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Lepidiolamprologus kamambae, a new species of cichlid fish (Teleostei: Cichlidae) from Lake Tanganyika

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Abstract

Lepidiolamprologus kamambae is described from the Kamamba Island off the southeastern coast of Lake Tanganyika. It is similar to *L. elongatus, L. kendalli*, and *L. mimicus* in the presence of three horizontal rows of dark blotches along the sides. It differs from those species in the presence of a distinct suborbital stripe across the cheek. It is further distinguished from *L. elongatus* and *L. mimicus* by the presence of a marbled pattern on the top of the head, and narrower interorbital width (4.9–5.9% of SL vs. 6.0–7.0%). It is distinguished from *L. kendalli* by a shorter last dorsal-fin spine (11.2–13.3% of SL vs. 13.3–15.1 %) and presence of distinct dark blotches on the side instead of contiguous blotches forming stripes separated by light interspaces. *Lepidiolamprologus profundicola* is unique in the genus having the cheeks covered with small scales. Scales are absent from the cheek in *L. kamambae*, and in the other species scales are either absent or very few and deeply embedded. *Lepidiolamprologus nkambae* was diagnosed from *L. kendalli* by the absence of scales on the cheek. The presence of scales in *L. kendalli* is variable, however, and *L. nkambae* is tentatively synonymized with *L. kendalli* for want of other diagnostic characters.

Key words: color pattern, endemism, meristics, morphometry, taxonomy

Introduction

The endemic Lake Tanganyika cichlid genus *Lepidiolamprologus* Pellegrin (1904) presently includes eleven species characterized by the presence of a sesamoid ossification in the labial ligament of the lower jaw, and paired coronalis foramina (Stiassny 1997; Schelly 2007). Species of the genus present considerable diversity in color pattern and body shape, and the composition of the genus has been challenged in several studies (Schelly 2007; Schelly *et al.* 2006; Sturmbauer *et al.* 2010; Day *et al.* 2007). Schelly (2007) proposed a more restricted *Lepidiolamprologus* characterized by a gracile anterior portion of the hyoid, a strongly emarginate caudal fin, scales reduced in size and presence of a dermosphenotic, in addition to the labial ossification and paired coronalis foramina. Five species conforming to *Lepidiolamprologus* sensu Schelly share a distinctive color pattern characterized by horizontal rows of contiguous or discrete dark blotches, viz., *L. elongatus* (Boulenger, 1898), *L. kendalli* (Poll & Stewart, 1977), *L. nkambae* (Staeck, 1978), and the most recently described species *L. mimicus* (Schelly, Takahashi, Bills & Hori, 2007). *Lepidiolamprologus profundicola* (Poll, 1949), placed in the restricted *Lepidiolamprologus* by Schelly (2007) is overall dark in color and the dark blotches on the side are much less conspicuous than in the other species of *Lepidiolamprologus*. The remaining species in *Lepidiolamprologus* as restricted by Schelly (2007) is *L. attenuatus* (Steindachner, 1909). It differs from the others in having only two rows of dark blotches along the side, one along the dorsal-fin base, and the other along the middle of the side. The median blotch in the lower row is elongate and much more prominent than the remaining blotches which may fade away completely.

Surveys by the two junior authors along the Tanzanian coast provided material identified as *L. elongatus*, *L. kendalli*, and *L. mimicus*, establishing considerably extended vouchered geographical distributions for the latter two species, but also a sample very similar to those species, differing from known species in details of the color pattern and a combination of other character states. The objective of this paper is to provide a formal description of the new species.

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Material and Methods

Measurements and counts were recorded as described by Roberts & Kullander (1986). The length of the caudal peduncle is measured from the base of the last ray of the anal fin to the middle of the base of the caudal fin. Scales in a longitudinal row are counted as described by Trewavas (1946) and include the scales of the upper lateral line followed by those of the horizontal row containing the lower lateral line, starting with the first scale in the oblique row (sloping rostrad and ventrad) next behind that containing the last scale of the upper lateral line. Lateral line scales on the caudal fin are not counted. Counts of lateral line scales include all scales up to the posteriormost canal-bearing scales in the upper lateral line, and to the anteriormost canal-bearing scale in the lower lateral line. That means that, especially in the lower lateral line, the count may include several scales from which neuromasts or bone canals are absent. Vertebral counts and counts of fin rays in unpaired fins were taken from X-radiographs. Vertebral counts include the last half-centrum. Teeth were counted in the outer row on one side (predominantly the left side) of the upper and lower jaw. Counts of caudal-fin rays include unsegmented procurrent rays, the marginal unbranched segmented ray, and the branched rays separated by periods, counts of upper and lower lobe separated by a plus sign. X-radiographs were made on Kodak X-omat V film using a Philips MG-105 low voltage X-ray unit. Abbreviations: NLF0 = neurocranial lateral line foramen 0; SL = Standard length.

Morphometric data were managed and analysed using PASW Statistics 18 (SPSS, 2009), except that the principal component analysis (PCA) of measurements was made using a separate procedure for component shearing, partialling out multivariate size residues from the second and further components as described by Humphries *et al.* (1981). The PCA analysis was made with log-transformed measurement data to tenth of a millimetre in a covariance matrix, and without rotation.

Specimens studied are deposited in the Swedish Museum of Natural History, Stockholm (NRM).

Comparative material. *Lepidiolamprologus attenuatus*: NRM 24148. 10, 70.7–118.1 mm SL. Zambia, Northern Province: Lake Tanganyika, ca 1 km E of Lufubu River mouth, Mwense Fishing Camp. 8 33' 0" S, 30 44' 0" E. 1 Mar. 1993. E. Schwanck & D. Kawage.

Lepidiolamprologus elongatus: NRM 12887. 2, 115.7–150.4 mm SL. Democratic Republic of the Congo, Sud-Kivu Province: Lake Tanganyika, Luhanga. 3 31' 0" S, 29 9' 0" E. 30 Nov. 1957. G. Marlier.—NRM 24147. 2, 108.3–115.8 mm SL. Zambia, Northern Province: Lake Tanganyika, ca 1 km E of Lufubu River mouth, Mwense Fishing Camp. 8 33' 0" S, 30 44' 0" E. 1 Mar. 1993. E. Schwanck & D. Kawage.—NRM 17449. 1, 111.3 mm SL. Tanzania, Kigoma Province: Lake Tanganyika, Kigoma Bay, tip of Nondwa Point. 4 51' 51" S, 29 35' 39" E. 5 Jul. 1976. G. Berglund.—NRM 59555. 9, 91.5–154.9 mm SL. Tanzania, Rukwa Province: Lake Tanganyika, Udachi. 7 3' 30" S, 30 33' 10" E. 2 Jun. 2008. M. Karlsson & M. Karlsson.—NRM 59600. 1, 136.6 mm SL. Tanzania, Rukwa Province: Lake Tanganyika, Udachi. 7 3' 30" S, 30 33' 10" E. 2 Jun. 2008. M. Karlsson & M. Karlsson.—NRM 60241. 1, 150.5 mm SL. Tanzania, Rukwa Province: Lake Tanganyika, Kansombo. 6 56' 42" S, 30 32' 26" E. 1 Dec. 2008. M. Karlsson & M. Karlsson.

Lepidiolamprologus kendalli: NRM 51544. 1, 124.0 mm SL; NRM 51590. 10, 74.3–124.9 mm SL.Tanzania, Rukwa Province: Lake Tanganyika, Muzi. 8 25' 59" S, 31 8' 44" E. 13 Oct. 2008. M. Karlsson & M. Karlsson.

