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A new dwarf cichlid genus and species (Teleostei, Cichlidae) from Guinea, West Africa

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Abstract

Enigmatochromis lucanusii, a new cichlid genus and species, is described from Guinea (West Africa). It is a member of the chromidotilapiine cichlid clade, and differs from other genera within the group in a combination of morphological characters and coloration patterns; e.g., twelve circumpeduncular scales; three tubular infraorbital bones in addition to the lachrymal bone; upper lateral-line separated from the dorsal-fin base; first ray of pelvic fin in adult females of equal length or longer than second ray; sexual dimorphism well developed; small juveniles with 3–4 rows of irregular dark dots on body; and breeding coloration of females.

Key words: *Enigmatochromis*, chromidotilapiine

Résumé

Enigmatochromis lucanusii, un nouveau genre et espèce de cichlidé, est décrit de Guinée (Afrique de l'Ouest). C'est un membre du clade des cichlidés chromidotilapiines, et il diffère des autres genres du groupe par une combinaison de plusieurs caractères morphologiques et patrons de coloration; e.g., 12 écailles autour du pédoncule caudal; trois os infraorbitaires tubulaires en plus de l'os lacrymal; ligne latérale supérieure séparée de la base de la nageoire dorsale; premier rayon de la nageoire pelvienne des femelles adultes de longueur égale ou plus long que le deuxième rayon; dimorphisme sexuel bien développé; juvéniles de petite taille avec 3–4 rangées de marques noires irrégulières sur le corps; et livrée nuptiale des femelles.

Introduction

In 2004, a small cichlid species from Guinea was introduced into the aquarium hobby by several commercial importers in Canada, the U.S.A. and Europe. This new cichlid clearly was a member of the chromidotilapiine cichlid assemblage *sensu* Greenwood (1987) as it possessed the characteristic combination of features of this group: (1) a typical, visor-like and well circumscribed projection (“hanging pad”) of the pharyngeal tissues situated anterior to the upper pharyngeal bones of each side; (2) no microbranchiospines; (3) outer-row jaw teeth unicuspid; (4) some anterolaterally positioned teeth in the outer tooth row of the lower jaw, curved directly posteriorly and not buccally as they are in all other tooth rows; (5) tuberculate gill rakers on the first ceratobranchial. Females possessed coloration patterns unknown from any other species within this assemblage, e.g., a bright blue dorsal-fin in females. The species was initially called *Pelvicachromis* sp. “blue fin”, and was thought to be closely related to *P. roloffii*. Further morphological and behavioral observations however revealed differences from the genus *Pelvicachromis*.

In 2006, Canadian importer and aquarist Oliver Lucanus collected specimens of this species in Guinea at a single locality near the village of Fria, and provided the author with a detailed description of the habitat (pers.

comm.). It is the aim of this paper to describe this new genus and species based on several collections all from this locality.

Material and methods

External counts and measurements follow [Barel *et al.* \(1977\)](#). All measurements were taken on the left side of the specimens with digital calipers with an accuracy of ± 0.1 mm.

Radiographs were produced for the AMNH material for vertebrae counts. The clearing and staining protocol to examine bones and cartilage followed [Dingerkus & Uhler \(1977\)](#). Definitions of genera described before 1987 follow all diagnoses as given in [Greenwood \(1987\)](#). Description of coloration was based on both wild caught and tank raised specimens. Abbreviations used include: AMNH, American Museum of Natural History, New York; MNHN, Muséum National d'Histoire Naturelle, Paris; MRAC, Musée Royal de l'Afrique Centrale, Tervuren; NMW, Naturhistorisches Museum, Wien; ZSM, Zoologische Staatssammlung, München; SL, standard length; HL, head length; and undet., undetermined gender.



FIGURE 1. *Enigmatochromis lucanusi*, NMW 95063, holotype, male, 44.7 mm SL; Guinea: Small creek near the village of Fria, north of Conakry. Scale bar = 10 mm.

Enigmatochromis new genus

(Figs. 1 & 2.; Table 1)

Type species. *Enigmatochromis lucanusi*, new species by original designation.

