Apistogramma playayacu sp. n.: Description of a new cichlid species (Teleostei: Perciformes: Geophaginae) from the Rio Napo system, Ecuador

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> Abstract

Apistogramma playayacu sp. n. is described based on a total of 41 specimens from tributaries of the Rio Napo from the border area between Ecuador and Peru (about 76°36′ W // 00°22′ S). The species is distinguished from all other *Apistogramma* species by the combination of 7 to 8 horizontal rows of mostly triangular black spots along the sides, horizontally devided spot on caudal base, rounded caudal fin, and straight narrow cheek stripe. The species is a moderately large (males up to 49 mm, females to 38 mm SL), high-backed, laterally compressed, and only slightly elongated *Apistogramma* species. *Apistogramma playayacu* sp. n. probably belongs to the *Apistogramma macmasteri* complex within the *Apistogramma regani* lineage (*sensu* Römer, 2006), and exhibits pronounced sexual dimorphism.

> Resumen

Apistogramma playayacu sp. n. ha sido descrita en base de 41 especimenes, provenientes de pequeño tributaria del Rio Napo cerca de frontera con Ecuador en Peru (approximo 76°36′ W // 00°22′ S). *Apistogramma playayacu* sp. n. es distinta de otras especies de *Apistogramma* por su combinacíon de la 7 a 8 lineas laterales formada por puntos individuales triangulares, una mancha horizontalmente partida en la raíz de la aleta caudal, la aleta caudal rondada, y una linea afilada y recta por la mejilla. Esa especie es de un tamaño moderado grande (machos hasta 49 mm, hembras hasta 38 mm SL), con un dorso alto, el cuerpo lateralmente comprimido y moderadamente extendido. Se piensa que *Apistogramma playayacu* sp. n. es un representante del complejo *Apistogramma macmasteri* a dentro del linea systematico del *Apistogramma regani* con un dimorfismo sexual bien pronunciado.

> Kurzfassung

Apistogramma playayacu sp. n. wird auf Basis von 41 Exemplaren beschrieben, die aus Zuflüssen des Rio Napo im Grenzgebiet zwischen Ecuador und Peru stammen (etwa 76°36′ W // 00°22′ S). Die Art ist von allen anderen *Apistogramma*-Arten durch die Kombination von 7 bis 8 aus meist senkrecht dreieckigen Flecken bestehenden horizontalen Punktreihen auf den Körperseiten, horizontal geteiltem Fleck auf der Schwanzbasis, abgerundeter Schwanzflosse und schmalem geradem Wangenstreif unterschieden. Die Art ist mäßig groß (Männchen bis 49 mm, Weibchen bis 38 mm SL), hochrückig, seitlich zusammengedrückt und leicht gestreckt. *Apistogramma playayacu* sp. n. ist wahrscheinlich ein Vertreter des *Apistogramma-macmasteri*-Komplexes innerhalb der *Apistogramma-regani*-Linie mit ausgeprägtem Geschlechtsdimorphismus.

> Key words

Cichlidae, freshwater, ichthyology, Neotropics, taxonomy, new taxa, systematics.

Prefatory Remarks

In recent years numerous new *Apistogramma* species have been discovered in Peru, mostly from the *Apistogramma cacatuoides* and *Apistogramma nijsseni* phylogenetic groups (KULLANDER, 1980, 1986; nomenclature & details in RÖMER, 2006). Species related to *Apistogramma eunotus* and *A. macmasteri* have also become known, but gained far less attention than taxa from other phylogenetic groups within the genus from this region. During the 2006 annual meeting of the American Cichlid Association in Chicago (USA) UR had the opportunity to visit the Field Museeum of Natural History (FMNH) to check numerous Neotropical dwarf cichlids in the museum's collection. During the inspection of type material of a species in doubt [*cf. Apistogramma maciliensis* (HASEMAN, 1911)], three lots of still undetermined specimens from the Rio Napo system were discovered. This material, collected in the 1980′s, obviously represents two new species. One of them had probably been imported to Europe in 2004 as a contaminant in a commercial shipment of *Corydoras reynoldsi* MYERS & WEITZMAN, 1960 from the Rio Caquetá drainage, and was therefore given the trade name *Apistogramma* sp. "Caquetá" later on (KÄSTNER, 2005). The purpose of this work is to provide a formal description of the species, in order to facilitate its unequivocal identification during the documentation of future research the laboratory and in the field, especially for ecological and behavioural studies.

Materials and Methods

Methods of preservation, counts, and measurements are as detailed in RÖMER (2006), RÖMER & HAHN (2008), RÖMER *et al.* (2003, 2004, 2006, & 2011), and RÖMER & WARZEL (1998) except where otherwise stated. For museeum acronyms compare LEVITON *et al.* (1985). The description of preserved specimens is based on the holotype, generally supplemented by observations on all paratypes. Photographs of all specimens were taken under standardised conditions as specified in RÖMER *et al.* (2011). Pharyngeal elements and gill rakers have been excluded from this study; they form part of further investigation in progress. The description of the live coloration of this species is restricted to known diagnostic features derived from the few photographs available of specimens imported alive to Germany in 2004 (BORK & KÄSTNER, pers. com.). RÖMER (2000, 2006) and RÖMER *et al.* (2003, 2004, 2006) have explained the reasons for providing precise and detailed descriptions of live coloration in *Apistogramma* species. Nevertheless, in this case the species can be readily determined on the basis of the description of preserved material alone. Due to the limited material available the description of live coloration concentrates on the basic aspects. The discussion of additional details of color variation in life must of necessity be postponed until sufficient live material is available for further studies in the laboratory. The original method of preservation is unknown, but the specimens are currently stored in 70 to 75 % ethanol. With the permission of the FMNH and MTD F curators, DNA samples were taken from three typical large males by clipping a small portion of the right-hand pectoral fin, which is thus slightly damaged in the voucher specimens in question. It appears that some samples may have been taken earlier by clipping fins, as most larger specimens exhibit typical (small) areas of damage to the caudal fin. The DNA samples were fixed and stored as described in RÖMER *et al.* (2010).