Lepidiolamprologus mimicus: NRM 51595. 8, 103.8–141.8 mm SL; NRM 16249. 1, 133.9 mm SL. Tanzania, Rukwa Province: Lake Tanganyika, Frontosa Reef. 7 6' 38" S, 30 27' 44" E. 29 Nov. 2008. M. Karlsson & M. Karlsson.

Lepidiolamprologus profundicola: NRM 61570. 1, 260.9 mm SL. Tanzania, Rukwa Province: Lake Tanganyika, Kansombo. 6 56' 42" S, 30 32' 26" E. 30 Nov. 2010. M. Karlsson & M. Karlsson.

Lepidiolamprologus kamambae, new species

(Figs. 1–5; Table 1)

Holotype. NRM 61943. 1, 137.2 mm SL. Tanzania, Rukwa Province: Nkansi: Lake Tanganyika, Kamamba Island. 7 23' 51" S, 30 33' 16" E. 27 Oct. 2008. M. Karlsson & M. Karlsson.

Paratypes. All with same data as holotype. NRM 51514. 1, 119.2 mm SL.—NRM 51558. 9, 118.9–135.2 mm SL.

TABLE 1. Standard length (in millimeters) and proportional measurements in percents of standard length of *L. kamambae*. SD= standard deviation. Regression line parameters, a (intercept), b (slope), and r (Pearson's correlation coefficient) are calculated from measurements expressed in millimeters and shown for $p < 0.05$.

	N	Holotype	Min	Max	Mean	SD	a	b	r
SL mm	11	137.2	118.9	137.2	127.3	6.34			
Head Length	11	33.2	31.1	34.2	32.8	0.78	-4251	0.361	0.914
Snout length	11	12.8	11.8	13.0	12.4	0.37	-0.903	0.721	0.917
Body depth	11	20.9	20.8	22.7	21.8	0.63	7.782	0.157	0.815
Orbital diameter	11	7.9	7.5	8.6	8.0	0.30	-0.617	0.085	0.831
Interorbital width	11	4.9	4.9	5.9	5.4	0.28			
Preorbital depth	11	6.1	5.9	6.5	6.2	0.20	1.848	0.047	0.785
Caudal peduncle depth	11	9.9	9.8	10.6	10.1	0.25	2.727	0.080	0.869
Caudal peduncle length	11	15.4	15.4	17.6	16.5	0.75	2.622	0.144	0.691
Pectoral-fin length	11	20.3	19.3	20.9	20.1	0.47	6.075	0.153	0.878
Upper jaw length	11	12.5	12.5	13.5	13.1	0.28	0.621	0.126	0.904
Lower jaw length	11	15.9	15.9	17.4	16.5	0.48	-0.903	0.172	0.868
Last dorsal-fin spine length	11	13.1	11.2	13.3	12.5	0.69			

Diagnosis. A species of the restricted group of *Lepidiolamprologus* sensu Schelly (2007), characterized by emarginate or truncate caudal fin (vs. rounded, subtruncate, or lyreate in other Lamprologini), small scales (61–74, vs. less than 60, usually less than 40 in other Lamprologini, but up to 60 and 71 in *Neolamprologus pleuromaculatus* (Trewavas & Poll) and *N. cunningtoni* (Boulenger), respectively), and presence of dermosphenotic bone combined with absence of other infraorbital ossicles (vs. absence in other Lamprologini except in *Lamprologus lemairii* Boulenger, and *N. cunningtoni*). Similar to *L. elongatus*, *L. kendalli* and *L. mimicus* in color pattern composed of three horizontal rows of dark blotches on each side of body. Distinguished from all of these species by presence of a broad dark stripe on cheek. Distinguished from *L. elongatus* by more slender body (depth 20.8–23.6% of SL vs. 23.9–29.0%), narrower interorbital space (width 4.9–5.9% of SL vs. 6.0–7.0%), and presence of frontal pattern of light spots on dark brown ground. Distinguished from *L. mimicus* by narrower interorbital space (4.9–5.9% of SL vs. 6.0–6.8%), shorter upper jaw (length 12.5–13.5% of SL vs. 13.8–14.5%), and presence of frontal pattern of light spots on dark brown ground. Distinguished from *L. kendalli* by shorter last dorsal-fin spine (11.2–13.3% of SL vs. 13.3–15.1%), and lateral blotches distinct or only partly contiguous (vs. forming lateral bands separated by narrow light stripes). Distinguished from *L. profundicola* by presence of a row of dark blotches along middle of side (reported in *L. profundicola* only from unvouchered specimens), cheek naked except for a few scales posterodorsally (vs. numerous scales in regular rows on cheek), more scales in a longitudinal row (64–71 vs. 61–65), and presence (vs. absence) of dark markings on cheek and top of head. Distinguished from *L. attenuatus* by possession of three (vs. two) horizontal rows of dark blotches on each side of body, all blotches of similar intensity (vs. median blotch particularly prominent, other blotches often obsolete), and presence of frontal pattern of light spots on dark brown ground (vs. absence).

Description. All specimens examined are adult males. Elongate, moderately compressed laterally, trunk about elliptic in cross section anteriorly. Predorsal outline about straight ascending to or slightly in advance of dorsal-fin origin; dorsal-fin base contour slightly sloping. Ventral profile almost straight and horizontal, anal-fin base slightly ascending. Caudal peduncle contours slightly constricted at middle. Mouth large, slightly upwards directed, lower jaw slightly protruding before upper jaw. Maxilla reaching caudad to or not quite to vertical from anterior margin of orbit; lower jaw articulation below middle of orbit. Ascending processes of premaxillae forming minor elevation dorsally on snout. Snout tip obtuse. Orbit and eye lateral, in about middle of length of head, in upper half of head. Eye exposed in dorsal view of head, barely exposed in ventral view of head. Interorbital area flat, narrower than snout and mouth. Nostril situated at one-third distance from orbital margin to tip of upper jaw. Lips relatively thick, fold of lower jaw broadly interrupted anteriorly. Elongate labial ossification present on each side of lower lip.

