

Geophagus gottwaldi sp. n. - a new species of cichlid fish (Teleostei: Perciformes: Cichlidae) from the drainage of the upper río Orinoco in Venezuela

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Abstract. *Geophagus gottwaldi* sp. n. is described from the drainage of the upper río Orinoco in the Estado Amazonas in southwestern Venezuela. It can be distinguished from all other described *Geophagus* species by the following combination of characters: a prominent dark infraorbital stripe, caudal fin with a pattern of roundish light spots, a rectangular midlateral spot, 34–36 scales in a lateral line and total length of more than 20 cm.

Resumo. *Geophagus gottwaldi*, espécie nova, é descrita da drenagem do alto rio Orinoco (Estado Amazonas, Venezuela). *Geophagus gottwaldi* é distinta das demais espécies descritas do gênero *Geophagus* pela combinação das seguintes características: faixa intraorbital completa, nadadeira caudal com manchas claras arredondadas, uma grande mancha rectangular preta no meio de corpo, 34–36 escamas no linha lateral e tamanho grande (TL > 20 cm).

Resumen. Se describe una nueva especie de cíclido, *Geophagus gottwaldi*, de la cuenca del alto río Orinoco (Estado Amazonas de Venezuela). La nueva especie se distingue de todas las demás especies del género *Geophagus* por la siguiente combinación de caracteres diagnósticos: una banda oscura conspicua intraorbital que extiende desde el ojo hasta el ángulo del preopérculo, aleta caudal con manchas blancas redondas, una grande mancha rectangular en el centro del cuerpo, 34–36 escamas en la serie longitudinal y tamaño grande (TL > 20 cm).

Kurzfassung. *Geophagus gottwaldi* sp. n. wird aus Zuflüssen des oberen Orinoko im Estado Amazonas in Venezuela beschrieben. Dieser Cichlide unterscheidet sich von allen anderen bisher beschriebenen *Geophagus*-Arten durch die Kombination folgender diagnostischer Merkmale: kräftiger, vollständig ausgebildeter Intraorbitalstreifen, Schwanzflosse mit einem Muster von hellen rundlichen Flecken, ein großer rechteckiger dunkler Seitenfleck, 34–36 Schuppen in der Längsreihe und eine maximale Gesamtlänge von über 20 Zentimeter.

Key words. Taxonomy, ichthyology, freshwater, ecology, Cichlidae, new species, Venezuela.

Introduction

The South American cichlid genus *Geophagus* HECKEL, 1840 includes medium-sized to moderately large geophagine cichlids (TL approximately 12 to 25 cm) with an extensive laminar ventral expansion of the first epibranchial margined by a so-called epibranchial lobe. The genus is widely distributed in the Amazon and Orinoco basins, in the Guianas and in parts of northeastern Brazil. As currently recognized, *Geophagus* includes fifteen nominal species (LÓPEZ-FERNÁNDEZ & TAPHORN, 2004; STAECK & SCHINDLER, 2006), but numerous others remain to be described (WEIDNER, 2000; STAWIKOWSKI & WERNER, 2004). Six species are known from Venezuela where they are distributed on the Guyana shield, in the Llanos of the lower Orinoco drainage, in the headwaters of the río Negro, in the Casiquiare and in the drainage of the Orinoco in its upper and middle course.

The fish described below is one of the many examples of South American cichlid species which are well-known both in the aquarium trade and the popular literature long before their formal description is available. In the genus *Geophagus* there are more than two dozens of such species (cf. STAWIKOWSKI & WERNER, 2004), referred to by popular names.

The species provisionally referred to as *Geophagus* sp. “Sipapo” has been known in the aquarium trade since 2001 when it was first imported as an aquarium fish to Germany

(STAWIKOWSKI & WERNER, 2004; ARENDT, 2006). The purpose of the present paper is to give a formal description of this species, bringing the total number of described species in the genus to sixteen.

Material and Methods

The holotype and paratypes were fixed in formalin and later transferred into 75% ethanol. The type specimens are deposited in the Museum für Tierkunde Dresden (MTD F).