Diagnosis. The new genus is distinguished from all other chromidotilapiine genera by a unique combination of characters. It possesses twelve scales around the caudal peduncle vs. (13 or 14 scales) in *Limbochromis* Greenwood 1987, (14–16 scales) in *Chromidotilapia*, Boulenger 1898, and (16 scales) in *Benitochromis* Lamboj 2001, *Pelvicachromis* Thys van den Audenaerde 1968 and *Thysochromis* Daget 1988. Among the remaining chromidotilapiine genera with twelve circumpenducular scales this new genus is further distinguished from *Congochromis* Stiassny & Schliewen 2007 and *Nanochromis* Pellegrin 1904 by: an infraorbital series containing a lachrymal and three additional tubular bones, and a gap between the 2nd and 3rd tubular infraorbitals (vs. lachrymal and one tubular bone), plus the lateral line is clearly separated from the dorsal-fin base (vs. posterior part contiguous with the dorsal-fin base). It is distinguished from *Divandu* Lamboj & Snoeks 2000 by: an infraorbital series with a lachrymal and three additional tubular bones and a

gap between the 2nd and 3rd tubular infraorbitals (vs. four tubular bones), only four openings of the laterosensory system in the lachrymal bone (vs. five), the first ray of pelvic fin in adult females is of equal length or longer than second ray of this fin (vs. first ray always longer), being a pair-bonding cave breeder (vs. a mouthbrooder), and by well developed sexual dichromatism (vs. weakly developed). Finally it is distinguished from *Parananochromis* Greenwood 1987 by: an infraorbital series with a lachrymal and three additional tubular bones with a gap between the 2nd and 3rd tubular infraorbitals (vs. four tubular bones in some species of *Parananochromis*), juveniles with 3 or 4 rows of irregular dark brown to black dots on body (vs. maximum of 2 rows), and the first ray of pelvic fin in adult females of equal length or longer than the second ray of this fin (vs. second ray slightly longer or of equal length).

Etymology. *Enigma* from enigmatic, refers to the somewhat intermediate characters between *Pelvicachromis* and *Parananochromis* in possessing pigmentation similarities to the first, but anatomical similarities to the second genus; and *chromis* – a common ending for African cichlid fishes. Gender masculine.

