kilometres from one anoth-

er (*cf*. Kullander, 1980, 1981, 1986). We surmise that voucher specimens of certain species used for the revision by Kullander may in fact unintentionally represent different populations, genotypic clusters, and potentially species (*cf*. also Römer *et al*., 2010). In fact the type series of *Apistogramma cruzi* and *A. eunotus* both originate from more than one location, and as a result these two species may possibly be polytypic.

This situation now leaves us with the dilemma of how to differentiate the species described by Kullander based solely on the descriptions and / or the type material. As the type material may be polytypic, we decided to restrict comparison to the only reliably relevant specimens, the holotypes, and as far as available to syntopically collected material. Furthermore, to prevent similar problems with the species described here (especially as it may be problematical systematically), we observed the fish used in this study in the aquarium for a few days before preservation, to make sure that they were conspecific. During this type of observation phase it is usually possible to identify potentially heterospecific specimens in any given group of *Apistogramma* by differences in coloration (including black markings) relating to the behavioural situation in the observation tank. In particular diagnostic behavioural traits, plus basic fright, dominance, display, aggression, and breeding coloration / patterns, can usually be observed within a comparatively short time under such circumstances by an experienced researcher.

In addition to the species already known to science, there are a number of other species still awaiting formal description that might at first sight be mistaken for *Apistogramma cinilabra* sp.n., but most of these species, for example *Apistogramma* sp. "Xingu" and *A*. sp. "Vielflecken", are easily distinguished by their caudal-fin pattern (dense vertical bands), or different aggressive colour pattern, for example *A*. sp. "Xipamanu" (reverse pattern of spots with light centres in lateral band) (for more information on this species *cf*. Römer, 2000, 2006; Staeck, 2003).

Apistogramma cinilabra sp. n. appears to be trapped in its isolated lake habitat within the Iquitos palaeoarch, and this may be responsible for this comparatively large species of *Apistogramma* being strictly isolated from other *Apistogramma* species. The resulting lack of interspecific competition, and the reduction in evolutionary pressure caused by the absence of competitors with similar basic adaptations to a probably long-term stable environment, may also explain why the specimens collected show a high degree of variability in morphometric as well as meristic data, unusual in the genus *Apistogramma*. Even the striking polychromatism of males may be explained by this situation. We do not as yet know how long this fish has been isolated from other *Apistogramma* species, but isolation may also explain the comparatively high level of intraspecific aggression in territorial specimens of both sexes. As an interim measure, *Apistogramma cinilabra* sp.n. might be hypothesised to be a phylogenetically comparatively ancestral form within both the *Apistogramma regani* lineage and the genus *Apistogramma* based on the following characteristics: number of head pores and elements of black colour pattern not reduced; counts of spines and rays in the dorsal and anal fins, as well as number of lateral-line pores, comparatively high for a species of the genus.

In view of this currently inadequate state of knowledge, further research is required into the biology as well as the phylogenetic background of this new species. Furthermore, extensive studies of the species assemblages of long-isolated *cochas* in the Iquitos palaeoarch may prove to be of greater relevance than previously expected to our understanding of the evolutionary processes within the genus *Apistogramma* and other Neotropical fish.

Conservation status

Owing to its ecology and endemic status in a small forest lake located on land currently for sale, *Apistogramma cinilabra* sp.n. must be considered potentially seriously endangered and therefore should be placed on the red data list of Peru and the IUCN. The most immediate threat to the species is the felling of the primary forest surrounding the type locality, as this is at present being offered for sale to timber companies. The first step in the conservation of the species should be the protection of its habitat by the creation of a strictly protected forest reserve. Given the small size of the lake, collecting for the ornamental fish trade, if not properly controlled, may also be a problem to a lesser extent. Breeding this *Apistogramma* species in captivity, as is already the case with some other species of the genus in the Iquitos area, may turn out to be a reasonable and sustainable way of exploiting and at the same time protecting the wild population, and may, furthermore, create employment in the area.

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