The techniques for taking measurements and meristic data follow those described in KULLANDER (1986, 1990) and KULLANDER & NIJSSEN (1989). Measurements were made with a dial caliper reading to the nearest 0.1 mm when linear distance was less than 130 mm, and with a measuring tape to the nearest mm when the distance was more than 130 mm. For details of scale counts see LÓPEZ-FERNÁNDEZ & TAPHORN (2004). Number in brackets after counts indicate the number of specimens examined with that condition. The terminology for dark patterns is adopted from LÓPEZ-FERNÁNDEZ & TAPHORN (2004). Comparisons were made with specimens of *G. taeniopareius* (NRM 12775). Data from the original species descriptions and redescriptions (GOSSE, 1976; KULLANDER, 1986; KULLANDER & NIJSSEN, 1989; KULLANDER, 1991; KULLANDER *et al.*, 1992; LOPEZ-FERNANDEZ & TAPHORN, 2004) were also used.

The terminology used for two major portions of the Orinoco drainage follows CHERNOFF *et al.* (1991). The upper Orinoco comprises the region above the rapids near Puerto Ayacucho and the lower Orinoco includes the parts of the drainage which flow north and east below the confluence of the río Meta.

Abbreviations: E1 = row of scales in the horizontal series directly above the longitudinal row including the lower lateral line; SL = standard length; TL = total length; MTD F = Staatliche Naturhistorische Sammlungen Dresden, Museum für Tierkunde, Fischsammlung; NRM = Swedish Museum of Natural History, Stockholm.

Geophagus gottwaldi sp. n.

(Table 1, Figs. 1 and 3–5)

Holotype. MTD F 30394, an adult male, 198 mm SL, lower río Sipapo at the Raudal Caldero, Estado Amazonas, Venezuela (approx. 4° 55' N and 67° 45' W), *leg.* April 2001 by J. GOTTWALD.

Paratypes. MTD F 30395, 183 mm SL, collecting data like holotype. MTD F 30396, 93,2 mm SL, lower río Atabapo near San Fernando de Atabapo, Estado Amazonas, Venezuela (approx. 4° 2' 55 N and 42° 8 W), *leg.* January 2006 by M. BÖTTNER & W. STAECK.

Diagnosis. A large species of *Geophagus* (largest type 198 mm SL), which differs from all the other described species in the genus in the combination of (1) a well developed, complete infraorbital stripe, (2) a rectangular midlateral spot (3) a caudal fin with large irregularly arranged light roundish spots on the entire fin, (4) a comparatively high number of XVIII or XIX dorsal-fin spines and (5) 34 to 36 scales in E1 row.

Description. Based on the holotype and two paratypes. See figs. 1 and 3–5 for general shape and colour patterns. Body proportions are summarized in Table 1. The larger paratype (MTD F 30395) was kept in aquaria and is not well preserved, which made it difficult to take certain measurements and meristic data.

Body moderately elongate; dorsal outline more arched than ventral outline. Dorsal head profile slightly curved. Orbit in about middle of head length, close to frontal contour. Snout moderately long. Lips moderately wide and comparatively thin; lower lip without expanded fold. Soft dorsal and anal fin pointed. Caudal fin truncate, tip of both lobes with pointed prolongation. Pelvic fins pointed, produced into a long filament reaching slightly beyond the posterior end of anal-fin base.



Fig. 1: *Geophagus gottwaldi* sp. n., holotype, MTD F 30394.

Scales on body and nape ctenoid; cheek and prepelvic scales cycloid. Anal, pelvic and pectoral fin naked. Dorsal fin with minute scales along its base. Caudal fin densely scaled up to $\frac{4}{5}$ of its length in its upper and lower parts; middle of caudal fin scaled only at its base. Jaw teeth unisupid, slightly recurved. Teeth in outer row larger than those of inner rows. Outer row with 14–24 teeth.

Gill arches dissected only from the larger paratype: On first gill arch 9 epibranchial and 12 lower limb external gill rakers. Microbranchiospines present on second to fourth ceratobranchial. Gill filaments with narrow basal skin cover. Lower pharyngeal tooth plate moderately long (width of bone 85% of its length); with well-ordered teeth; length of dentigerous area 85% of its width; 24 teeth in posterior row, 9 teeth in median row (tooth obviously lost were also counted). Fourth ceratobranchial with 5 tooth plates with 3, 7, 4, 3, 3 (left side) and 4, 5, 4, 3, 2 teeth respectively (right side).

Dorsal fin XVIII.12 (2) or XIX.12 (1). Anal fin III.8 (3). Pectoral fin 15 (3). Pelvic fin I.5 (3). Caudal fin 16 (3). Scales in E1 row 34(1), 35(1) or 36(1). Scales on upper lateral line: 20 (1), 22 (1) or 24(1); on lower lateral line 16(1), 17 (1) or 19(1).

