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Lamprologus markerti, a new lamprologine cichlid (Teleostei: Cichlidae) endemic to the lower Congo River in the Democratic Republic of Congo, west-central Africa

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Abstract

A new *Lamprologus* is described from the lower Congo River (LCR) in the Democratic Republic of Congo. *Lamprologus markerti*, new species, is readily distinguished from *L. tigripictilis* and *L. werneri*, the LCR endemic lamprologines with which it was once taxonomically conflated, in the possession of a reduced number of gill rakers on the first arch (9–11 versus 12–17), a longer head (32.1–34.7% SL versus 29.3–31.9 and 29.1–32.9% SL, respectively), and a longer predorsal length (33.0–35.9% SL versus 29.3–32.7 and 28.5–32.6% SL, respectively). Further, *L. markerti* lacks a second intestinal loop present in both *L. tigripictilis* and *L. werneri*, and has a highly reduced infraorbital series often consisting of a single first infraorbital (lachrymal) element.

Key words: new riverine *Lamprologus*, Bas Congo endemism

Resumé

Une nouvelle espèce de *Lamprologus* est décrite du cours inférieur du fleuve Congo en République Démocratique du Congo. La nouvelle espèce, *Lamprologus markerti*, se distingue facilement de *L. tigripictilis* et *L. werneri*, deux autres *Lamprologus* endémiques de cette partie du fleuve Congo avec lesquels il a été une fois confondu du point de vue taxonomique, par un nombre réduit de branchiospines sur le premier arc branchial (9–11 contre 12–17), une tête plus allongée (32,1–34,7% LS contre respectivement 29,3–31,9 et 28,5–32,6%). En outre l'intestin de *Lamprologus markerti* n'a pas la deuxième boucle présente chez *L. tigripictilis* et *L. werneri*, et l'espèce possède une série de sous-orbitaires très réduits, ne comprenant souvent qu'un seul premier élément infraorbital (le lacrymal).

Introduction

The lower Congo River (LCR), a relatively short stretch of about 420 km between Pool Malebo and the Congo's outflow into the Atlantic Ocean, harbors notably high levels of fish species richness and endemism (Stiassny *et al.*, 2011). For cichlids, the LCR is particularly rich with more than 30 species reported, of which 23 are endemic to main channel habitats (Lowenstein *et al.*, 2011). Among these, four *Lamprologus* species (*L. lethops*, *L. teugelsi*, *L. tigripictilis*, and *L. werneri*) are considered LCR endemics.

Roberts and Stewart (1976) recognized two color varieties within *Lamprologus werneri*, and Schelly and Stiassny (2004) elevated the "barred variety" to the species level, naming it *L. tigripictilis* in reference to its markedly striped appearance. Based on the materials available at the time they recorded its presence in the LCR main channel from the region of Wombe, about 90 km downstream from Pool Malebo, to just below the riverside

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settlement of Boma, some 65 km from the outflow into the Atlantic Ocean. The distributional range of *L. tigripictilis,* encompassing a stretch of about 265 river kilometers, was considered the largest of all LCR endemic *Lamprologus*.

During an investigation of cichlids in the region of the large Inga rapids (Fig. 1), and based on analysis of both mitochondrial (cyt-b & ND2) and nuclear (10 microsatellite loci) markers, Markert *et al.* (2010) identified two distinct genetic clusters within *L. tigripictilis*. The Inga rapids appear to spatially separate these two genetic clusters, with one set of populations present along the shoreline and above the main rapids, and the others found below the main rapids (Markert *et al.* 2010). Based on additional specimens that have become available since the original description of *L. tigripictilis*, we undertook a detailed morphological study of the species and our findings support the assertion that individuals found below the Inga rapids and previously identified as *L. tigripictilis*, are diagnosably distinct from *L. tigripictilis.* Here, we present anatomical and morphological data to describe *L. markerti* n. sp. and distinguish it from *L. tigripictilis* and *L. werneri*, the two LCR endemics with which it bears closest phenotypic similarity and was once taxonomically conflated.