Apistogramma playayacu sp. n.

Type material: 41 specimens.

Holotype: (fig. 1) FMNH 101589, male, 45.8 mm SL; South America, Ecuador, rio Napo system, Quebrada Playayacu, Quebrada entering Limoncocha, 2 km NE of village along lake shore, (76°36′ W / 00°22′ S), field station DJS81-39 / 05, October 1981, *coll.* M. IBARRA, R. BARRIGA and UQUILLAS.

Paratypes: 40 specimens: FMNH 101585, 4 males, 18.7–41.9 mm SL, 3 females, 16.7–23.2 mm SL, 1 unsexed 14.7 mm SL; MTD F 32378, 1 female, 31.5 mm SL; South America, Ecuador, Napo State, Laguna Zancudococha, flooded forest edge, rio Aguarico drainage, (about 75°30′ W / 00°35′ S), field station DJS83-60 / 29, October 1983, *coll.* D. STEWARD, M. IBARRA and R. BARRIGA. FMNH 117727, 3 males, 38.0–48.9 mm SL, 1 female, 30.2 mm SL (fig. 2), and 1 unsexed, 23.6 mm SL; FMNH 117728, 2 males, 37.7–48.6 mm SL, 1 female, 28.0 mm SL, 1 unsexed, 23.6 mm SL; FMNH 117729, 1 male, 47.8 mm SL, 1 female, 39.6mm SL, 2 unsexed, 15.4–18.3 mm SL; FMNH 117730: 1 male, 41.2 mm SL, 1 female, 38.3mm SL, 3 unsexed, 15.5–18.4 mm SL; MTD F 32377: 1 male, 48.0 mm SL; collection data as for holotype. FMNH 117732: 4 males, 15.6–35.0 mm SL, 3 females, 15.3–30.5 mm SL; South America, Ecuador, Napo State, Laguna Zancudococha, flooded forest edge, rio Aguarico drainage, (about 75°30′ W / 00°35′ S), field station DJS83-60 / 29, October 1983, *coll.* D. STEWARD, M. IBARRA and R. BARRIGA. FMNH 117733: 2 males, 20.1–24.3 mm SL, 2 females, 15.9–16.7 mm SL, 1 unsexed, 16.7 mm SL; South America, Ecuador, Napo State, Laguna Zancudococha, flooded forest edge, rio Aguarico drainage, (about 75°30′ W / 00°35′ S), field station DJS83-60 / 29, October 1983, *coll.* D. STEWARD, M. IBARRA and R. BARRIGA.

Comparative material. MTD F 32380, *Apistogramma guttata*, 3 males, 21.3–31.6 mm SL; MTD F 32381, 3 males, 41.6–36.8 mm SL, 1 female, 27.8 mm SL; rio Morichal Largo, near

Fig. 1. *Apistogramma playayacu* sp. n., holotype, FMNH 101589, male, 45.8 mm SL; 29 years after preservation. Photo: 1, 2, 4–6: U. Römer.

Fig. 2. *Apistogramma playayacu* sp. n., paratype, FMNH 117727, female, 30.2 mm SL; 29 years after preservation.

San Miguel, December 2006, *coll*. M. Sugino; further material as listed in Römer (1994, 1997, 2006), Römer & Hahn (2008, in prep.), Römer & Warzel (1997), and Römer *et al*. (2003, 2004, 2006a-c, 2011).

Diagnosis: *Apistogramma playayacu* sp. n. is distinguished from all other *Apistogramma* species known to date by the combination of the following characters: seven to eight horizontal rows of mostly triangular black spots along sides, rounded caudal fin, horizontally split spot on caudal base in males, straight, narrow cheek stripe, and body more high-backed compared to similar species.

Apistogramma playayacu sp. n. is a moderately large (males up to 49 mm, females to 38 mm SL), high-backed, laterally compressed, and only slightly elongate *Apistogramma* species with pronounced sexual size dimorphism and dichromatism. Adult males with produced and pointed lappets along entire length of hard rays of dorsal fin, dorsal membranes with irregular pattern of dark spots; caudal fin rounded and immaculate. Caudal-peduncle spot visible in all specimens, horizontally devided in medium-sized to large male specimens, entire in small ones and all females. Most larger females with up to three roundish lateral spots within margins of lateral band, absent in all small ones. In most specimens cheek stripe less than half as wide as pupil. Females with short midventral stripe, absent in males.

Description. Morphological characters: (n = 41; 14.7 to 48.9 mm SL); (for biometric data see tables 1 & 2, for meristic data see table 3).