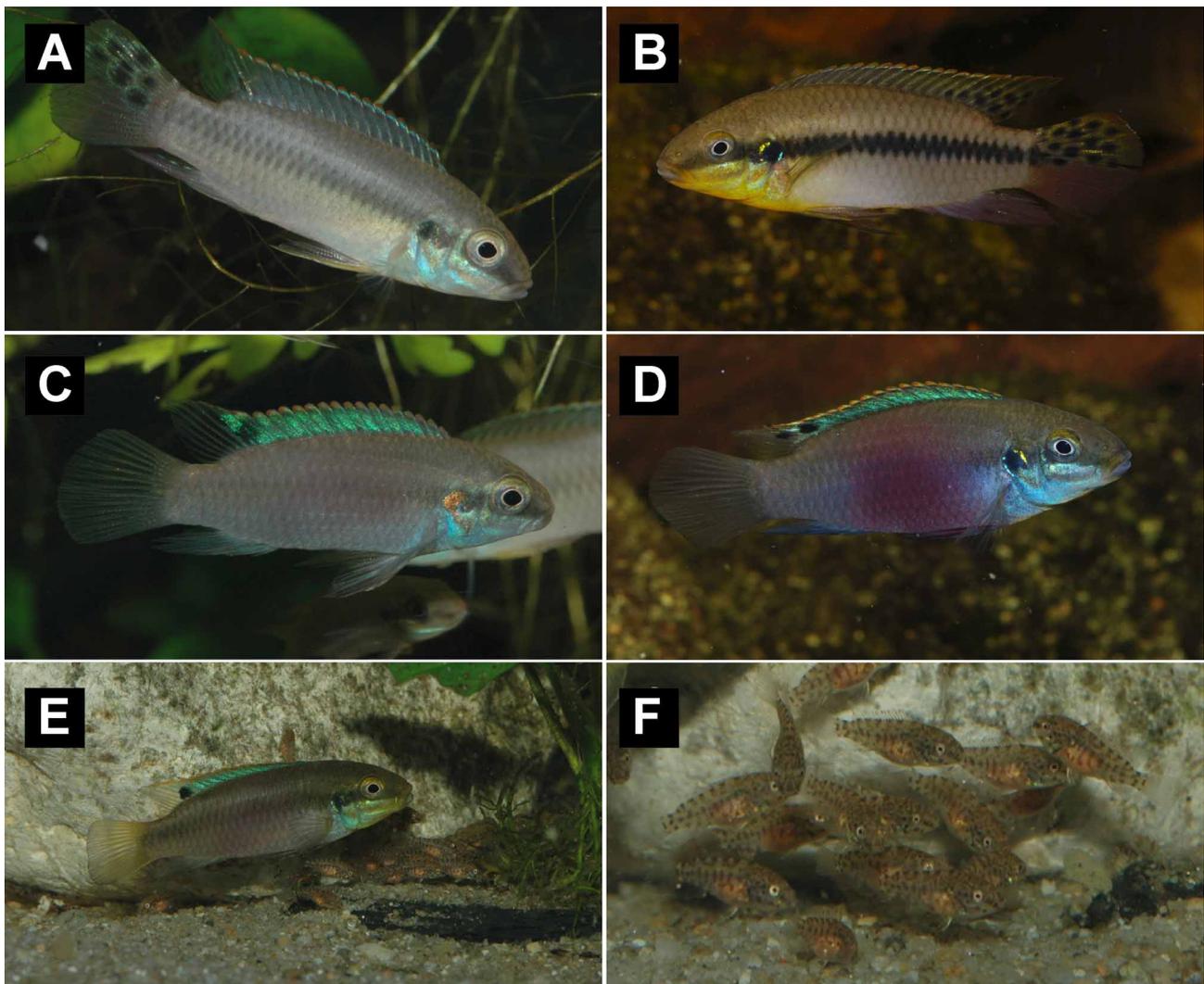


FIGURE 2. Photographs showing coloration of *Enigmatochromis lucanusi*, nov. sp.: A) male, wild collected specimen in aquaria, ~40 mm SL, not preserved, displaying submissive coloration; B) male, wild collected specimen in aquaria, ~42 mm SL, not preserved, displaying aggressive coloration; C) female, wild collected specimen in aquaria, ~38 mm SL, not preserved, displaying submissive coloration; D) female, wild collected specimen in aquaria, ~39 mm SL, not preserved, displaying aggressive coloration; E) female, wild collected specimen in aquaria, ~38 mm SL, with juveniles at the age of approx. one week after swimming free and size of less than 12 mm TL, not preserved; F) aquarium bred juveniles with the age of app. one week after swimming free, size less than 12 mm TL, not preserved.

TABLE 1. Morphometrics and meristics of the holotype and 25 syntopic paratypes of *Enigmatochromis lucanusi*.

	Holotype	Mean	SD	Range
SL	44.7	38.2		30.8–45.3
% of SL				
Body depth	35.5	32.4	2.9	27.2–36.6
Head length	34.21	33.3	0.9	31.9–35.2
Caudal-peduncle length	12.5	11.8	0.9	9.5–13.7
Caudal-peduncle depth	16.8	16.5	0.9	14.6–18.2
Length of dorsal-fin base	61.9	60.8	1.9	56.9–66.3
Length of anal-fin base	21.1	19.5	1.3	17.3–22.3
Predorsal distance	31.0	28.8	0.9	27.4–31.0
Preanal distance	69.7	70.0	1.8	66.6–73.7
Prepectoral distance	33.6	34.5	1.6	30.9–38.4
Prepelvic distance	37.3	37.1	1.7	32.4–39.9
% of HL				
Head depth	62.2	64.8	3.4	57.0–71.3
Snout length	30.5	27.2	2.9	21.3–33.1
Eye diameter	29.5	32.1	1.7	29.2–34.9
Postorbital distance	40.1	40.7	1.7	37.7–43.8
Interorbital distance	27.8	26.6	1.3	24.3–29.9
Cheek depth	31.9	30.8	2.8	25.8–35.7
Lower jaw length	33.7	35.2	3.1	29.5–40.9
Preorbital distance	18.7	20.2	2.2	17.4–24.0
% of caudal peduncle depth				
Caudal peduncle length	74.4	71.7	7.0	58.7–86.3
Meristics		Median		Range
Upper lateral-line scales	17	18		16–20
Lower lateral-line scales	7	6		5–8
Total lateral-line scales	26	26		24–28
Circumpeduncular scales	12			12
Dorsal-fin spines	17	18		17 or 18
Dorsal-fin rays	8	7		7–9
Anal-fin spines	3	3		3
Anal-fin rays	6	7		6 or 7
Pectoral-fin rays	12	11		11 or 12
Gill rakers on lower limb of first arch	8	9		8–12
Total gill rakers on first arch	15	15		14–17

***Enigmatochromis lucanusi*, new species**

(Figs. 1 & 2; Table 1)

Pelvicachromis sp. "Blue Fin" (Lamboj 2005)

Holotype. NMW 95063, male, 44.7 mm SL; Guinea: Foto River near the town of Fria, north of Conakry, Konkoure River system. 10° 20.074' N, 13° 43.431' W, collected by W. M. Traore, November 2007.