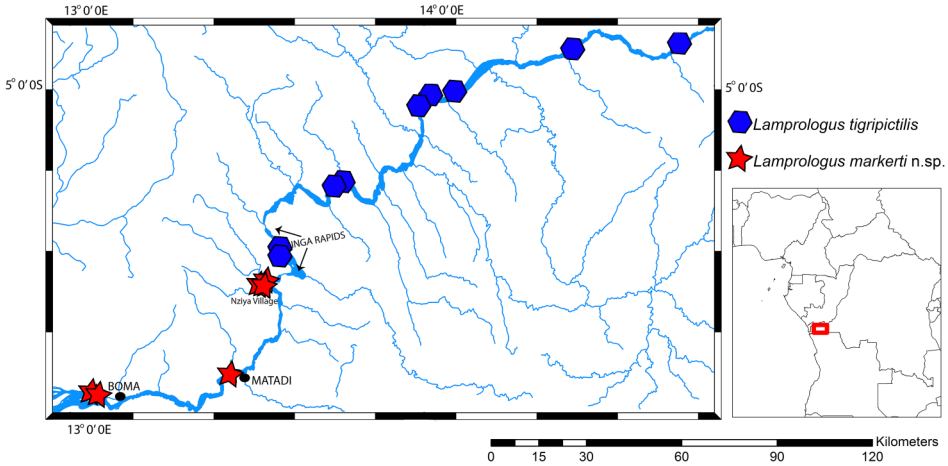

FIGURE 1. Distributional range of *Lamprologus markerti*, and sampled *L. tigripictilis* localities along the lower Congo River, west-central Africa.

Methods and material

Counts and measurements follow Barel *et al.* (1977) and were made using a dial caliper to the nearest 0.5 mm on the left side of specimens. Vertebral and fin-ray counts were taken from radiographed and/or cleared and stained specimens. These data for the type series of *L. markerti* are given in Table 1, and because of initial confusion regarding the limits of *L. tigripictilis,* we have re-measured the holotype and a series of individuals confirmed as belonging to that species (Table 2). For all other riverine lamprologines we rely on anatomical, morphometric, and meristic data taken from the revisional study of Schelly and Stiassny (2004). Additional specimens were cleared and stained using a modified protocol of Taylor and Van Dyke (1985). Abbreviations used throughout the text are: C&S, cleared and stained preparations; SL, standard length; HL, head length; ex, number of specimens examined. Institutional abbreviations follow Leviton *et al.* (1985).

Thirty-five specimens of *L. tigripictilis* and 24 specimens of *L. markerti* (previously identified as *L. tigripictilis*) were selected for geometric morphometric analysis, and both series included adult and juvenile individuals of both sexes. Photographs were taken on the left side of laterally compressed fish using a Nikon Digital SLR camera with a 60 mm f/2.8 AF Micro-Nikkor lens. A set of 16 homologous landmarks was selected to capture overall body shape variation (Fig. 2B). Photographs of each specimen were uploaded into the software tpsDIG2 (Rohlf, 2013) for digitization of landmarks, and the resultant *TPS* files were uploaded into MorphoJ v.1.05f (Klingenberg, 2011). In order to obtain shape variables, non-shape variation was eliminated using a Generalized Procrustes Analysis (GPA) (Rohlf & Slice, 1990). MorphoJ was then used to perform a Principal Components Analysis (PCA) of variance and permutation tests (α=0) to investigate statistical significance of body shape differentiation between samples. Permutation tests were used instead of Goodall's F-test, a commonly used

parametric statistical test in analyzing shape space, to avoid an assumption of isotropic normal distribution of landmark points around the mean (Webster & Sheets, 2010).