Habitus (figs. 1–3 & 6)**:** Body remarkably deep (35.6 to 40.4 % SL, mean 38.1 % SL) and short compared to other species of genus, strongly compressed laterally, allometry of depth of body slightly positive,

in smaller specimens about twice, in large specimens more than twice, as deep than wide (extreme factor 2.4), head moderately long (32.4 to 36.8 % SL, mean 35.0 % SL) with allometry positive in relation to body size; these features combining to produce impressively robust appearance. Statistically significant meristic differences in morphometrics between sexes: Adult males usually about 20 to (usually) 25 % larger than females, with ventral fins as well as soft portions of dorsal and anal fins significantly prolonged, last dorsal and anal fin spines on average about 15 % longer, and head deeper than in females. Upper head profile of males almost straight from nostril to base of dorsal fin, frequently with slight concave indentation above eye; dorsal profile along dorsal fin base regularly convex, producing more or less stout and "humped" impression; lower head profile slightly convex from lip to posterior margin of branchiostegal membrane; ventral contour curving slightly upwards from below gill cover to base of ventral fins, then almost straight to first anal-fin spine, thereafter curving slightly upwards along anal-fin base to beginning of caudal peduncle. Mouth terminal, blunt, rounded, jaws not enlarged but lower jaw moderately long, not protruding (about 13.8 to 17.5 % SL, mean 15.2 % SL), maxillary extending to vertical between anterior margin of pupil and centre of eye; allometry of jaws significantly positive in relation to body size; lips normal, thick but not hypertrophied; eye relatively large (diameter 10.2 to 12.4 % SL); cheek completely scaled; five dentary and four infraorbital pores. Ventral fin [V I.5 (n =26)] only slightly prolonged, in males extending to first third of anal fin, in females to anus, only exceptionally to first hard rays of anal fin, in no specimen extending to caudalmost anal-fin base. Pectoral fin [11 (n = 1), 12 (n =25)] transparent with only few small spots of brownish pigment along fin rays. Dorsal fin [D. XIV.7 (n = 1), XV.6 (n = 2), XV.6.i (n = 5), XV.7 (n = 10), XV.7.i (n = 2), XV.8 (n = 1), XVI.6.i (n = 3), XVI.7.i (n = 2)] with spines increasing in length from D1 to D5 or D6, thereafter remaining almost constant, but last spine normally longest; dorsal membranes pointed and prolonged significantly past tips of spines, in some males extensions of membranes about 50 % to 60 % longer than related spine, in females tips of lappets from D1 to D3 (rarely D4) slightly pointed, others usually rounded, in some large individuals almost rectangular, extensions of lappets beyond spines less than 10 % of spine length, in many cases even shorter; soft portion of dorsal fin noticeably pointed, extending back to posterior margin of caudal fin or even further in adult males, in females rounded, extending to distal edge of first third of fin. Anal fin [A. III.7 (n = 24), III.7.i (n = 2)] pointed in males, soft portion extending to posterior edge of caudal fin in adult males, rounded in females and small males, extending only onto first third of caudal fin when folded. Caudal fin with 14 (n = 1), 15 (n = 5), 16 (n = 19), or 17 (n = 1) principal soft rays; in both sexes rounded; scales on caudal fin in both sexes overall restricted to basal fifth, usually only scattered on fin base. In large adult males caudal peduncle about one third deeper than long, in others depth less expressed. Scales in median longitudinal row (L-row) 19 to 22 [19 (n = 2), 20 (n = 2), 21 (n = 11), 22 (n = 7), 23 (n = 4)]; 16 scales around caudal peduncle (n = 26).

Coloration of preserved specimens (after 27 to 29 years in 75% ethanol) (figs. 1–2): Basic colour of body predominantly light brownish, significantly darker on dorsum in most specimens, posterior margin of scales on upper half of body with somewhat darker edgings. Lower lip, unscaled lower parts of cheeks, lower jaw yellowish, pectoral-fin base whitish. In most specimens upper lip more or less dark grey-brown, rarely blackish; in several males centre of lower lip light yellowish brown, rest as upper lip. Frontal part of head from lips to interorbital area uniform light brown or grey-brown except significantly darker brown edges of cephalic pores; no distinct interorbital stripe. Pre-orbital stripe as broad as pupil, straight, light brown in most specimens, framed by two straight narrow parallel black stripes; third parallel stripe on lower frontal edge of cheek in several adult males; scaled parts of cheeks and operculum (except cheek stripe) light brownish. Operculum in some larger males with light grey overlay. Cheek stripe brownish, mostly darker in females, in both sexes as wide as pupil on cheek, half as wide from frontal margin of preoperculum, beginning close to orbit between foramina 1 and 2 of posterior orbital of suborbital series (for terminology see KULLANDER, 1987), running backwards in straight line between lateral canal foramina (LCF) 10 and 11 across posterior half of cheek to lower margin of operculum. Small blackish chin spot contiguous with narrow lip stripe. Another small blackish spot on lower frontal base of preoperculum. Chin and central parts of branchiostegal membrane yellowish brown with some black pigmentation. Forehead from interorbital to below first dorsal spine dark brown, usually darker than dorsum. Iris dark, bluish grey, in some specimens with greenish grey lower zone. Apart from spot pattern no abdominal stripes. Anal spot absent in all specimens. Lateral band present in most specimens, almost straight, brown, about one scale high in frontal third, covering upper third of L-row scales, entire L+1-row scales, and in larger specimens lower quarter of L+2-row scales, widening posteriorly, extending from posterior margin of orbital to just above centre of caudal-fin base. No lateral spot. Seven distinct but faded vertical bars on body visible only in