Paratypes. NMW 95064, 2 males, 1 female, 32.9–45.3 mm SL, same collection data as holotype. NMW 95065, 2 males, 2 females, 1 undet., 32.8–40.6 mm SL, same locality as holotype, but collected in January 2004; 1 female, 1 undet. used for C&S after taking counts and measurements. NMW 95066, 5 males, 4 females, 32.8–44.3 mm SL, same locality as holotype but collected in February 2006, 2 males and 2 females used for C&S after taking counts and measurements. AMNH 238830, 2 males, 2 females 30.8–44.4 mm SL, same locality as holotype, but collected in January 2004. MRAC 2008-015-P-1-4, 2 males, 2 females, 33.1–43.9 mm SL, same locality as holotype but collected in January 2008.

None-types. In addition, 8 pairs of wild collected fishes and their F1-descendents were used for behavioural observations, but not included in morphological examinations or type series or other collections.

Diagnosis. Same as for genus.

Description. Measurements and meristic counts for holotype and 25 syntopic paratypes are presented in Table 1.

Small cichlid species with body moderately gracile, dorsal head profile smoothly rounded and short snout. Ventral body wall gently rounded to caudal peduncle. Caudal fin rounded. Caudal peduncle short, always deeper than long. Sexual dimorphism well-developed with males usually 10–15% larger than females, with soft dorsal and anal fin rays more elongated. First ray of pelvic fin always longest in males, in females of equal length or longer than second ray. In males, tips of pelvic fin reaching origin of anal fin.

Osteology and dentition. Infraorbital bones series with lachrymal and three additional tubular bones and a gap between 2nd and 3rd tubular infraorbital; lachrymal with four openings of laterosensory system. 23–25 total vertebrae (12–14 abdominal and 11 or 12 caudal).

Premaxilla with one or two, dentary with one to three rows of regularly set unicuspid teeth. Anteriorly in the lower jaw a few teeth oriented posteriorly, not buccally. Lower pharyngeal bone triangular, with unicuspid to weakly bicuspid teeth on lateral parts of this bone, and asymmetric bicuspid teeth in the central field. Gill rakers on first gill arch. Eight to twelve tuberculate gill rakers on ceratobranchials, 4–7 pointed gill rakers on epibranchials. Well-developed hanging pad on roof of the pharynx.

Scales. Cycloid, one or two rows of scales on cheek; four horizontal rows on opercle. Dark spot on outer edge of opercle unscaled. Chest-scales smaller than body scales, four or five scales between pectoral and pelvic fins. Upper lateral-line separated from dorsal-fin base anteriorly by three scales, at the 8th pored scale by one or one and a half scales, and at last pored scale by no or a half scale. End of upper lateral-line never overlapping lower lateral-line, and separated from beginning of lower lateral line by one to four rows of scales. About ¼ of caudal fin covered with scales, and all other fins unscaled.

Coloration. Live specimens of both sexes (Fig. 2): Head and body pale brown to greyish brown. Dorsum somewhat darker than ventral parts of body. Dark scaleless spot on the outer edge of opercle, with a light blue margin on posterior edge. Upper lip brownish to yellow-brown, lower lip greyish to brown. Throat and ventral parts of branchiostegal membranes yellow, more prominent in dominant specimens. Dark longitudinal stripe sometimes visible on sides (in stressed, submissive, breeding and guarding individuals), at about height of lower lateral-line, from posterior edge of eye to end of caudal peduncle, but not extending onto caudal fin. Dark stripe from anterior edge of the eye to the middle of upper lip. Upper edge of eye golden-yellow. Lachrymal bluish, with a red to reddish horizontal stripe from angle of the mouth to anterior edge of preopercular. Pectoral fin clear.

Male specific coloration. Dorsal fin pale yellow, with red margin, followed by a thin white submargin, more prominent in anterior portion of this fin. Upper half of caudal fin yellow, lower half reddish. Soft ray

parts of dorsal fin and upper half of caudal fin with some to numerous black dots in individual variation. Base of anal fin yellowish, rest of this fin reddish to violet. Anterior edge of pelvic fins yellow, first soft ray dark grey to black, other parts of this fin pale reddish to pale violet. Body scales with pale greyish margins. Most ventral parts of opercle, subopercle, interopercle and chest are yellow.