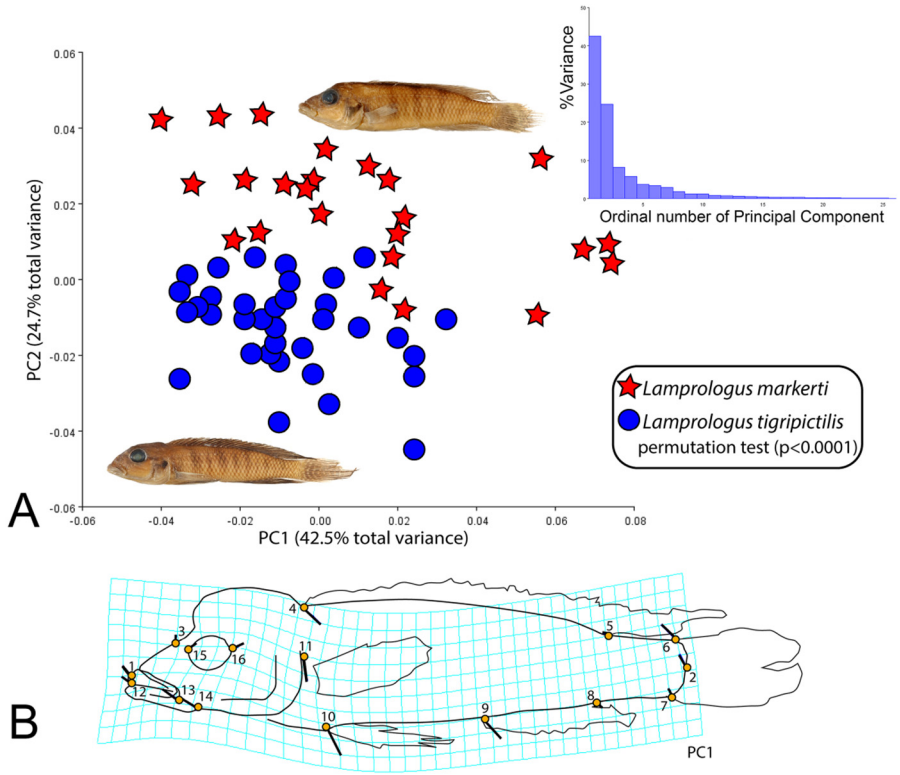

FIGURE 2. (A) Principal Components Analysis of body shape, with inset plot of percentage variance explained by each Principal Component, (B) Deformation implied by PC1 scores using Procrustes superposition of 16 homologous landmarks.

Morphometric results

The PCA representation of shape variation indicates that 67.2% of total variance can be explained by the first two principal components, with PC1 and PC2 accounting for 42.5% and 24.7% of the total variance, respectively (Fig. 2A). Although some overlap is evident, permutation tests (10,000 permutation rounds) for Procrustes distances among groups revealed a significant difference in shape between *L. markerti* and *L. tigripictilis* ($p<0.0001$). The lollipop graph, showing shifts of landmark positions relative to all landmarks, and a deformation grid implied by PC1 scores using Procrustes superimposition, highlights regions of shape variation across both species (Fig. 2B). Body shape variation is primarily concentrated in paired fin placement, body depth and jaw size. The vectors suggest a vertical and antero-posterior movement of dorsal and ventral fins. The deformation grid implies that phenotypic variation is concentrated in the anterior region of the body, which is corroborated by some of the linear distances measured for the two species: *Lamprologus markerti* possesses a longer head as well as longer predorsal and preanal-fin lengths than *L. tigripictilis* (Tables 1 & 2).

Lamprologus markerti, new species

Figures 1–6, Tables 1 & 3.

Holotype: AMNH 238601, male, 90.0 mm SL, Democratic Republic of Congo, Bas Congo Province, across from Matadi, Congo River at Lufu River confluence, 5°48' 6.60" S, 13°27' 25.80" E, Coll. R. Schelly *et al.*, 19 July 2005.

Paratypes: AMNH 238602, 6 specimens, 44.5–78.5 mm SL, same locality as holotype.—MRAC B4-10-P-1, 60.4 mm SL, same locality as holotype.—MCZ 171125, 54.0 mm SL, same locality as holotype.—AMNH 238603, 2 specimens, 66.0–72.5 mm SL, Democratic Republic of Congo, Bas Congo Province, Nziya site, Inga, 05°32'

10.20" S, 13°33' 23.40" E, Coll. M.J. Stiassny *et al.*, 17 July 2007.—AMNH 238604, 69.0 mm SL, Democratic Republic of Congo, Bas Congo Province, Nziya, downstream of Inga, below Bundi stream of Congo River confluence, 5°33' 22.20" S, 13°33' 13.20" E, Coll. R. Schelly *et al.*, 16 July 2005.—AMNH 233568, 43.0 mm SL, (paratype of *L. tigripictilis*), Democratic Republic of Congo, Bas Congo Province, Nziya village, 5°32' 15.00" S, 13°33' 36.60" E, Coll. R. Schelly *et al.*, 24 September 2002.—AMNH 238652, 45.0 mm SL, Democratic Republic of Congo, Bas Congo Province, Main channel of Congo River, upstream of Boma, 5°51' 49.80" S, 13° 4' 24.60" E, Coll. R. Schelly *et al.*, 18 July 2005.—ZSM 37820, 2 specimens, 58.5–64.5 mm SL, Democratic Republic of Congo, Bas Congo Province, Congo River, weeds upriver of boat landing site, 5°51’ 48” S, 13°4’ 28” E, Coll. D. Neumann, 16 July 2008.—ZSM 38391, 102.5 mm SL, Democratic Republic of Congo, Bas Congo Province, Congo River, purchased at Boma fish market, 5°51’ 46.90” S, 13°4’ 3.99” E, Coll. D. Neumann, 16 July 2008.

FIGURE 3. AMNH 238601, holotype of *Lamprologus markerti*. (A) in life, (B) in preservation.