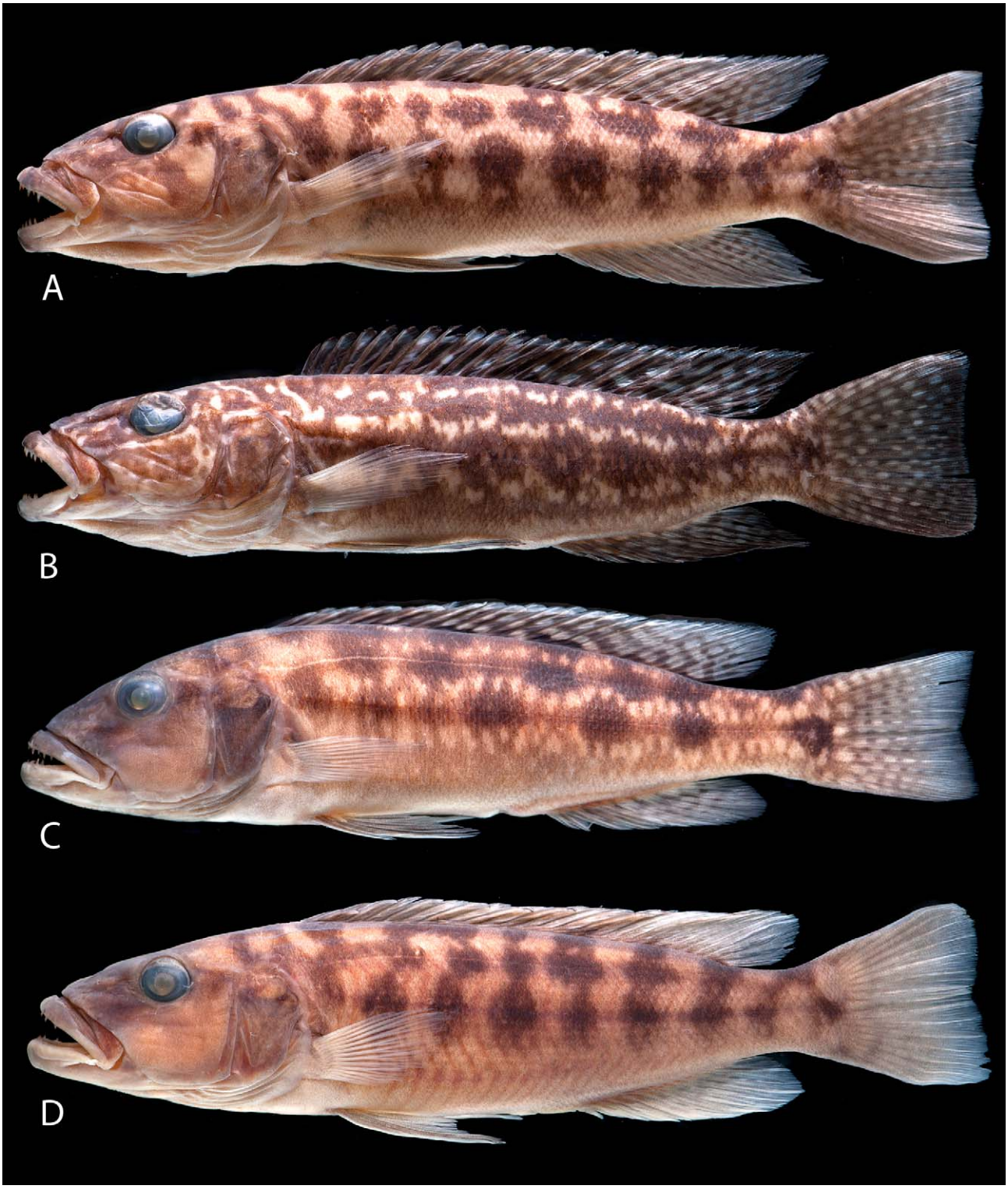

FIGURE 1. Preserved specimens, all from Tanzania, Lake Tanganyika. **A**. *Lepidiolamprologus kamambae*, holotype, NRM 61943, 137.2 mm SL, Kamamba Island. **B**. *L. kendalli*, NRM 51590, 100.5 mm SL, Muzi. **C**. *L. elongatus*, NRM 59555, 116.4 mm SL, Udachi. **D**. *L. mimicus*, NRM 51595, 126.7 mm SL, Frontosa Reef.

First dorsal-fin spine inserted above pectoral-fin base, at or slightly posterior to vertical from caudal margin of opercle; spines subequal from 4th–6th, gradually slightly longer to last spine; soft dorsal-fin rays all branched, gradually slightly longer to 7th, beyond which shorter; soft portion ending in acute tip slightly beyond vertical from caudal-fin base. First anal-fin spine inserted opposite antepenultimate dorsal-fin spine; spines gradually increasing in length to last; soft anal-fin rays all branched, increasing in length to 6th ray, posterior rays shorter; soft portion

ending in blunt tip at or slightly posterior to vertical from caudal-fin base. Pectoral fin short, reaching halfway to vertical from first soft ray of anal fin; rounded, 4th and 5th rays longest, forming rounded tip. Pelvic fin short, reaching to genital papilla; subacuminate, posterior branch of first soft ray and anterior ray of second soft ray forming rounded tip. Caudal-fin hind margin very slightly indented medially, lobes slightly convex, corners rounded. Caudal fin rays x.1.7+7.1.ix (8), viii.1.7+7.1.viii (1), ix.1.7+7.1.ix (1), ix.1.7+7.1.viii (1).

Trunk scales small, ctenoid. Cheek naked except for a group of minute cycloid partly embedded scales posterodorsally. Predorsal scales minute, cycloid, about 20 along midline; squamation extending anteriorly to slightly posterior to orbits. Abdominal scales small, with free margin, ctenoid. Prepelvic and chest scales very small, cycloid, embedded. Upper lateral line distance from dorsal-fin base anteriorly at about 12, posteriorly at about three scales; reaching posteriorly to about middle of caudal peduncle, but posteriorly may include scales or short sequences of scales from which tubes absent. Lower lateral line reaching forward to above spinous anal fin, anterior to that continued by short series or scattered pores or tubed scales at most up to 8 scales distance from cleithrum. Five rows of scales separating upper and lower lateral lines where overlapping above anal fin. Circumpeduncular scales 26 (1), 27 (2), 28 (2), 29 (4), 30 (2); comprising 12 (2) or 13 (9) above, and 12 (2), 13 (3), 14 (4), 14 (2) below lateral lines.

Gill rakers sparse, 4+1+9 (8), 4+1+10 (2), 5+1+9 (1); epibranchial and lower ceratobranchial rakers simple, needle-like, upper ceratobranchial rakers bifurcate distally. Microbranchiospines present externally on second through fourth gill arches. Lower pharyngeal tooth-plate (Fig. 2) slender, only slightly wider than long and toothed surface about as long as posterior width. Pharyngeal teeth erect, slender, compressed, sparse; most teeth beveled with distinct blunt posterior cusp preceded by sharp edge or 1–3 minor cusps; anteriormost teeth with slightly recurved tip and usually a minor cusp subapically on the posterior aspect; larger posteromedian teeth tending to conical with erect more or less sharp cusp, and less pronounced cusp gap and minor cusps. Coronalis pore (NFL0) double. Six lacrimal lateralis openings; infraorbitals 2–5 absent, substituted by series of free neuromasts, infraorbital 6 (dermosphenotic) present.

Both upper and lower jaw marginally with anterior pair of minute caniniform teeth close to symphysis, followed on each side by three long (about 2–3 mm) caniniform, erect, distally recurved teeth, followed by much shorter, posteriorly gradually shorter, erect caniniform teeth; an inner band of minute, dense sharp teeth, about 6–8 teeth in width. Usually one or two of anterior long caniniform teeth and/or minute symphysial teeth in outer row absent. Total teeth in outer row hemiseries in upper/lower jaw 17/25, 18/25, 18/28, 19/31, 20/33, 20/34, 21/27, 21/28, 21/31, 22/31, 23/28.

Color pattern in preservative (Figs. 1, 3). Ground color off-white, ventral aspect whitish. Dark markings on head and trunk brown to dark brown. Horizontal row of six dark brown blotches next to dorsal-fin base and slightly extended onto dorsal-fin base; in line with those a dark blotch posteriorly on dorsal margin of caudal peduncle. Dorsal blotches of slightly different shape on left and right side, shape roundish or subrectangular, variably including a light center; extended ventrally to slightly below upper lateral line, or portion on lateral line separate and forming separate horizontal row of round or slightly elongate blotches. Along middle of flank a row of eight or nine dark brown blotches, roundish or slightly deeper than wide; penultimate blotch contiguous with dark blotch dorsally on caudal peduncle; last blotch posteriorly on caudal peduncle and partly on caudal fin base; each blotch usually connecting dorsally with blotches on upper lateral line; blotches margined ventrally by a faintly pigmented band spanning entire horizontal row of contiguous blotches. Head with complex pattern of dark and light stripes and blotches dorsally (Fig. 3). On cheek a light to dark brown blotch or wide stripe variably extending posteroventrad from orbit minimally to halfway point, maximally to contact with inner margin of preopercle. A dark brown blotch immediately posterior to orbit. Opercular blotch dark brown, small; usually connected by narrow stripe to blotch posterior to orbit. Lachrymal stripe brown.