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

		all specimens						males						females					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	45.8	26	34.2	20.7	48.9	9.55		17	37.5	21.5	48.9	9.66		8	28.4	20.7	38.3	5.50	standard length
TL	134.5	26	135.0	129.7	146.3	3.28		17	135.5	129.7	146.3	3.81		8	134.3	131.6	137.1	1.67	total length
TLS	134.5	26	135.0	129.7	146.3	3.28		17	135.5	129.7	146.3	3.81		8	134.3	131.6	137.1	1.67	total length plus streamer
HL	36. 8	26	34.9	32.4	36.8	1.16		17	34.9	32.4	36.8	1.23		8	34.8	32.5	36.2	1.05	head length
HD	28.8	26	28.7	25.5	35.1	1.97		17	29.0	26.3	31.2	1.35		8	27.2	25.5	28.8	1.07	head depth
BD	40.2	26	38.1	35.6	40.4	1.11		17	38.4	36.7	40.4	1.04		8	37.8	36.5	39.1	0.85	body depth
HW	18.3	26	18.2	15.7	19.9	0.99		17	17.9	15.7	19.3	0.95		8	18.9	17.5	19.9	0.75	head width
PDL	37.5	26	37.9	35.5	41.1	1.33		17	37.9	35.6	41.1	1.33		8	38.2	36.3	40.3	1.15	pre-dorsal length
TDL	91.3	26	90.7	87.5	93.6	1.58		17	91.1	88.5	93.6	1.33		8	90.3	87.5	93.1	1.92	trans-dorsal length
PVL	41.3	26	40.1	37.1	42.6	1.37		17	40.2	38.1	42.6	1.31		8	39.9	37.1	42.0	1.63	pre-pelvic length
PAL	95.9	26	77.0	72.3	95.9	4.37		17	77.6	72.3	95.9	5.17		8	76.1	73.3	78.6	2.11	pre-anal length
TAL	69.7	26	87.2	69.7	90.7	3.87		17	86.8	69.7	89.5	4.61		8	88.3	86.5	90.7	1.41	trans-anal length
Eye	11.5	26	11.9	10.2	14.6	1.10		17	11.6	10.2	12.9	0.93		8	12.7	11.1	14.6	1.19	eye diameter
SNL	9.3	26	7.4	4.3	9.8	1.23		17	7.5	6.5	9.5	0.90		8	7.2	4.3	9.8	1.79	snout length
CHD	10.7	26	8.5	6.2	10.7	1.18		17	8.9	6.2	10.7	1.25		8	7.9	6.8	9.1	0.75	cheek depth
POD	4.2	26	3.4	2.4	4.6	0.64		17	3.5	2.4	4.6	0.71		8	3.2	2.7	3.8	0.46	pre-orbital depth
IOW	9.4	26	8.4	6.8	9.4	0.77		17	8.5	6.8	9.4	0.74		8	8.2	7.0	9.4	0.89	inter-orbital width
UJL	12.2	26	10.3	8.0	12.9	1.45		17	10.7	8.1	12.9	1.46		8	9.5	8.0	11.2	1.14	upper jaw length
LJL	15.2	26	14.7	12.4	17.5	0.98		17	15.0	13.7	17.5	0.91		8	14.3	12.4	15.5	1.00	lower jaw length
CPD	19.2	26	16.3	12.2	19.2	1.64		17	16.5	12.4	19.2	1.64		8	15.9	12.2	17.6	1.76	caudal peduncle depth
CPL	13.1	26	11.9	9.0	16.7	2.04		17	12.2	9.0	16.7	2.11		8	11.6	9.4	15.5	1.98	caudal peduncle length
DFB	59.7	26	60.2	57.8	62.6	1.43		17	60.5	57.8	62.6	1.44		8	59.9	58.4	62.3	1.44	dorsal fin base length
AFB	21.7	26	20.4	17.1	24.4	1.78		17	21.0	18.6	24.4	1.50		8	19.7	17.4	22.3	1.72	anal fin base length
PecL	32.8	26	30.0	21.0	39.9	3.94		17	30.9	21.0	39.9	4.30		8	28.4	25.5	31.7	2.38	pectoral fin length
PelL	42.1	26	33.3	25.0	44.3	5.82		17	34.7	26.9	44.3	6.25		8	31.3	26.9	36.5	3.55	pelvic fin length
PelSL	15.3	26	15.3	13.2	18.6	1.36		17	15.3	13.3	18.6	1.39		8	15.6	13.2	17.4	1.39	pelvic fin spine length
LDS	20.4	26	17.4	9.8	22.1	2.72		17	18.5	14.9	22.1	2.12		8	15.4	9.8	18.4	2.83	last dorsal spine length
LAS	16.4	26	17.4	12.6	19.7	1.80		17	18.2	16.4	19.7	0.92		8	15.9	12.6	18.5	2.26	last anal spine length