Female specific coloration. Spiny portion of dorsal fin iridescent blue, sometimes extending to first one to two soft rays, with a red margin, followed by a thin dark to black submargin. Rest of fin clear. One or two black dots in most posterior part of iridescent blue coloration in many individuals. Caudal fin clear to very pale reddish, without patterns or marks. Anal-fin base and most anterior parts bluish, rest of the fin clear to pale reddish. Anterior edge of pelvic fins black, as first soft ray dark, other parts of this fin reddish with thin blue vertical lines in some specimens. Lower parts of opercle, subopercle and interopercle are blue, also most anterior parts of chest. Flanks and belly region, up to about upper lateral line or higher in some individuals, are wine red.

Juveniles of both sexes (before getting adult coloration) exhibit a pattern of three or four rows of irregular dark spots on brown coloration, up to about 10–12 mm SL. With increasing size, sex-specific coloration is seen.

Preserved specimen coloration General coloration of both sexes: Head and body brown, darker dorsally. Cheek, throat, pre-pelvic and pre-pectoral regions of flanks and chest pale light brown. Lips greyish. Dark spot on outer edge of opercle. A dark longitudinal stripe visible in some individuals, reaching from posterior edge of eye to end of caudal peduncle, but not extending into the caudal fin. Dark bar from anterior edge of eye to angle of mouth.

Male specific coloration. The general preserved coloration of adult males is shown in the holotype (Fig. 1). Anterior portion of dorsal fin greyish. Posterior portion of dorsal fin and upper parts of caudal fin yellowish to greyish, with numerous dark spots. Lower parts of caudal fin pale grey. Anal fin dusky grey to dark grey anteriorly, posterior portion pale greyish to pale reddish. Pelvic fins dark grey to reddish grey, and pectoral fins clear.

Female specific coloration. Belly dark grey to reddish grey. Anterior portion of dorsal fin bluish grey to dark grey, posterior portion of this fin clear with no up to two black dots. Caudal fin clear without any markings. Anal fin base dark grey, sometimes with a pale reddish flush, outer parts of fin clear. Pelvic fins reddish to reddish brown, with dark to black anterior edge, and pectoral fins clear.

Breeding behaviour. In aquaria, this species is a monogamous, pair bonding, cave spawner. Eggs are guarded by both sexes, but more intensively by the female. Hatching occurs after three days post-spawn. Larvae are normally deposited on the bottom of the cave, rarely in other caves nearby the original cave. Juveniles are free swimming 8 or 9 days post-hatching, and are guarded by both parents for about 5 to 6 weeks. Breeding and guarding individuals of both sexes regularly exhibit more aggressive and intensive coloration. The dark, longitudinal stripe that is typical for breeding and guarding specimens of both sexes in many other cave breeders of the chromidotilapiine lineage (e.g., *Pelvicachromis*, *Congochromis*, and *Parananochromis*) is prominently visible in males, but is more rarely and weakly visible in females. In this character, females of *Enigmatochromis* differ from females of *Pelvicachromis*, *Congochromis* and *Parananochromis*, where a prominent dark, longitudinal stripe is typical for females (and only rarely for males) during the first 2 to 4 weeks when guarding fry.

Distribution. This species is thus far only known from type locality, the Foto River, what is a small savannah river near the bauxite mining town of Fria in coastal Guinea, north of Conakry, 10° 20.074' N, 13° 43.431' W.

Habitat. Detailed habit data for the type locality was provided by O. Lucanus. The river was 3–6 meters wide, and during the dry season only 30–90 cm deep with water visibility ~1.2 m. Water parameters measured during the dry season in February, 2006 were: General hardness 0, Carbonate hardness 0, pH 5.8, and temperature 24° C.

This site was ringed by dense forest and often fallen trees obstructing access to the water in many places. Margins of the river were densely overgrown by *Anubias lanceolata*, and exposed boulders and fallen trees

have large clusters of *Bolbitis heudelotti* and other ferns (Fig. 3). The river substrate consisted of fine gravel with a few larger rocks and boulders. Dense growths of *Vallisneria* were found where sunlight penetrated through the trees.

Enigmatochromis lucanusi occurred syntopically at this site with *Pelvicachromis humilis*.

Etymology. The species name is dedicated to the collector, aquarist and friend Oliver Lucanus.