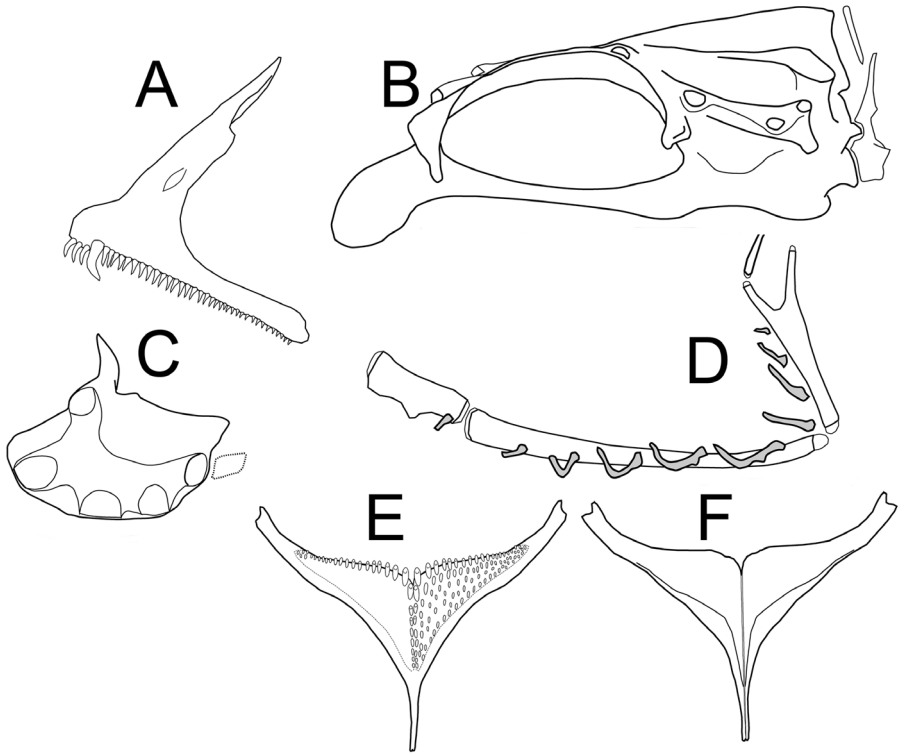

FIGURE 4. *Lamprologus markerti*, AMNH 238650. (A) premaxilla, B) neurocranium, (C) infraorbital series, (D) first gill arch, (E) lower pharyngeal jaw in dorsal view, (F) lower pharyngeal jaw in ventral view. Elements not drawn to scale.

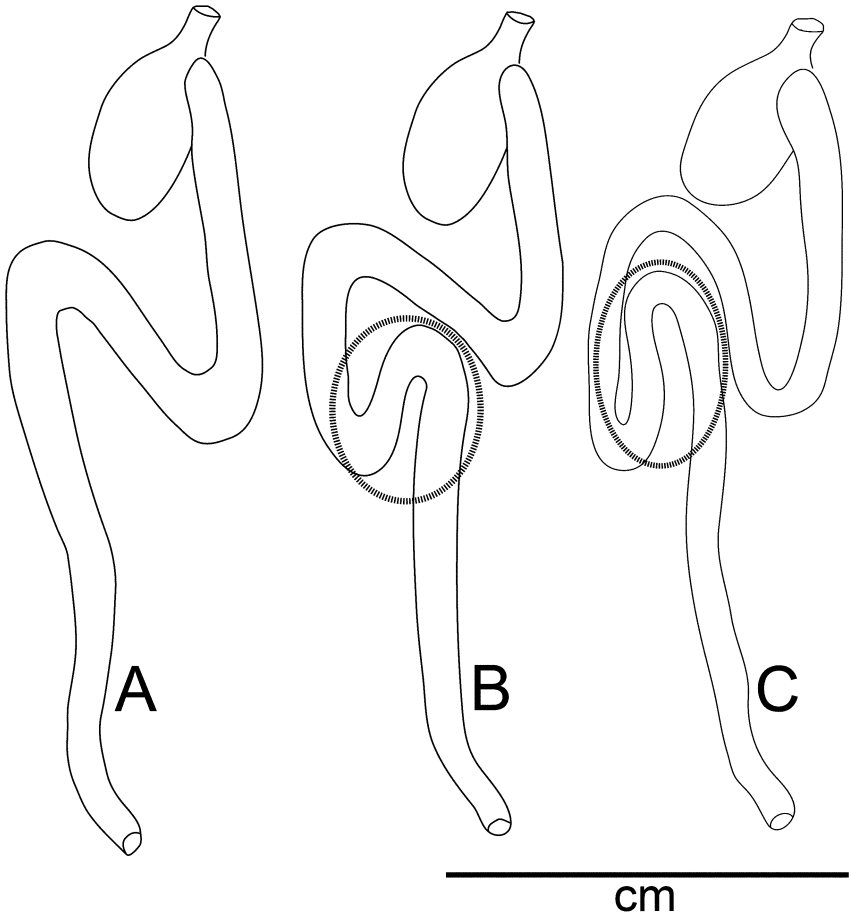

FIGURE 5. Digestive tracts (slightly unraveled for clearer depiction of morphology), after removal of liver, pancreas, gallbladder, spleen and adherent tissues. (A) *Lamprologus markerti*, (B) *L. tigripictilis*, (C) *L. werneri.* Dashed ovals enclose second intestinal loop.