Table 2. Biometric data taken from *Apistogramma playayacu* 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
FMNH 117727	m	PT	48.9	66.3	66.3	17.3	15.2	18.2	7.7	17.4	43.7	19.1	33.5	42.3	5.4
FMNH 117728	m	PT	48.6	67.3	67.3	17.6	15.2	19.1	9.0	19.0	44.5	20.0	35.6	43.0	5.3
MTD F 32377	m	PT	48.0	65.2	65.2	16.2	14.8	18.3	7.9	17.8	44.5	18.5	32.2	41.0	5.2
FMNH 117729	m	PT	47.8	65.5	65.5	15.5	14.5	18.0	8.2	17.8	42.3	19.1	32.3	40.5	5.8
FMNH 101589	m	HT	45.8	61.5	61.5	16.8	13.2	18.4	8.4	17.2	41.8	18.9	39.9	31.9	5.2
FMNH 117727	m	PT	44.5	61.4	61.4	15.6	12.9	16.7	7.9	16.7	40.7	18.7	31.0	39.9	4.6
FMNH 101585	m	PT	41.9	61.3	61.3	14.0	12.0	15.9	7.8	15.2	38.7	17.9	29.4	37.4	5.3
FMNH 117730	m	PT	41.2	55.0	55.0	14.6	11.9	16.1	7.6	16.4	37.7	16.5	28.3	36.1	4.5
FMNH 117729	m	PT	39.6	53.0	53.0	13.6	11.8	14.5	7.2	14.9	35.2	16.2	27.7	35.1	4.0
FMNH 117730	f	PT	38.3	50.7	50.7	13.4	11.0	14.6	7.0	13.9	34.4	16.1	26.9	34.2	4.3
FMNH 117727	m	PT	38.0	53.0	53.0	13.7	11.0	15.4	7.0	15.6	35.5	15.4	27.6	33.7	4.1
FMNH 117728	m	PT	36.7	48.9	48.9	12.5	10.6	14.2	6.6	13.6	33.1	14.1	25.2	32.0	3.9
FMNH 101585	f	PT	35.0	46.5	46.5	11.8	9.8	13.1	6.2	13.1	32.2	13.7	24.8	31.3	4.3
FMNH 117732	m	PT	35.0	46.5	46.5	11.8	9.8	13.1	6.2	13.1	32.2	13.7	24.8	31.3	4.3
MTD F 32378	f	PT	31.5	42.6	42.6	11.1	8.9	11.7	6.2	11.9	29.3	12.5	22.5	28.6	4.6
FMNH 117727	f	PT	30.2	40.5	40.5	10.6	8.0	11.2	5.7	12.2	27.6	12.3	20.1	26.6	3.7
FMNH 117732	m	PT	30.1	39.6	39.6	10.4	8.1	11.8	5.7	11.3	27.5	11.8	21.5	26.4	4.3
FMNH 117728	f	PT	28.0	37.6	37.6	9.8	7.4	10.7	5.3	10.9	25.6	11.7	18.9	24.8	3.4
FMNH 117732	f	PT	26.1	34.3	34.3	9.6	7.5	9.9	4.7	10.2	23.8	10.4	18.5	23.1	3.1
FMNH 101585	m	PT	26.0	33.7	33.7	9.0	7.3	10.2	4.8	9.8	23.8	10.7	18.6	23.0	3.3
FMNH 101585	m	PT	24.4	32.9	32.9	8.4	6.8	9.5	4.7	9.4	22.2	9.5	16.6	21.5	3.0
FMNH 117733	m	PT	24.3	33.0	33.0	8.7	6.6	9.3	4.5	9.4	21.9	9.3	16.0	21.4	3.0
FMNH 117728	?	PT	23.6	31.2	31.2	8.5	8.3	8.4	4.3	8.4	20.9	9.4	16.0	19.9	2.9
FMNH 101585	m	PT	23.2	31.1	31.1	7.5	5.9	8.8	4.6	8.9	20.6	9.1	16.4	20.6	2.9
FMNH 117732	m	PT	24.9	33.5	33.5	8.6	6.7	9.6	4.8	9.7	22.0	9.2	16.9	21.5	3.0
FMNH 117732	f	PT	21.5	28.6	28.6	7.6	5.7	8.3	3.6	8.1	19.5	8.7	14.8	18.6	2.8
FMNH 101585	f	PT	20.7	28.4	28.4	7.5	5.7	7.5	3.6	7.8	18.1	8.1	14.0	17.9	2.6

Table 2. Continuation.

SNL	CHD	POD	IOW	UJL	LJL	CPD	CPL	DFB	AFB	PecL	PelL	PelSL	LDS	LAS
4.2	5.2	1.8	4.2	5.9	7.3	8.4	6.4	29.4	9.3	16.4	18.1	8.0	10.1	8.5
4.2	4.9	1.9	4.1	6.3	8.5	8.5	6.7	28.8	9.9	15.0	21.2	7.1	7.9	9.5
4.6	4.4	1.8	4.3	5.7	7.5	8.6	6.5	30.1	10.5	15.4	21.3	6.5	9.9	8.5
3.5	4.3	2.0	4.3	5.5	7.4	6.7	8.0	27.9	11.0	15.4	17.5	6.8	7.1	7.9
4.2	4.9	1.9	4.3	5.6	6.9	8.8	6.0	27.3	9.9	15.0	19.3	7.0	9.3	7.5
3.1	4.2	1.7	3.8	5.2	6.6	7.5	5.5	27.3	9.0	17.8	18.8	6.8	8.1	8.0
3.2	4.2	1.4	3.8	5.0	6.7	6.6	4.4	22.2	7.2	11.0	10.8	5.6	7.1	6.7
2.9	3.9	1.9	3.8	4.7	6.5	7.8	5.2	25.4	9.0	14.6	13.1	6.1	8.5	7.7
2.7	3.4	1.6	3.3	4.4	6.0	4.9	6.3	23.5	9.7	13.3	13.7	5.6	7.5	7.3
3.1	3.3	1.5	2.7	4.1	5.7	6.5	4.9	23.2	7.4	12.0	14.0	5.0	5.9	6.2
2.8	3.6	1.7	3.3	4.2	5.6	6.7	4.8	23.1	8.0	12,.3	13.6	5.3	7.0	6.7
2.7	3.2	1.3	3.0	3.9	5.3	5.9	4.5	22.2	7.2	11.0	10.8	5.6	7.1	6.7
2.5	3.0	1.1	2.6	3.4	5.1	5.5	3.5	12.1	3.9	6.1	5.8	3.4	3.6	3.4
2.5	3.0	1.1	2.6	3.4	5.1	5.5	3.5	12.4	4.0	4.5	6.2	3.6	3.4	3.9
2.5	2.9	1.0	2.9	3.1	3.9	5.1	3.9	19.6	7.0	8.7	10.9	5.3	4.5	5.2
1.8	2.3	0.9	2.9	3.0	4.5	4.8	3.5	17.6	5.3	9.6	9.7	4.8	5.5	4.9
2.7	2.4	0.8	2.4	2.9	4.3	4.8	3.0	21.8	7.8	10.0	10.4	5.5	5.3	6.5
2.7	2.3	1.1	2.4	3.1	4.3	3.4	4.3	17.1	6.0	7.5	9.3	4.9	4.8	5.2
1.8	1.9	0.7	1.9	2.3	3.7	4.2	2.7	18.0	5.3	8.7	9.6	4.4	4.1	3.8
1.7	1.8	0.7	2.2	2.4	3.7	4.2	2.3	26.1	8.4	13.7	17.5	7.2	9.3	7.8
1.6	2.0	0.6	1.7	2.1	3.3	4.1	2.5	16.1	5.3	8.1	7.2	4.3	5.1	5.0
1.8	2.1	0.7	2.2	2.3	3.5	4.1	2.5	14.4	5.3	6.2	6.8	3.2	4.3	4.6
1.4	1.9	0.8	1.9	2.2	3.3	3.6	2.3	13.9	4.0	6.1	5.9	3.3	3.6	3.7
1.5	1.8	0.6	1.9	1.9	3.1	4.1	2.4	14.9	5.2	7.2	7.3	4.5	4..6	4.8
1.1	1.7	0.7	2.0	2.0	3.6	4.4	2.3	15.5	5.2	6.5	7.0	3.9	4.4	4.7
1.6	1.3	0.5	1.9	1.8	3.1	3.3	2.3	14.5	5.1	6.3	6.8	3.6	4.3	4.6
1.3	1.5	0.6	1.5	1.8	3.0	3.1	2.2	14.0	4.7	5.9	6.2	3.7	2.3	2.9