Dorsal fin with hyaline lappets and margin underneath very thin black margin along distal edge. Rest of dorsal fin pale brownish with very large hyaline spots forming continuous oblique stripes on soft portion. Anal fin pale greyish, almost hyaline, withup to six oblique rows of hyaline spots with brownish interspaces on soft portion.
Pelvic fin pale greyish, anterior margin white. Margin of caudal fin hyaline, rest of tin pale brownish grey with dense pattern of small whitish or hyaline spots; lighter and spots less distinct on lower lobe compared to upper lobe. Pectoral fin hyaline.

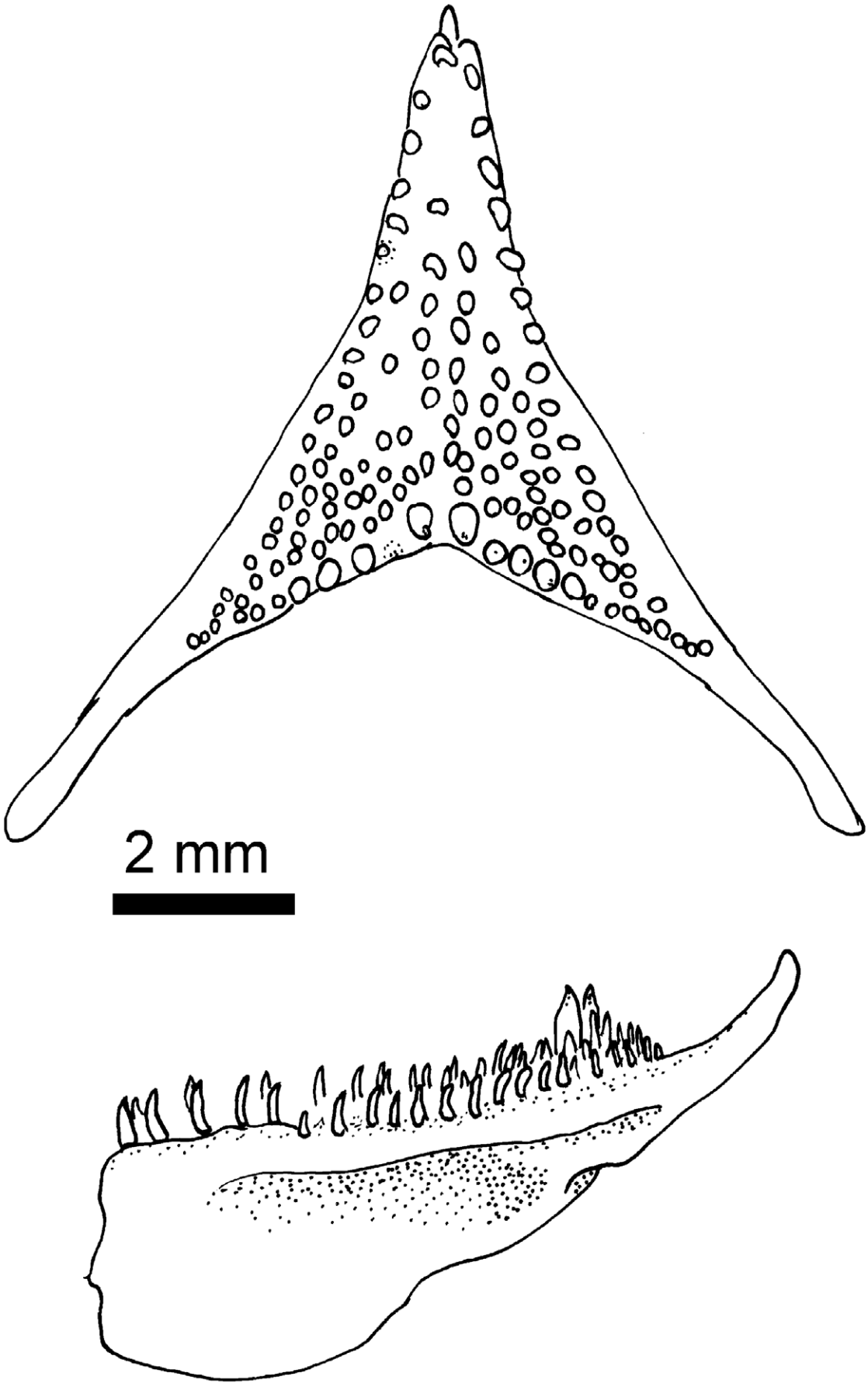

FIGURE 2. *Lepidiolamprologus kamambae*. Lower pharyngeal jaw in occlusal (upper) and approximately lateral (lower) aspect. Scale for occlusal aspect. From paratype NRM 51558, 122.1 mm SL.