Additional non-type specimens examined: AMNH 238654, 14 specimens, 2 C&S.—AMNH 241592, 16 specimens, 1 C&S.—AMNH 238650, 23 specimens, 6 C&S.

Differential diagnosis. *L. markerti* is readily distinguished from *L. tigripictilis* by the presence of 4–6 broad dark bars on the flanks (versus 7–10 narrow bars), and from *L. werneri* in the possession of 14 (*vs*. 15) precaudal vertebrae. It differs from both *L. tigripictilis* and *L. werneri* in a reduced number of gill rakers on the first arch (9–11 versus 12–17), a longer head (32.1–34.7% SL versus 29.3–31.9 and 29.1–32.9% SL, respectively), and a longer predorsal length (33.0–35.9% SL versus 29.3–32.7 and 28.5–32.6 % SL respectively). Further, *L. markerti* lacks an intestinal loop present in both *L. tigripictilis* and *L. werneri*, and has a highly reduced infraorbital series often consisting only of the first infraorbital (lachrymal) element.

Description. A *Lamprologus* attaining a maximum-recorded size of 102.5 mm SL (mature male, ZSM 38391), with general body shape and appearance as in Figures 3 and 6A. Counts and proportional measurements for holotype and 16 paratypes as in Table 1 with comparable ranges for *L. tigripictilis*, the taxon with which it has previously been confused, in Table 2. Body relatively shallow (BD 20.2–24.8% SL), greatest depth at level of first dorsal fin-spine. Head long (32.1–34.7% SL), snout prominent, with well-developed, fleshy lips. Dorsal head profile rises at angle of 40–50° to mid-orbit, then rises steeply to nape. Large males with a prominent, fat filled nuchal hump (Fig. 3). Dorsal and ventral body profiles slightly convex to relatively deep caudal peduncle.

Dorsal fin XVI–XVIII (mode: XVIII) 7 or 8 (mode: 7). Anal fin IV–VI (mode: VI) 5–7 (mode 6). Spines in both fins gradually increase in length posteriorly. Dorsal and anal fins with tapering filamentous extensions to middle of caudal fin, longer in mature males than females. Caudal fin large, paddle-shaped with 14 branched rays; fin often appearing subacuminate in preserved specimens. Pectoral fin short, not reaching anus. Pelvic fins also short but somewhat produced, reaching just short of anus or to between anal fin and anus. Second branched ray in pelvic fin longest in both sexes.

TABLE 1. Morphometric and meristic data for holotype and 16 paratypes of *Lamprologus markerti*. Values in parentheses indicate number of specimens examined with that count.

Character	Holotype	N	Mean	Min	Max	SD
Standard length (mm)	90.0		70.3	43.0	102.5	14.2
% Standard Length					2	
Body depth	23.3	17	22.8	20.2	24.8	1.41
Head length	33.9	17	33.2	32.1	34.7	0.71
Caudal-peduncle depth	11.1	17	12.0	10.9	13.4	0.74
Caudal-peduncle length	16.1	17	16.5	15.4	19.1	0.97
Anal-fin base length	22.2	17	20.1	17.6	22.8	1.41
Dorsal-fin base length	56.1	17	54.4	51.5	56.5	1.52
Pelvic-fin length	26.7	17	23.9	20.2	26.8	1.76
Caudal-fin length	31.1	14	29.0	23.9	34.4	3.43
Pectoral-fin length	23.3	17	22.4	19.1	24.7	1.67
Predorsal length	33.3	17	34.3	33.0	35.9	0.81
Preanal length	62.8	17	64.7	62.8	66.7	1.35
Prepectoral length	35.5	17	36.2	33.7	39.3	1.62
Prepelvic length	37.8	17	39.2	35.9	42.6	1.94
% Head Length						
Lower-jaw length	39.3	17	41.6	34.5	47.8	3.27
Upper-jaw length	32.8	17	32.1	27.6	36.9	2.56
Eye diameter	23.0	17	25.3	22.7	28.5	1.97
Snout length	32.8	17	31.8	24.1	34.7	2.45
Interorbital width	19.7	17	14.9	12.0	19.7	2.24