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

Coll.No.	sex	status	SL	DF (h)	DF (s)	DF (i)	AF (h)	AF (s)	PF (h)	PF (s)	PecF	CF	abbreviations
FMNH 117727	m	PT	48.9	15	6	0	3	6	1	5	12	15	m = male
FMNH 117728	m	PT	48.6	15	7	0	3	6	1	5	12	15	f = female
MTD F 32377	m	PT	48.0	15	7	0	3	6	1	5	12	16	
FMNH 117729	m	PT	47.8	16	6	1	3	6	1	5	12	16	DF
FMNH 101589	m	HT	45.8	15	6	0	3	6	1	5	12	16	dorsal fin
FMNH 117727	m	PT	44.5	15	7	0	3	6	1	5	12	16	
FMNH 101585	m	PT	41.9	14	7	0	3	6	1	5	12	16	AF
FMNH 117730	m	PT	41.2	15	6	1	3	6	1	5	12	14	anal fin
FMNH 117729	m	PT	39.6	15	6	1	3	6	1	5	12	15	
FMNH 117730	f	PT	38.3	15	7	0	3	6	1	5	12	16	PF
FMNH 117727	m	PT	38.0	15	6	1	3	6	1	5	11	16	pelvic fin
FMNH 117728	m	PT	36.7	14	7	0	3	6	1	5	12	16	
FMNH 101585	f	PT	35.0	15	7	0	3	6	1	5	12	16	PecF
FMNH 117732	m	PT	35.0	15	7	0	3	6	1	5	12	16	pectoral fin
MTD F 32378	f	PT	31.5	15	7	0	3	6	1	5	12	16	
FMNH 117727	f	PT	30.2	15	6	1	3	6	1	5	12	15	CF
FMNH 117732	m	PT	30.1	15	7	1	3	7	1	5	12	17	caudal fin
FMNH 117728	f	PT	28.0	16	6	1	3	6	1	5	12	16	
FMNH 117732	f	PT	26.1	15	7	0	3	6	1	5	12	16	(h)
FMNH 101585	m	PT	26.0	15	7	0	3	7	1	5	12	15	hard rays (spines)
FMNH 117732	m	PT	24.9	16	7	0	3	6	1	5	12	16	
FMNH 101585	m	PT	24.4	15	7	1	3	6	1	5	12	16	(s)
FMNH 117733	m	PT	24.3	16	7	0	3	6	1	5	12	16	soft rays
FMNH 117728	?	PT	23.6	15	6	1	3	6	1	5	12	16	
FMNH 101585	m	PT	23.2	15	8	0	3	6	1	5	12	16	(i)
FMNH 117732	f	PT	21.5	16	6	1	3	6	1	5	12	16	minor soft rays
FMNH 101585	f	PT	20.7	15	7	0	3	6	1	5	12	16	

Fig. 3. *Apistogramma playayacu* sp. n., non type, male, live coloration in the aquarium, adult subdominant, aggressive. Photo: D. Bork / N. Kästner.

subadult to semi-adult individuals, broad, width of interspaces approximately 10 % of bar width. No distinct dorsal spots, but slightly brownish stripe covering only uppermost scale row immediately below dorsal base. Spot on caudal peduncle visible in all specimens, basically upright oval, devided horizontally in most males, entire in females and some small males. Under microscope caudal fin with small light greyish to pale brownish spots, giving cloudy milky to greyish impression; in males basal quarter to third of fin with irregular pattern of blackish brown vertical streaks or spots; no spots or other markings in females; rest of fin without any pattern in all specimens. Base colour of all other fins likewise cloudy milky to pale grey but light brownish in some larger males. Dorsal fin with dark blackish-brown spots on base of every second and third membrane, covering about one tenth of height of fin; first membrane in males, first and second (rarely third) in females, dark brown to black; in males irregular series of dark brown spots or dashes covering spines along centre of fin, streaks extending to tips of spines in some cases. Soft portion of dorsal and anal fins without hyaline spots of any type. Anal fin with brown dashes along hard and first soft rays, rest immaculate. Pectoral fin delicate light greyish in males, a little darker along fin-rays; in females anterior part along spine and adjacent two (rarely three) soft rays densely speckled with dark black-brown spots, rendering about one third to half of fin blackish.