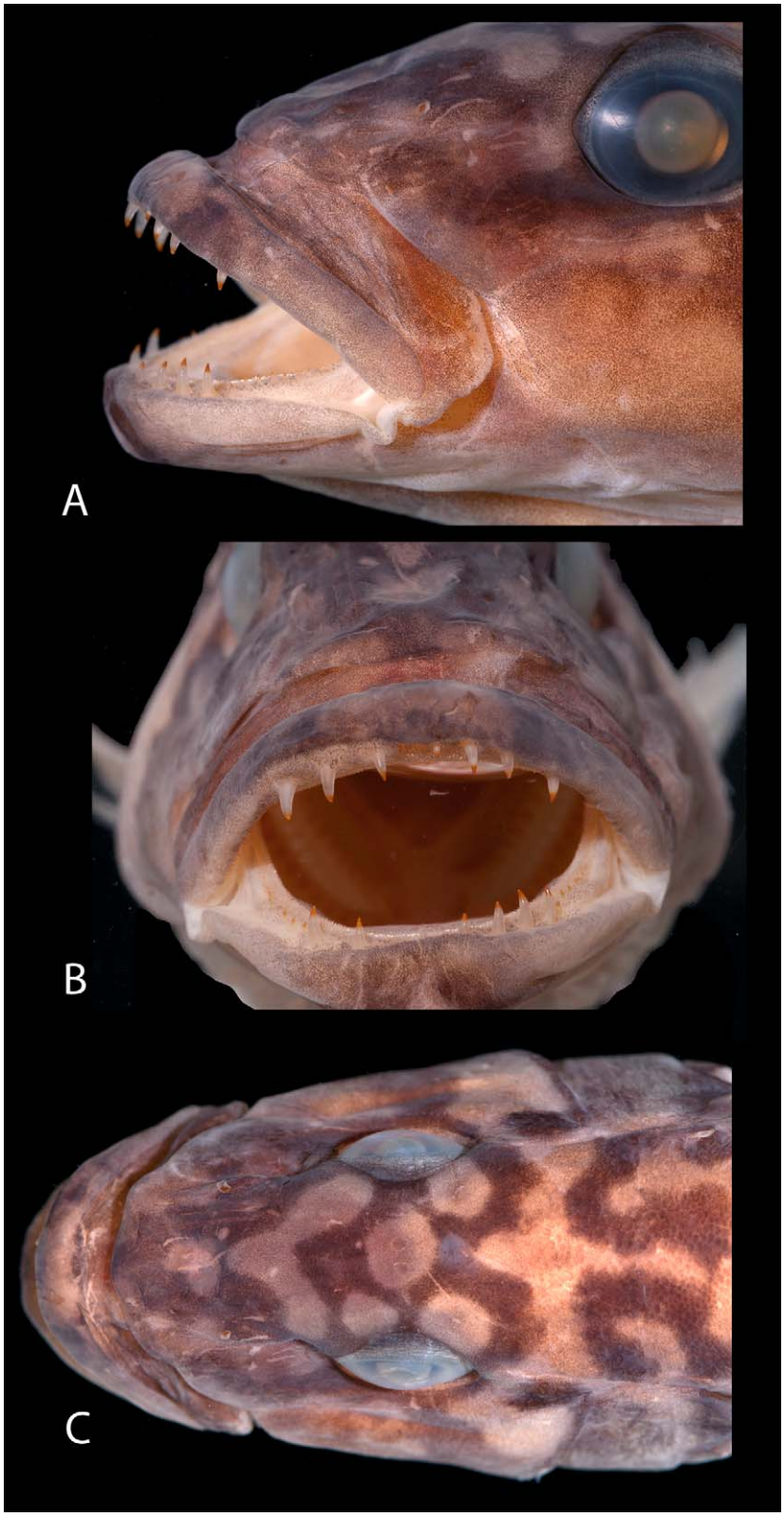

FIGURE 3. *Lepidiolamprologus kamambae.* Holotype, NRM 61943, 137.2 mm SL. **A.** Lateral aspect of snout. **B**. frontal aspect of snout. **C**. dorsal aspect of head.

Live coloration (Figs. 4 & 5). Ground color variable, beige, yellowish, or greyish white. Dark blotches on side and dark spots on head as in preserved specimens, dark brown. Between rows of dark blotches, minute whitish spots forming three irregular horizontal stripes. A turquoise stripe from lower margin of orbit to upper lip. Many small whitish spots on caudal and anal fins, and posterior part of dorsal fin.

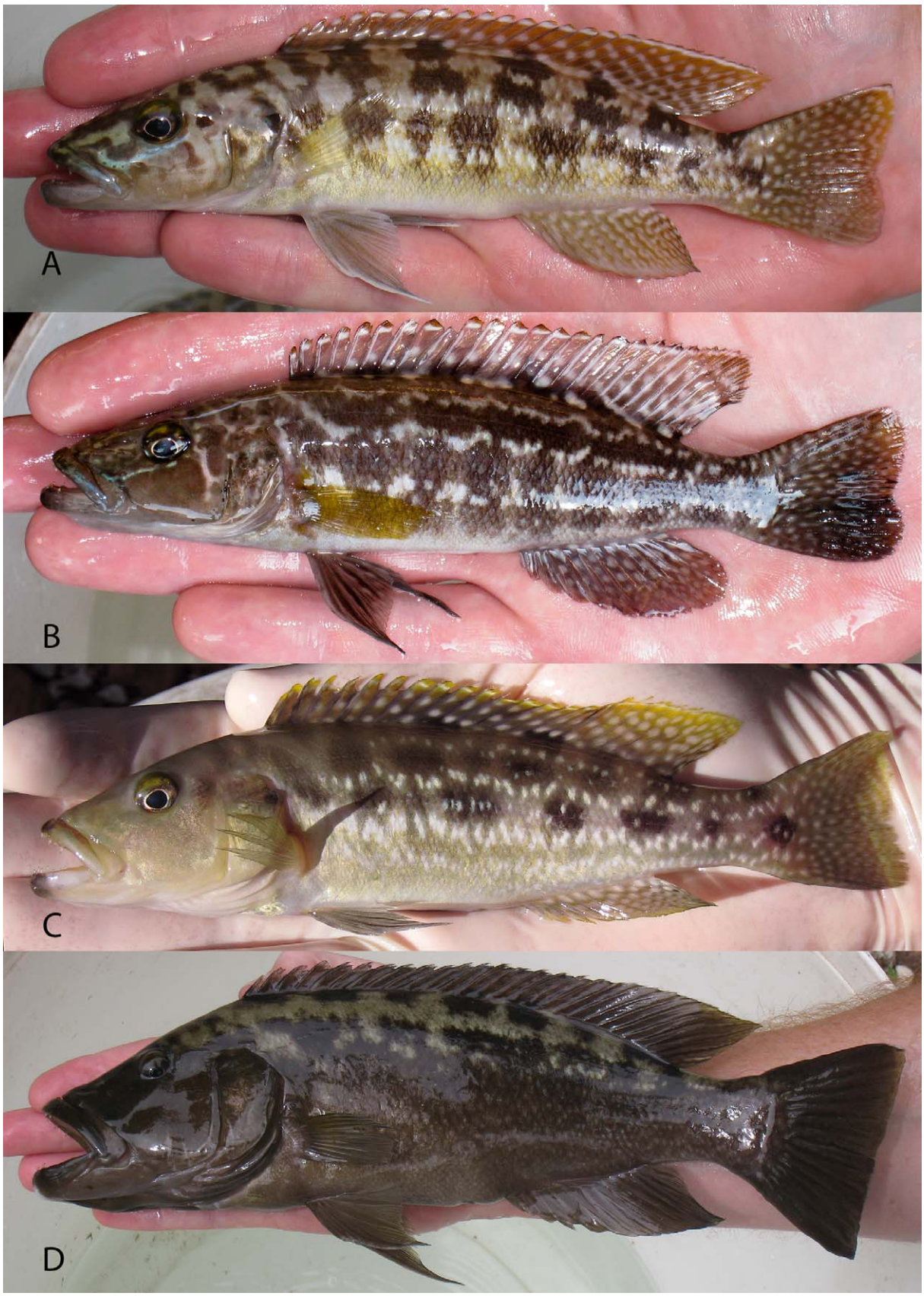

FIGURE 4. Living specimens photographed in the field, showing live colors, all from Tanzania, Lake Tanganyika. **A**. *Lepidiolamprologus kamambae*, paratype, NRM 51558, 135.2 mm SL, Kamamba Island. **B**. *L. kendalli*, NRM 51544, 124.0 mm SL, Muzi. **C**. *L. elongatus*, NRM 59555, 150.1 mm SL, Udachi. **D**. *L. profundicola*, NRM 61570, 260.9 mm SL, Kansombo. Photographs by Mikael Karlsson and Magnus Karlsson.

FIGURE 5. *Lepidiolamprologus kamambae*. Living specimen, not preserved, photographed in natural habitat at Kamamba Island, 15 m depth. Photo by Mikael Karlsson and Magnus Karlsson, 30 April 2008.

Comparative morphometry and coloration. Proportional measurements, selected meristics, a principal component analysis of measurement data, and habitus images are provided for *L. kamambae* and the most similar species *L. elongatus, L. kendalli, and L. mimicus* in Tables 1–10 and Figs. 1, 4, and 6.

Etymology. The specific epithet is a genitive based on the name of Kamamba Island at which the type series was collected.

Geographical distribution. Specimens are available so far only from the type locality, the Kamamba Island slightly off the southern Tanzanian coast of Lake Tanganyika (Figs. 7, 8). The species was observed, but not sampled at Kerenge Island, about 350 m to the northeast. It is likely that *L. kamambae* occurs also at the nearby Mwila and Nkondwe Islands. These two islands exhibit biotopes similar to those at Kamamba and Kerenge Islands. We have not observed *L. kamambae* either to the south or north of the vicinity of Kamamba and Kerenge Islands. We did not observe it at Mswa Point 10 km north of Mwila Island, or at the southern islands of Mvuna, Lupita, and Ulwile, or at Kipili.