Counts	Holotype	Variation
Lateral-line scales	35	34 (4), 35 (6), 36 (7)
Dorsal-fin spines and rays	XVIII 7	XVI 8 (1), XVII 7 (2), XVII 8 (4), XVII 8 (1), XVIII 7 (5), XVIII 8 (4)
Anal-fin spines and rays	V 5	IV 6 (3), V 5 (1), V 6 (1), V 7 (1), VI 5 (6), VI 6 (5)
Gill rakers	6,1,3	5,0,4 (1), 5,1,3 (1), 5,1,4 (1), 6,0,3 (1), 6,0,4 (2), 6,1,3 (8), 6,1,4 (1), 7,1,3 (2)
Vertebrae	14+18	14+18 (10), 14+19 (2)

Jaws isognathus, inner and outer row teeth in both jaws pointed unicuspids. Single series of eight enlarged, recurved, procumbent canines situated anteriorly on premaxilla (Fig. 4A), with largest pair displaced dorsolaterally. Behind the procumbent canines a single row of slightly enlarged canines gradually taper in size beginning at mid-length of premaxilla. Outer row teeth extend almost entire length of both dentary and premaxilla. Lower pharyngeal jaw wider than long, with straight ventral suture (Fig. 4F). Usually 24–28 teeth in posterior row, symphysial teeth moderately robust (Fig. 4E), become slender laterally. Gill rakers markedly elongate, non-denticulate and slender (Fig. 4D). Nine to eleven rakers along outer row of first gill arch; one hypobranchial, 4–6 ceratobranchial rakers, often one raker in angle of arch, and 3 or 4 epibranchial rakers.

Flank scales large, uniformly sized, and ctenoid. Chest and cheek scaleless. Scales on nape and above upper lateral line, to level of 7–9th dorsal-fin spine, markedly smaller than those on flanks Opercle and subopercle with few, scattered, deeply embedded cycloid scales. Proximal half of caudal fin covered with small ovoid, ctenoid scales. Pored lateral line scales 34–36. Upper and lower lateral lines usually overlap by 2 or 3 scales. Total number of vertebrae: 32 or 33, comprised of 14 precaudal and 18 or 19 abdominal centra.

Supraoccipital crest relatively low, with no frontal ridge extending to neurocranial lateral-line foramen (Fig. 4B). Infraorbital series consisting of broad, plate-like first infraorbital (lachrymal) bearing 5 inflated, sensory-canal

pores. Small second infraorbital element polymorphically present and, when present, often lacks tubular sensory canal (Fig. 4C). In some individuals a second infraorbital element is entirely lacking (Fig. 6A).

Digestive tract short; esophagus leads to small bulbous stomach, from which intestine exits left side at transition zone between esophagus and stomach. Intestine exhibits single, rostro-caudad loop before descending to anus (Fig. 5A). Total length of tract (unraveled but not stretched) c. 40–50% SL (Table 3).

TABLE 2. Comparative morphometric and meristic data for *Lamprologus tigripictilis.* Measurements from the holotype and 15 individuals selected from AMNH 239705, AMNH 238639, AMNH 238635, AMNH 238655, AMNH 238659, AMNH 247200, AMNH 246500, AMNH 247131, and AMNH 246715.

Character	Holotype	N	Mean	Min	Max	SD
Standard length (mm)	62.0		66.9	53.5	83.5	8.21
% Standard Length					2	
Body depth	21.0	16	19.9	17.4	22.3	2.23
Head length	30.6	16	30.6	29.3	31.9	0.83
Caudal-peduncle depth	9.7	16	9.9	9.1	11.1	0.55
Caudal-peduncle length	16.1	16	17.3	16.1	18.7	0.78
Anal-fin base length	21.7	16	21.9	20.5	24.1	1.04
Dorsal-fin base length	53.2	16	57.3	53.1	60.6	2.00
Pelvic-fin length	24.2	16	24.3	21.7	28.7	1.94
Caudal-fin length	31.4	14	30.4	26.9	34.1	2.23
Pectoral-fin length	21.0	16	21.6	19.4	23.9	1.31
Predorsal length	29.8	16	30.4	29.3	32.7	1.02
Preanal length	62.9	16	60.6	59.0	62.9	0.73
Prepectoral length	35.5	16	34.1	32.3	37.4	1.25
Prepelvic length	37.1	16	34.6	32.8	37.1	1.09
% Head Length						
Lower-jaw length	42.1	16	42.1	38.3	45.5	2.59
Upper-jaw length	31.6	16	35.3	32.3	38.4	1.83
Eye diameter	26.3	16	26.3	23.9	30.5	0.79
Snout length	31.6	16	30.2	25.6	34.0	2.90
Interorbital width	21.0	16	15.1	11.7	17.5	1.47