Colouration in life. See Figs. 3–5 for illustration of the colouration. Colour photos of this species were also published by STAWIKOWSKI & WERNER (2004) and ARENDT (2006). Subadult specimens with dark grey, adult ones with maroon ground colour. Chest and belly greyish white. Forehead and nape darker. Gill cover often with a tinge of orange. Upper and frontal part of iris bright red. A dark infraorbital stripe from the eye to the corner of the preopercle. On the body sides up to approximately seven iridescent golden or green longitudinal lines. Dorsal, caudal and anal fin of subadult specimens dark grey, in adult ones reddish brown. Large irregularly arranged roundish whitish spots on the soft portion of dorsal fin and on the entire caudal fin. Anal fin with several horizontal streaks of the same colour. Pelvic fins with similar longitudinal banding. In the middle of the flanks a large black rectangular midlateral blotch extending dorso-ventrally from the upper lateral line to the margins of the E1 scales 10–14.

Colouration in alcohol. Ground colour dark grey. Front and nape darker. Lower portion of head, chest and belly whitish. A dark infraorbital stripe from the eye to the corner of the preopercle. On the flanks up to seven horizontal lines formed by the brown margins of the scales on the body sides. In the middle of the sides a dark brown or black rectangular midlateral spot as described above. Dark vertical bars indistinct. Soft portion of dorsal and caudal fin with irregular pattern of light roundish spots. Anal fin and pelvic fins with several light horizontal streaks.

Table 1. Body proportions of *Geophagus gottwaldi*. Measurements of holotype (MTD F 30394) and two paratypes (MTD F 30395, 30396) in percent of SL or head length (SL in mm).

	Holotype		Paratypes	
Standard length	198	183	93.2	
Percent of standard length				
Head length	28.7	28.6	33.0	
Body depth	37.9	35.7	34.8	
Length of anal-fin base	16.9	16.3	16.6	
Length of dorsal-fin base	57.9	52.3	57.4	
Caudal peduncle depth	11.1	10.9	10.8	
Caudal peduncle length	18.9	22.8	20.5	
Pectoral fin length	30.2	28.3	29.3	
Pelvic fin length	53.0	48.7	37.2	
Length of last dorsal-fin spine	17.8	14.6	14.1	
Percent of head length				
Snout length	13.3	12.2	16.1	
Orbital diameter	8.9	8.0	8.9	
Head depth	31.5	30.5	28.8	
Interorbital width	9.2	8.2	7.2	
Preorbital depth	11.5	9.9	9.1	



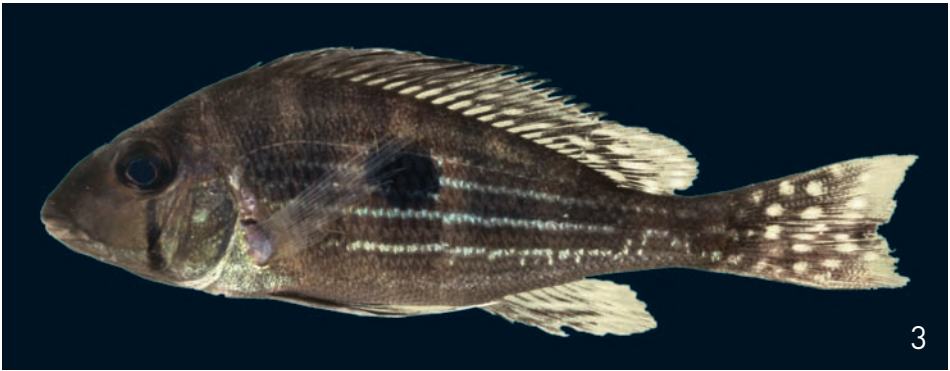
Fig. 2. Collecting site of *Geophagus gottwaldi* sp. n. at the río Atabapo in the vicinity of San Fernando de Atabapo.

Fig. 3. Live subadult *Geophagus gottwaldi* sp. n. from the río Atabapo, approx. 15 cm TL, immediately after capture in a photographic tank.

Fig. 4. Live topotypic adult *Geophagus gottwaldi* sp. n., approx. 25 cm TL, in photographic tank.