Field observations. *Lepidiolamprologus kamambae* was observed for the first time in April 2008, at Kamamba and Kerenge Islands. We first considered it as a population of *L. kendalli*, similar in body shape, but distinguished by the coloration, which was much lighter, especially underwater where the *L. kamambae* looked whitish (Fig. 5). The color pattern resembles more that of *L. elongatus*, a species that accepts a wide variety of biotopes and that is found in the whole lake, whereas *L. kendalli* is overall dark in color (Figs. 1 and 4). During a second trip to Kamamba Island in October the same year, we had the opportunity to study the *L. kamambae* more closely and capture voucher specimens. At Kamamba Island *L. kamambae* is found in the transition zone between rocks and sand at 15 m depth. The habitat consists of sparsely scattered stones of 0.2–2 m in size on white sand bottom. The coloration of the fish blends in well with the light substrate. This biotope differs considerably from that of *L. kendalli*, which consists mainly of rocks of various sizes with plenty of dark caves and hide-outs. In contrast to *L. kendalli*, which sneaks up on its prey among the rocks, the *L. kamambae* hunt similar prey among the few scattered stones on the open sand floor. The food of *L. kamambae* probably consists of cichlid fish juveniles, but actual prey capture was not observed. Individuals of *L. kamambae* are often seen swimming half a meter over

the bottom. *Lepidiolamprologus kamambae* was observed only in small numbers. Mostly solitary adults of 15–20 cm total length were encountered. Younger fish of about 10 cm total length were seen in pairs or smaller groups of at most four individuals.

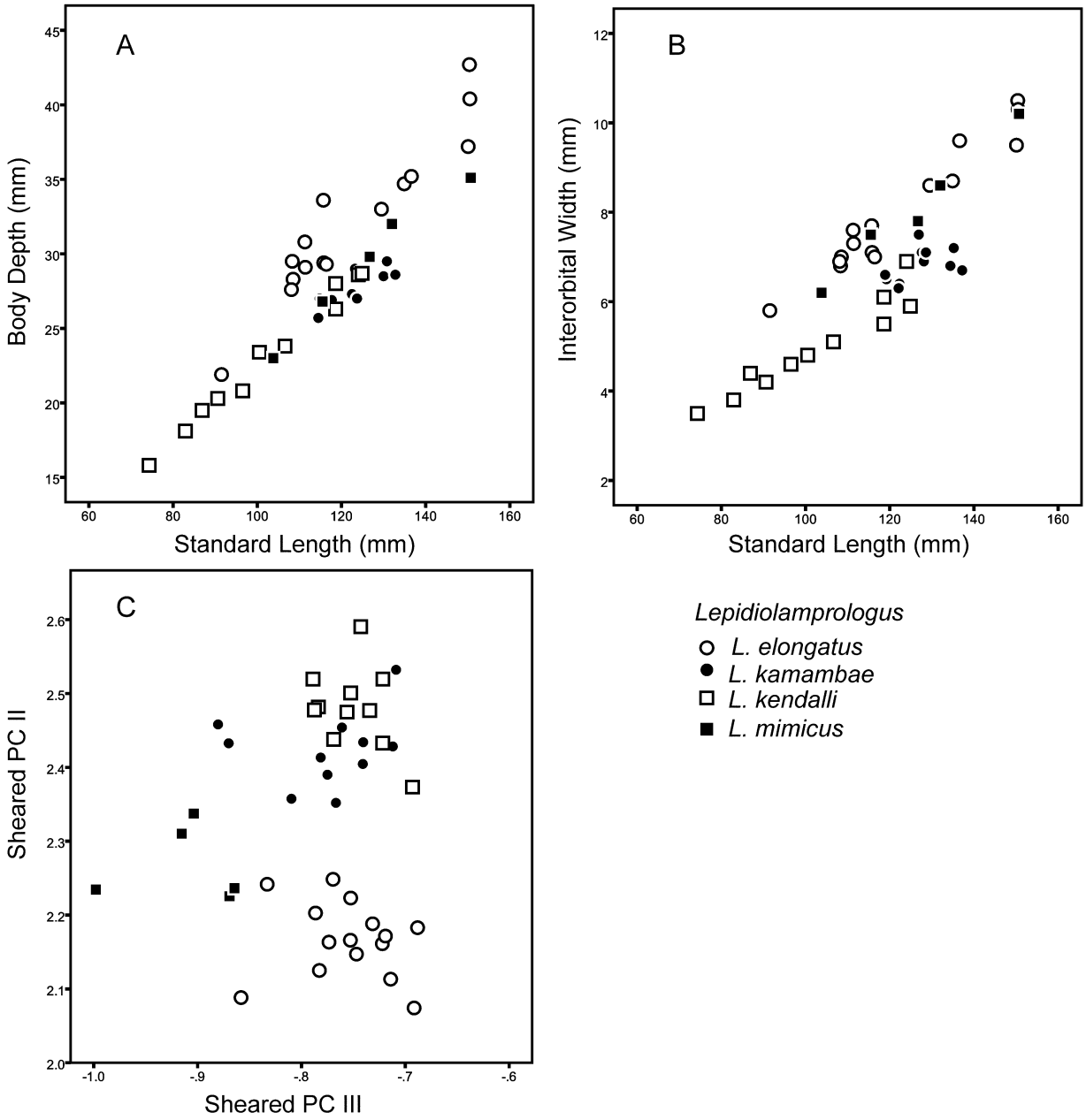

FIGURE 6. Morphometry of *Lepidiolamprologus kamambae* and similar species. **A**. Body depth plotted against Standard Length. **B**. Interorbital width plotted against Standard Length. **C**. Plot of scores from Principal Component Analyses of morphometric data.

Discussion

Lepidiolamprologus kamambae is referred to *Lepidiolamprologus* based on the presence of an ossified small sesamoid bone in the labial ligament (cf. Stiassny 1997), and separate openings for the coronalis pore (NLF0) combined with frontal shelf extending anterior to NLF0 (cf. Schelly 2007). In a morphological phylogenetic analysis of lamprologins Schelly (2007) recovered *Lepidiolamprologus elongatus* (type species), *L. nkambae*, *L. kendalli*, *L. profundicola*, and *L. attenuatus* as a diagnosable clade representing *Lepidiolamprologus* in a strict sense, excluding the similar species *L. cunningtoni* originally included in the genus, and others added by Stiassny (1997). Schelly listed as diagnostic a gracile anterior portion of the hyoid (the hypohyal bones), a strongly

emarginate caudal fin, scales reduced in size, and presence of a dermosphenotic. He did not define the gracile anterior portion of the hyoid, and we are uncertain whether this state is met in *L. kamambae*. When folded, as in most preserved specimens, the caudal fin of species of *Lepidiolamprologus* takes on a slightly emarginate posterior margin (Fig. 1), but when expanded, as in living specimens (Fig. 4D, Fig. 5), it attains either an only slightly emarginate, or even straight, truncate or subtruncate posterior border. This shape still contrasts with most other lamprologin species in which the caudal fin is rounded. The size of the scales can be obtained from scale counts. The species studied in this paper have 61–75 scales (Table 7 and *L. profundicola*). Based on the scale counts given in Poll (1956), most species of lamprologins in Lake Tanganyika other than those included in *Lepidiolamprologus* sensu Schelly, have between 30 and 40 scales along the middle of the side, the exceptions being *Neolamprologus cunningtoni* (61–71), *N. christyi* (Trewavas & Poll) (50–60), *N. pleuromaculatus* (47–60), *Lamprologus meeli* Poll (42–46) and *L. hecqui* Boulenger (45–55). The latter three were included in *Lepidiolamprologus* by Stiassny (1997) and the latter two are close to *Lepidiolamprologus* sensu Schelly (2007) in molecular phylogenetic analyses (Day *et al.* 2007; Schelly *et al.* 2006). The postlacrimal infraorbital series in lamprologins is usually either absent or reduced to a few bones and the dermosphenotic is usually absent (Stiassny 1997). The dermosphenotic is present and the other infraorbitals are absent in *L. kamambae* as well as in the other members of *Lepidiolamprologus.*