Coloration of live specimens and sexual dimorphism: (fig. 3) The degree (if any) of colour variation in live *Apistogramma playayacu* sp. n. is still unknown, but from the few photographs taken in life (Kästner, 2005) and preserved specimens we can state that this species is fairly similar in appearance to *Apistogramma guttata* Antonio *et al*., 1989 and in certain respects possibly to *Apistogramma hoignei* Meinken, 1965, two species that have actually turned out to be highly polychromatic in the male sex.

Live male specimens exhibit basically greenish base colour on body, orange spot on pectoral base, pattern of spots on abdomen dark brown to black, and light orange caudal fin. Adult females during brood

care with bright yellow base colour, black cheek and nape stripes, lateral band covering scales of L-row from behind head to base of caudal fin before upright oval caudal spot; this spot about half as deep as caudal-fin base; frontal third of ventral fins and frontal margin of caudal fin blackish. In aggression females with pattern of three to five roughly rectangular lateral spots within margins of lateral band.

As live material is still scarce, a more detailed description providing further additional diagnostic information on the live coloration of this species has had to be postponed until more live specimens become available.

Systematics. *Apistogramma playayacu* sp. n. is apparently a member of the *Apistogramma regani* lineage (nomenclature and systematics following RÖMER, 2006) with a still uncertain position within this species cluster. All species in this lineage share the following characters: unreduced number of cephalic pores, high-backed body, lateral band ending before or on first half of caudal-fin base, blackish first dorsal membranes, lateral spot absent, regularly visible vertical bars or dorsal spots, and brooding females with lateral band or row of 3 to 6 lateral spots. Within the lineage, *Apistogramma playayacu* sp. n. exhibits the most similarities to the species of the *Apistogramma macmasteri* complex. Species of this complex are additionally characterised by pronounced sexual dimorphism, more or less zigzag lateral band, prolonged dorsal membranes in males, and (in brooding females) row of up to 6 lateral spots (replacing lateral band) as well as dorsal spots. Of all known species of the genus with a comparable overall habitus, *Apistogramma guttata*, a member of this complex, exhibits the most similar black pattern on the head and body to the species described herein (*cf.* figs. 1 – 2, 4, & 6).

Distribution and ecology. The new species is known from only two locations in the Ecuadorian rio Napo system (fig.4), and at present its distribution and ecology are only poorly known and require further studies in the field. Interestingly, *Apistogramma playayacu* sp. n. has been collected in the rio Agarico, where another as yet undescribed *Apistogramma* species has also been reported. Future field studies should also focus on the question of whether the species' range also extends to Peruvian waters.

Etymology. The species epithet *playayacu* is a noun in apposition. The name refers to the type locality – the holotype was collected in the Quebrada Playayacu.

Biology. No detailed field reports on the biology or behaviour of this species are available at present. In

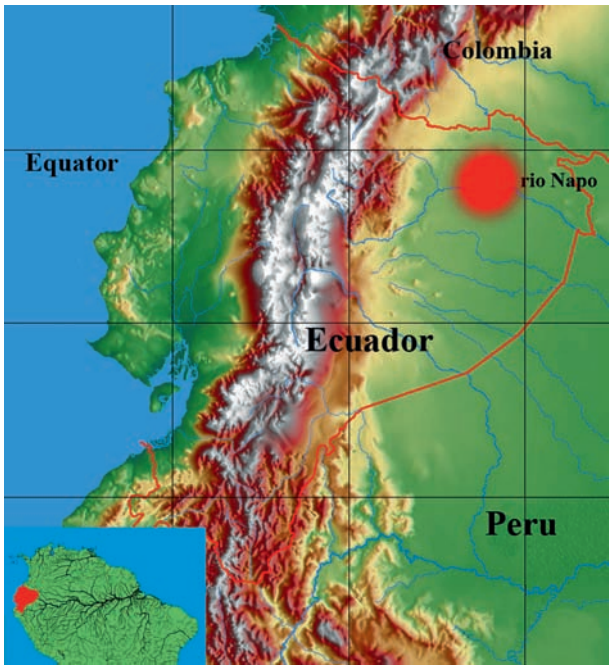

Fig. 4. Map of Equador, showing distribution of *Apistogramma playayacu* sp. n., type locality indicated by red ●.

spite of the fact that – as documented by published photographs – it has probably already been imported to Germany, only a single short note on its biology in captivity has been published (KÄSTNER, 2005), in a minor aquarium magazine. Nevertheless, this note indicates that there are no significant differences from other closely related species within the genus (*cf.* KOSLOWSKI, 2002; LINKE & STAECK, 2006; RÖMER, 2000, 2006; STAECK, 2003).

Discussion

Apistogramma playayacu sp. n. is the 71st valid species of *Apistogramma* to be formally described (last update October 2011). It is distinguished from most other species of the genus by the dense regular pattern of triangular spots on the body, as well as by the irregular spot pattern on the head and gill covers of mature males. In addition, adult specimens are distinguished by the shape and coloration of the body. *Apistogramma playayacu* sp. n. is distinguished from all species of the *Apistogramma agassizii* lineage in that the latter are a completely different shape with a long, slender body. Most species of the *Apistogramma steindachneri* lineage (*cf.* RÖMER, 2000, 2006) are distinguished from the new taxon by having a differ-