Counts	Holotype	Variation
Lateral-line scales	35	35 (6), 36 (4), 37 (5)
Dorsal-fin spines and rays	XVIII 9	XVII 7 (2), XVII 8 (2), XVIII 7 (3), XVIII 8 (6), XIX 7 (1)
Anal-fin spines and rays	VI 7	VI 5 (2), VI 6 (4), VI 7 (8), VII 5 (1)
Gill rakers	10,1,5	8,0,5 (1), 9,0,4 (2), 9,0,5 (3), 9,1,4 (2), 9,1,5 (3), 9,1,6 (1), 9,1,7 (1), 10,0,4 (1), 10,1,5(1)
Vertebrae	14+18	14+18 (13), 14+19 (2)

Coloration in life (Fig. 3A): in mature males, base body coloration mauve gray becoming pale silver ventrally. Turquoise reflective streak under eye, on posterior of cheek, and extending over opercle. Flank scales ringed with dark pigment strongly contrasting with silvery central field. Four or 5 dark vertical bars of uniform thickness, originating at base of dorsal fin and extending over flanks but not reaching to ventrum. Dorsal, anal and caudal fins proximally covered with alternating pale and dark spotting. Pectoral fin clear, pelvic fin pale silver along distal margin. Scaleless, dark, opercular spot obscured by turquoise iridescence. In preservation (Figs. 3B & 6A), base body coloration creamy brown, slightly darker dorsally becoming pale cream ventrally. Four or 5 dark vertical bars on flanks, and flank scales ringed with brown pigment contrasting with pale cream central field. Dorsal and anal

fins brown with alternating pale and dark maculae variously evident, but always present. Caudal fin membranes with conspicuous rows of maculae, strongest proximally. All fin spotting more prominent in mature males than in females and juveniles.

TABLE 3. Digestive tract length and ratio of length:standard length (SL) for *Lamprologus markerti*, new species, *L. tigripictilis* and *L. werneri.*

Lamprologus markerti	Gut length (mm)	SL (mm)	Ratio
AMNH 238654	30.0	69.0	0.43
	33.0	80.0	0.41
	33.0	76.0	0.43
	28.0	54.0	0.52
			Mean = 0.45
Lamprologus tigripictilis	Gut length (mm)	SL (mm)	Ratio
AMNH 238655	45.0	74.0	0.61
	36.0	61.0	0.59
	43.0	51.0	0.84
AMNH 238659	39.0	55.0	0.71
	50.0	54.0	0.93
	32.0	59.0	0.54
AMNH 246500	63.0	85.0	0.74
AMNH 247131	39.0	67.0	0.58
	41.0	66.0	0.62
			Mean = 0.68
Lamprologus werneri	Gut length (mm)	SL (mm)	Ratio
AMNH 238603	47.0	58.0	0.81
	55.0	65.0	0.84
	56.0	68.5	0.81
	50	57.0	0.87
	42.0	53.5	0.78
			Mean=0.82

Distribution (Fig. 1). *L. markerti* occupies a roughly 100-km stretch of the LCR from the region of Nziya Village located below the large Inga Rapids to the start of the short Congo estuary just below Boma. The species appears to be a habitat generalist found over a range of substrates from marginal riffle and rocks near rapids, to stiller water habitats over sand and mud.

Etymology. Named for Jeffrey Markert whose initial analyses of cichlid population structure in the region of the large Inga Rapids stimulated this morphological study.

Discussion

Although generally similar in appearance (Fig. 6), the more prominent snout, markedly fleshy lips, shorter gut, and reduced number of gill rakers of *L. markerti* as compared to its upstream congeners, *L. tigripictilis* and *L. werneri*, strongly suggests trophic divergence. Unfortunately gut contents of preserved specimens available for examination were too degraded to enable investigation of possible dietary partitioning among these species. Nonetheless, examination of gross gut morphology reveals that the gut-coiling configuration of *L. markerti* differs from that of

L. tigripictilis and *L. werneri* in lacking a characteristic second intestinal loop present in both these species (Fig. 5A vs. 5B,C), and as a result *L. markerti* has a significantly shorter total digestive tract than either of them (Table 3). It is to be anticipated that analysis of dietary partitioning, as inferred from detailed gut contents analysis, will likely prove informative in future investigations of eco-morphological differentiation and diversification among these parapatrically distributed LCR endemics.