DNA analyses have recovered a *Lepidiolamprologus* clade partly in conflict with morphology, and challenging also the monophyly of other lamprologin genera, as well as the monophyly of Schelly's stricter *Lepidiolamprologus* (Day *et al.* 2007; Schelly *et al.* 2006; Sturmbauer *et al.* 2010). Considerable more analytical work seems necessary to arrive at a stable phylogeny of lamprologins, but all available analyses group *L. attenuatus, L. kendalli, L. elongatus, L. profundicola, L. mimicus* (as *Lepidiolamprologus* sp. in Schelly *et al* 2006) within the same clade, which thus forms a reliable relationship container for *L. kamambae* based on Schelly's (2007) diagnosis of *Lepidiolamprologus.*

Lepidiolamprologus kamambae is very similar to five other nominal species of *Lepidiolamprologus* in general shape features, meristics and color pattern, viz., *L. elongatus*, *L. kendalli*, *L. mimicus*, *L. nkambae*, and *L. profundicola.*

Lepidiolamprologus elongatus was described and figured by Boulenger (1898a, b) from two specimens, one from Mbity Rocks, and one from Kinyamkolo (presently Mpulungu), both localities in the southern end of Lake Tanganyika. The total length was given as 113 mm. A redescription in French appeared in Boulenger (1901), with a specimen from Albertville (presently Kalemie) added. The figure in Boulenger (1898b) was reprinted along with a slightly expanded description in Boulenger (1915: 472), with specimens from Niamkolo and Sumbu added, the total length now given as 325 mm. Poll (1956: 491) redescribed the species based on numerous specimens mainly from the Western shore, but also samples from Sumbu, Mpulungu and Kigoma. Poll gave the maximum observed length as 194 mm. Boulenger gave the count of scales in a longitudinal row as 90–95 (1898a, b, 1901), and 85–95 (1915). These high counts were copied by Pellegrin (1904) and used as rationale for erecting *Lepidiolamprologus* with *L. elongatus* as only included species. Trewavas (1946) re-examined the syntypes and found only 71 and 73 scales.

Lepidiolamprologus kendalli was described by Poll & Stewart (1977) based on two specimens, holotype and paratype, 125 and 129 mm SL, respectively, taken by gill net at 40 m NW of Mutondwe [Mtondwe] Island, Zambia. Staeck (1978) described a similar species, *L. nkambae*, based on a single specimen 117.8 mm SL from the littoral of a small rocky island forming the eastern shore of the mouth of Nkamba Bay in Zambia. Staeck (1978) noted that *L. kendalli* and *L. nkambae* are very similar but argued for distinctness referring to slightly deeper body (23.3% of SL vs. 19.8–20.4%; 66.3% in the head length vs. 57.9–58.6%), more scales along the midline, "Schuppen in Längsreihe (66 vs. 62), and absence (vs. presence) of scales on the cheek in *L. nkambae*. This information is presented in a table comparing *L. nkambae* with *L. kendalli* and *L. elongatus*, modified from the comparative table in Poll & Stewart (1977: 1055), which included selected data from *L. elongatus, L. attenuatus, L. profundicola, L. cunningtoni* and *L. kendalli*. In Staeck's table, the scale count ("Schuppen in Längsreihe) for *L. elongatus* corresponds to that of "Ecailles en l. long for *L. attenuatus* in Poll & Stewart (1977: 1055); the scale count for *L. kendalli* (62) to that the "Ligne médiolat. in Poll & Stewart (1978: 1053). In Poll & Stewart (1977: 1055) *L. kendalli* has 72 or 73 scales in the "Ecailles en l. long and *L. elongatus* has 71–78. The "Ecailles en l. long corresponds to the longitudinal scale count used in the present paper, which includes the scales of the upper lateral line plus those of the lower lateral line posterior to the upper lateral line as explained by Poll & Stewart (1977: 1050), although we are uncertain what they mean by "counted in zig-zag. The counts of the upper lateral line scales and the number of scales along the midline are both given as 62 by Poll & Stewart (1978), although it would be reasonable to have a higher count for the scales along the midline.

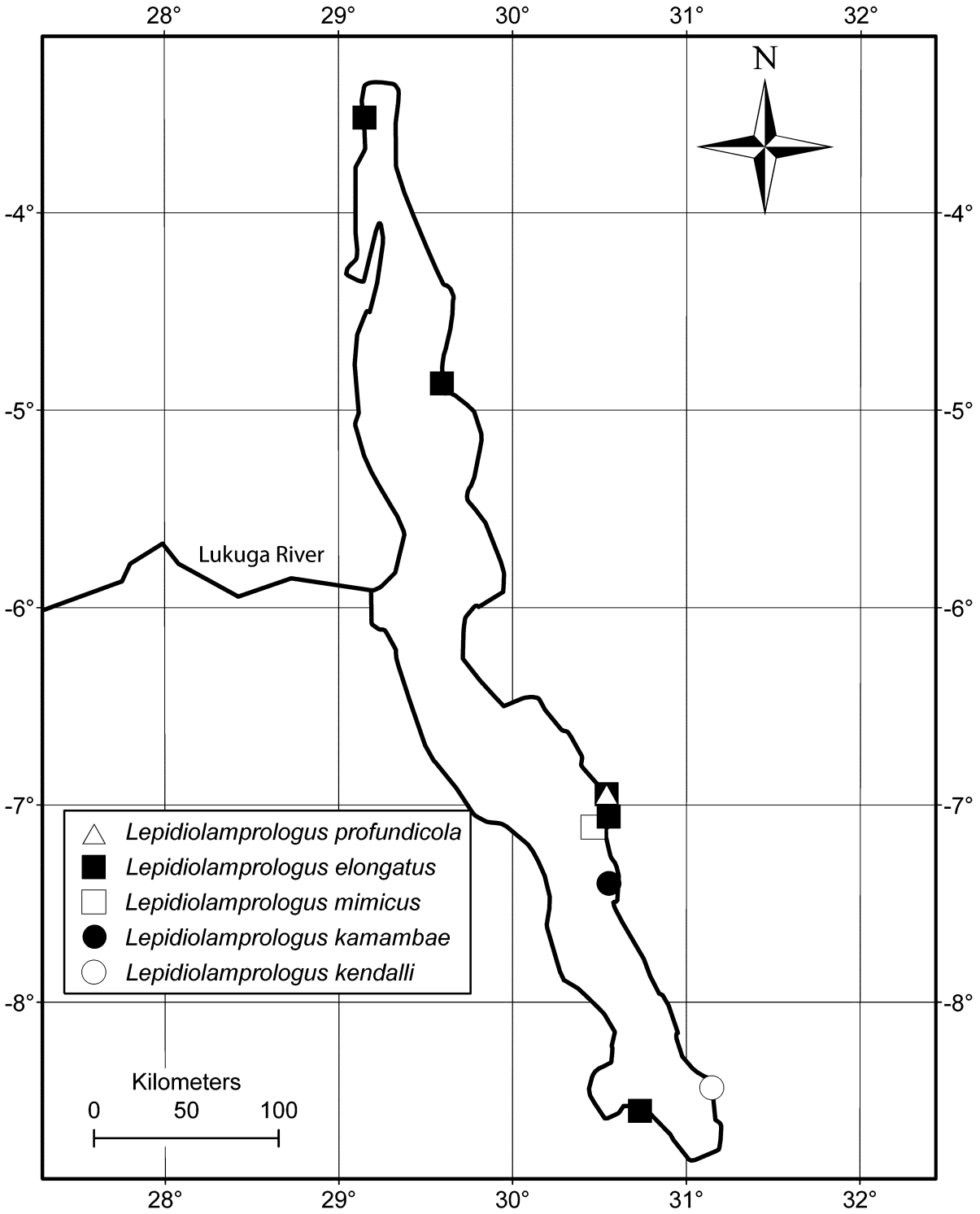

FIGURE 7. Outline map of Lake Tanganyika showing collecting localities of *L. kamambae* and comparative material of *L. elongatus*, *L. kendalli*, *L. mimicus*, and *L. profundicola.*