FIGURE 3. Type locality of *Enigmatochromis lucanusi*, Guinea: Foto River, near the town of Fria, north of Conakry. 10°20.074' N, 13° 43.431' W. Photo by O. Lucanus.

Discussion

This new genus and species clearly differs from *Pelvicachromis*, in having 12 circumpeduncular scales vs. 16, despite the overall similarities in basic coloration patterns or body shape (Lamboj, 2005). Within chromidotilapiine cichlids, 12 circumpeduncular scales are present in the genera *Divandu*, *Congochromis*, *Nanochromis* and *Parananochromis*, but several other characters clearly separate the first three of these genera from *Enigmatochromis* (see diagnosis of the genus for details). This leaves *Parananochromis* as the chromidotilapine most morphologically similar to *Enigmatochromis*. However *Enigmatochromis* can still be readily distinguished from *Parananochromis* by a much higher degree of colour dimorphism between the sexes, a juvenile colour pattern of three or four rows of dark dots on a brownish body (vs. only two rows), and the lack of a prominent, dark longitudinal stripe in females when guarding young fry (vs. the presence of prominent stripe).

Additionally, the distribution of the new genus is clearly disjunct from that of all *Parananochromis* species (i.e., Southern Cameroon, Rio Muni region of Equatorial Guinea, and Northern Gabon). First indications from unpublished molecular data do not support a close relationship of the new genus to *Parananochromis*. Instead the new genus seems to be more closely related to *Pelvicachromis*, and this hypothesis will be evaluated in upcoming works on chromidotilapiine cichlids.

Comparative material examined.

Congochromis dimidiatus: MNHN 92-120, holotype, Central African Republic, Bangui. *Congochromis squamiceps*: BMNH 1902.4.14.11, holotype, Democratic Republic of the Congo, Congo system: Lindi River. MRAC 49244-29251, Democratic Republic of the Congo, Congo system: Kunungu. MRAC 78-19-P-265-268, Democratic Republic of the Congo, Congo system: Riviere Iteli. *Divandu albimarginatus*: MRAC 95-125-P-0569, holotype, Congo (Brazzaville): Mpoulou. *Nanochromis consortus*: MCZ 50552, paratypes, Democratic Republic of the Congo: Zaire River. *Nanochromis minor*: MCZ 50342, paratype, Democratic Republic of the Congo: Zaire River. *Nanochromis nudiceps*: MRAC 1045, holotype, Democratic Republic of the Congo: Lac Leopold II. BMNH 1899.11.27.64, paralectotype, Democratic Republic of the Congo: Stanley

Pool. *Nanochromis parilus*: MCZ 50309, paratypes, Democratic Republic of the Congo: Zaire River. MCZ 50475, paratypes, Democratic Republic of the Congo: Zaire River. *Nanochromis splendens*: MCZ 50311, paratypes, Democratic Republic of the Congo: Zaire River. MCZ 50553, paratypes, Democratic Republic of the Congo: Zaire River. *Nanochromis transvestitus*: MRAC 81-14-P-1-10, paratypes, Democratic Republic of the Congo: Lac Mai Ndombe. *Parananochromis axelrodi*: AMNH 230714, holotype, Gabon: Ivindo system. *Parananochromis brevirostris*: AMNH 232536, holotype, Gabon: Ivindo system. *Parananochromis caudifasciatus*: BMNH 1904.7.1.244-249, syntypes, Cameroon: Nyong River system. *Parananochromis gabonicus*: BMNH 1967.10.12.57, holotype, Gabon: Ogowe River system. *Parananochromis longirostris*: BMNH 1903.7.28.77-83, syntypes, Cameroon: Kribi River. *Parananochromis ornatus*: MRAC A2-011-P-10, holotype, Gabon: Ivindo system. *Pelvicachromis humilis*: BMNH 1915.4.13:44, holotype, Sierra Leone: North Sherbo District. MRAC 154802, Sierra Leone: Kasewe Forest. *Pelvicachromis pulcher*: BMNH 1901.1.28.13-20, syntypes, Nigeria: Ethiop River. *Pelvicachromis roloffii*: All from Sierra Leone, Kwabolake, Sherbo District: MRAC 73399, holotype. MRAC 733400, allotype. MRAC 73401-402, paratypes. *Pelvicachromis taeniatus*: BMNH 1901.1.28.21, holotype, Nigeria: Ethiop River. BMNH 1912.6.29.19-28 + BMNH 1902.11.12.164-165 (syntypes of *P. kribensis*), Cameroon: Kribi River.

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