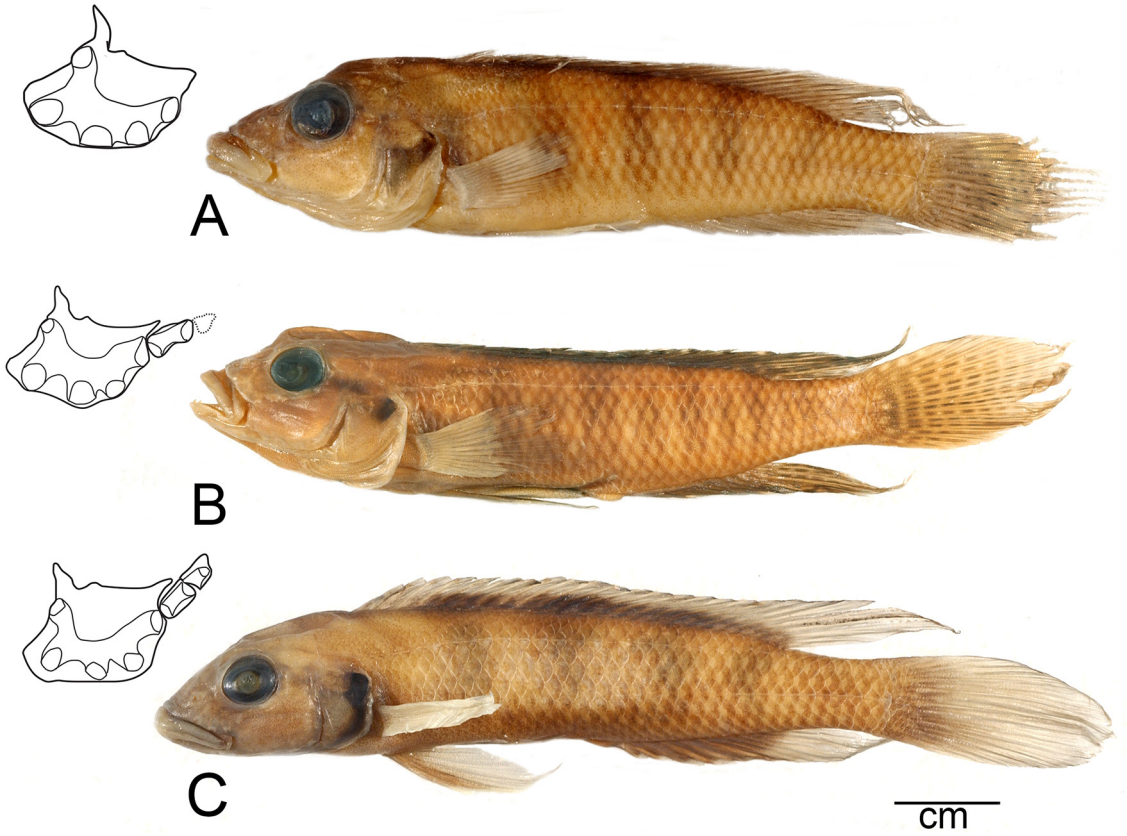

FIGURE 6. (A) AMNH 238602, *Lamprologus markerti*, new species, paratype (female), (B) AMNH 233609, *L. tigripictilis*, holotype (male), (C) AMNH 238603, *L. werneri*, male. Infraorbital series inset on left (not drawn to scale).

Comparative material examined

Lamprologus tigripictilis: AMNH 233609, holotype, Democratic Republic of Congo, Bas Congo Province, Congo River mainstream, a few km NE of Kinganga.—AMNH 239705, 89 specimens (ex. 10), Republic of Congo, Pool Province, Congo River, below falls, in next teardrop pool downstream of large pool below camp, Mbelo Village.—AMNH 238639, 42 specimens (ex. 5), Democratic Republic of Congo, Bas Congo Province, adjacent to Inga Rapids just below Inga intake canal, small branch of main channel flowing over boulder terrace and into sandy grassy depression.—AMNH 238635, 26 specimens (ex. 5), Democratic Republic of Congo, Bas Congo Province, Inga Rapids.—AMNH 238655, 95 specimens (ex. 10), Democratic Republic of Congo, Bas Congo Province, Main channel of Congo River, 2 km upstream of Kinganga.—AMNH 238659, 82 specimens (ex. 5), Democratic Republic of Congo, Bas Congo Province Main channel Congo River, 0.5 km downstream from 05-017.—AMNH 247200, 7 specimens, Democratic Republic of Congo, Bas Congo Province, Congo River, rocks at first large island downstream of Bulu.—AMNH 246500, 22 specimens (ex. 5), Democratic Republic of Congo, Bas Congo Province, Congo River, upstream of Bulu.—AMNH 247131, 26 specimens (ex. 5), Democratic Republic of Congo, Bas Congo Province, Small channel upstream Luozi on north bank of Congo River.—AMNH 246715, 1 specimen, Democratic Republic of Congo, Bas Congo Province, Congo River at Lenga Lenga.

Lamprologus werneri: AMNH 238603, 5 specimens, Republic of Congo, Pool Province, Congo River at start of rapids.—AMNH 239710, 118 specimens (ex. 10), Republic of Congo, Pool Province, Near camp at Foulakari, just off main channel of Congo River, in rocks.

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