Fig. 5. Adult aquarium specimen of *Geophagus gottwaldi* sp. n. from type locality, approx. 20 cm TL. Photo: J. GOTTWALD.

Fig. 6. Live paratype of *Geophagus taeniopareius* (NRM 12775), 60.6 mm SL, immediately after capture in photographic tank.



Etymology. Named in honour of JENS GOTTWALD, the collector of the holotype, in recognition of his commitment to increase the knowledge about cichlid fishes. He was the first who recognized this cichlid as a new species.

Geographical distribution. As currently known, *Geophagus gottwaldi* seems to have a restricted distribution in the upper río Orinoco and its tributaries in southwestern Venezuela (Estado Amazonas) for so far it has been collected only in the lower río Sipapo and the lower río Atabapo.

Ecological notes. Field observations indicate that the habitats preferred by *Geophagus gottwaldi* are bare sandy bottoms among rocky areas in the black water tributaries of the upper Orinoco, which may have a remarkably strong current. Water data collected in January at a collecting site at the río Atabapo (Fig. 2): pH 4.5; electrical conductivity 10 $\mu\text{S}/\text{cm}$; water temperature 28 °C. At the type locality at the río Sipapo the brownish water was moderately clear with pH 5.15 and a temperature of 29.5 °C (ARENDE, 2006).

The associated fish fauna includes *Aequidens* sp. "Atabapo", *Biotodoma wavrini*, *Crenicichla* sp. "Atabapo", *Laetacara* sp. "Orangeflossen", *Heros severus*, *Mesonauta insignis*, and several characid and siluroid species (cf. ARENDE, 2006).

Discussion.

Geophagus gottwaldi can be distinguished from all the described species of the *G. surinamensis*-complex (as diagnosed by LOPEZ-FERNANDEZ & TAPHORN, 2004) by the possession of a complete infraorbital stripe in both young and adult specimens. The only other *Geophagus* species having a prominent dark infraorbital stripe running from the eye to the corner of the preopercle as adults are *G. taeniopareius* KULLANDER & ROYERO, 1992 and *G. grammepareius* KULLANDER & TAPHORN, 1992.

In adult specimens of *G. argyrostictus* KULLANDER, 1991 and *G. harreri* GOSSE, 1976 the infraorbital stripe is distinct only on the cheek and usually does not ventrally extend to the corner of the preopercle. Furthermore *G. gottwaldi* can be distinguished from *G. argyrostictus* by the lack of iridescent silvery scales on the anterior sides, by a large rectangular midlateral spot (round or slightly ovate in *G. argyrostictus*) and an apparently higher number of dorsal-fin spines (XVIII or XIX versus mode XVII).

Beside other characteristics *G. gottwaldi* differs from the very distinctive *Geophagus*-species *G. harreri* (see KULLANDER & NIJSSEN, 1989) by a higher number of dorsal-fin spines XVIII–XIX versus XV–VII (mode XVI), the lack of a prominent dark blotch (being diagnostic for *G. harreri*) just below the posterior end of dorsal-fin base, the lack of distinct vertical bars, and the possession of 34–36 scales in row E1 versus 31–33 (see KULLANDER & NIJSSEN, 1989).

From *G. grammepareius* (distributed in the drainage of the lower Orinoco) *G. gottwaldi* can be distinguished by a higher number of dorsal-fin spines (XVIII or XIX versus XV–XVII in *G. grammepareius*), more scales in E1 row (34–36 versus up to 31), horizontal stripes along the sides (vs. plain sides), narrower lips (lower lips expanded to cover part of lower jaw), a large rectangular lateral spot (versus round and small), a dorsal-fin base with minute scales (versus dorsal fin completely naked) and the larger size (up to 198 mm SL versus max. 103 mm SL).

Geophagus gottwaldi is superficially most similar to its geographic neighbour *G. taeniopareius* (cf. Fig. 6), which is also distributed in the drainage of the upper Orinoco (KULLANDER *et al.* 1992). However, *G. gottwaldi* differs by the following diagnostic character states: more dorsal-fin spines (XVIII–XIX versus XV–XVIII, mode XVII in *G. taeniopareius*), more E1 scales (34–36 versus 31–33, mode 32), a large rectangular midlateral spot (versus round and smaller), irregularly arranged distinct large light roundish spots on the entire caudal fin (versus much smaller bluish spots) and the larger adult size (max. SL 198 mm versus max. SL 143 mm).

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