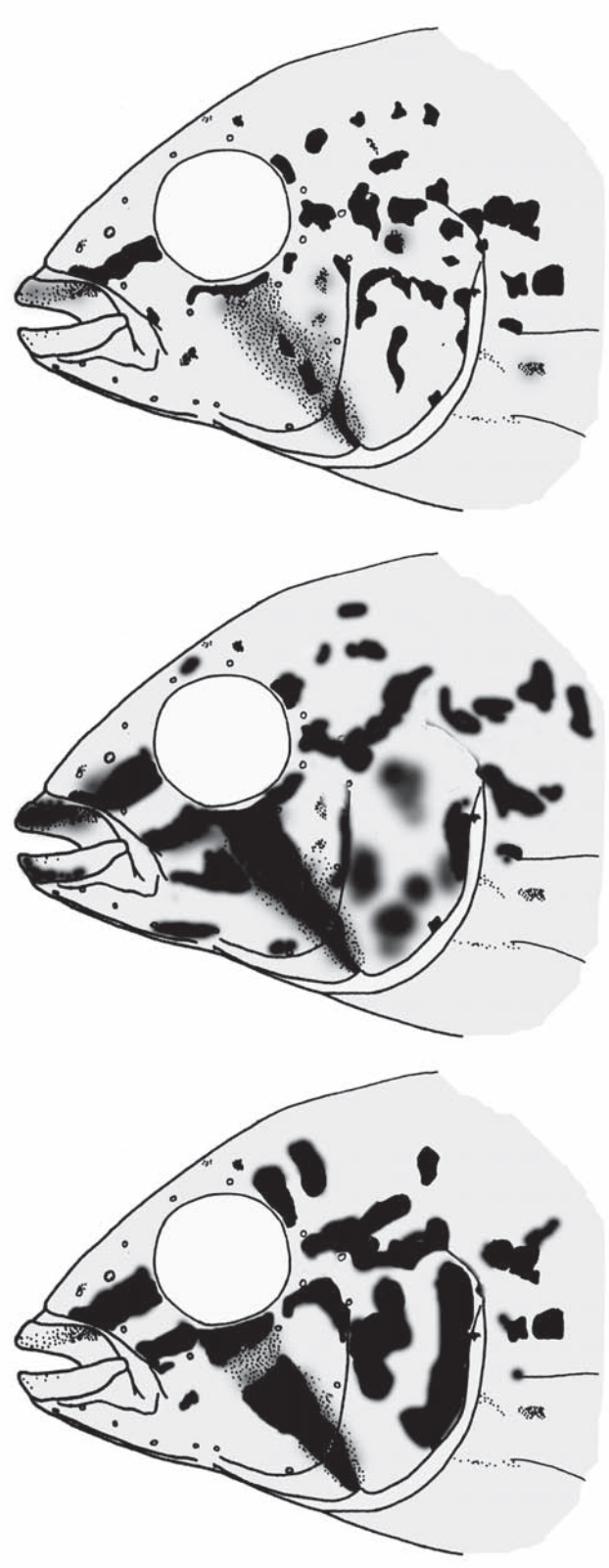

Fig. 5. Pigmentation pattern of the head of *Apistogramma playayacu* sp. n. (middle), *A. guttata* (top) and *A. hoignei* (bottom).

ent head and mouth structure (significantly enlarged with massive jaws), in many cases either a lyrate caudal fin or a caudal fin with a broad, coloured margin, as well as completely different coloration otherwise. Only *Apistogramma alacrina* Kullander, 2004 may also exhibit an irregular black spot pattern, but is easily distinguished from the new species by lacking regular rows of spots and having a distinct black spot at the base of the pectoral fin as well as a different dorsal-fin shape.

Having thus eliminated about 60 % of all known *Apistogramma* species, there remain only a few species of the *Apistogramma regani* lineage that exhibit comparable diagnostic features and may resemble the new species, and therefore need to be differentiated. *Apistogramma hoignei* Meinken, 1965 shares the overall morphological traits of *Apistogramma playayacu* sp. n. and has a comparable black head pattern (fig. 5), but adult males have a lyrate caudal fin and only exceptionally exhibit black spots on the body. Furthermore *Apistogramma hoignei* has significantly higher anal-fin counts. Staeck (1990) found four anal-fin spines in more than 60 % of the specimens inspected, while all the types of *Apistogramma playayacu* sp. n. have three. Other species with an overall similarity to *Apistogramma playayacu* sp. n. are *Apistogramma rubrolineata* Hein *et al*., 2002 and *Apistogramma tucurui* Staeck, 2003. Both also exhibit a black pattern that includes rows of black spots, but the latter number up to nine and are much fainter and more regular than in *Apistogramma playayacu* sp. n., and both species have a less deep and more slender body. Four still undetermined forms, *Apistogramma* sp. "Peixoto", *Apistogramma* sp. *aff*. "Peixoto", *A*. sp. "Vielflecken" (reviewed in Römer, 2000, 2006, respectively), and *A*. sp. "Jabuti" (see Stawikowski, 2005) also share the black body pattern with *Apistogramma playayacu* sp. n.. However, all these species are clearly distinguished from *Apistogramma playayacu* sp. n. by having much less prolonged dorsal-fin membranes than the new species, by a vertically-banded caudal fin, and in some cases by additionally exhibiting more or less intense orange markings in the dorsal and ventral margins of that fin. The only remaining species that may be mistaken for the new species is *Apistogramma guttata*, a species of similar size, similar overall morphology, and similar colour pattern (fig. 6). But *Apistogramma guttata* exhibits a different form to the spots on the abdomen (round to ovate vs. triangular), different head pattern (fig. 5), in most specimens subdorsal zigzag band (present vs. absent), small squarish undivided caudal spot, and intense red (or blackish) upper and lower margins to the caudal fin (Antonio *et al*., 1989; Römer, 2000, 2006; Staeck, 2003). Thus there is no doubt that the fish described here is a distinct species.

Its precise phylogenetic position is, however, still uncertain, as the relevant studies necessary to resolve

Fig. 6. For comparison: *Apistogramma guttata*, male, not preserved, live coloration in the aquarium, territorial, dominant, aggressive.

this question are as yet lacking. Further study is required, and should focus on variation in live coloration, behaviour, and ecological background data.

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