Poll & Stewart's table on p. 1055 probably incorporates the more detailed information in the table on pp. 1052 & 1053 in the same paper, but the characters are described differently, and the ranges are inconsistent, e.g., for *L. elongatus* the "Ecailles en l. long. scale count is given as 71–78 on p. 1055, but on p. 1053 the "Ligne longit. has 69–74 scales.

Both *L. kendalli* and *L. nkambae* were illustrated by pencil drawings, and mainly described on the basis of external characters. Our material of *L. kendalli/L. nkambae* agrees better with the description of *L. nkambae* than with that of *L. kendalli* with reference to the scale count, but the occasional presence of scales on the cheek would point to *L. kendalli.* The color pattern is similar, but not quite in agreement with that depicted in the drawings

provided by Poll & Stewart (1977) and Staeck (1978). Interestingly, Boulenger (1898) wrote "cheeks naked in the original description of *L. elongatus*, modified later (1915: 472) to "Cheek naked in the young, covered with very small scales in the adult contrasting with Poll's (1956: 491) "Joue nue, dépourvue complètement d'écailles. The scaly cheek was considered diagnostic for *L. kendalli* by Poll & Stewart (1977) and Staeck (1978), but either this is a variable character in *L. elongatus* or Boulenger's material may have included *L. kendalli* or *L. profundicola*, which latter is the only similar species conforming to Boulenger's description of the cheeks "covered with very small scales. Schelly *et al.* (2006) included both *L. nkambae* and *L. kendalli* in a molecular phylogenetic analysis of the lamprologine cichlids. They considered the two taxa morphologically indistinguishable, but found them highly divergent in mitochondrial DNA, and speculated that this may be due to a temporally distant introgression from some other species of *Lepidiolamprologus* in the Nkamba Bay area (*L. nkambae*).

Schelly *et al.* (2007) described *L. mimicus* based on material from Kasenga, Chituta Bay, and Mtondwe Island, Zambia, also on the southern end of the lake, and reported observations along the southern coast from Kapembwa to Kasenga. *Lepidiolamprologus mimicus* has about the same color pattern as *L. elongatus* and *L. kamambae*. Schelly *et al.* (2007) gave a clear distinction from *L. kendalli*, *L. profundicola*, *L. nkambae*, *L. cunningtoni*, and *L. attenuatus*, for which they listed comparative material. They also compared with *L. elongatus* which they considered sympatric with *L. mimicus* at the type locality. Apart from coloration, the only characters listed as distinguishing from *L. elongatus* were the longitudinal scale count (73–79 vs. 66–73 in *L. elongatus*, and fewer ceratobranchial gill rakers (10–12 vs. 11–14 in *L. elongatus*). Schelly *et al.* (2007) found scales on the cheek in three of the 13 specimens of *L. mimicus*.

FIGURE 8. Eastern part of Kamamba Island, type locality of *Lepidiolamprologus kamambae*. Photo by Mikael Karlsson and Magnus Karlsson, 30 April 2008.

Regarding *L. nkambae*, the only strong differences provided by Staeck (1978) were the deeper body and the absence of scales on the cheek in *L. nkambae*, present in *L. kendalli*. In the present material, there are scales posterodorsally on the cheek, posterior to the orbit in *L. elongatus*, *L. kamambae*, *L. kendalli*, and *L. mimicus*. Minute scattered scales, which may be embedded entirely in the skin and which are located close below the orbit and/or along the margin of the preopercle, are present in nine of 16 *L. elongatus*, four of 11 *L. kendalli* and one of nine *L. mimicus*. No such scales were present in *L. kamambae*. The body depth of the type series of *L. kendalli* (19.8–20.4 % SL) is below the range in our material (Table 3) as well that of the holotype of *L. nkambae*. The types

of *L. kendalli* are longer (125 and 129 mm SL) than our specimens and the holotype of *L. nkambae* (117.8 mm SL) but still would fall below the plots of *L. kendalli* in Fig. 6 (body depth backcalculated as 15.5 mm in both specimens). Nevertheless, with consideration that slight differences in methods of measurement may explain the difference, we prefer recognize *L. kendalli* as a senior synonym of *L. nkambae*, and consequently use *L. kendalli* as the name for the comparative material. We notice that the body depth data for *L. elongatus* given by Poll & Stewart (1977) is much higher than our range (Table 2). On the other hand, our proportional data for *L. mimicus* (Table 4) is roughly in agreement with corresponding measurements given by Schelly *et al.* (2007) for *L. mimicus*, but nevertheless not matching perfectly. We thus have limited confidence in comparing proportional data from different authors, especially for samples of different length ranges.

TABLE 2. Standard length (in millimeters) and proportional measurements in percents of standard length of *L. elongatus*. SD= standard deviation. Regression line parameters, a (intercept), b (slope), and r (Pearson's correlation coefficient) are calculated from measurements expressed in millimeters.

	N	Min	Max	Mean	SD	a	b	r
SL mm	15	91.5	150.5	122.6	18.30			
Head Length	15	31.3	34.4	33.0	0.84	-1.990	0.347	0.989
Snout length	15	10.7	13.7	12.5	0.72	-2.227	0.187	0.986
Body depth	15	23.9	29.0	26.2	1.38	-1.827	0.277	0.950
Orbital diameter	15	6.8	8.6	7.9	0.52	3.705	0.048	0.916
Interorbital width	15	6.0	7.0	6.5	0.30	-1.229	0.075	0.971
Preorbital depth	15	6.0	7.8	6.9	0.46	-2.957	0.093	0.977
Caudal peduncle depth	15	10.1	11.1	10.5	0.28	0.213	0.103	0.984
Caudal peduncle length	15	16.3	20.1	17.9	0.96	-1.266	0.189	0.948
Pectoral-fin length	15	16.3	20.3	18.6	1.00	3.813	0.154	0.919
Upper jaw length	15	12.7	14.7	13.7	0.51	-2.607	0.159	0.987
Lower jaw length	15	15.7	18.2	16.8	0.62	-2.227	0.187	0.980
Last dorsal-fin spine length	15	12.0	14.1	13.2	0.58	0.957	0.124	0.956

TABLE 3. Standard length (in millimeters) and proportional measurements in percents of standard length of *L. kendalli*. SD= standard deviation. Regression line parameters, a (intercept), b (slope), and r (Pearson's correlation coefficient) are calculated from measurements expressed in millimeters.

	N	Min	Max	Mean	SD	a	b	r
SL (mm)	11	74.3	124.9	102.2	17.61			
Head length	11	32.5	33.7	33.2	0.41	1.094	0.321	0.997
Snout length	11	10.9	12.8	12.0	0.52	-0.728	0.176	0.989
Body depth	11	21.3	23.6	22.4	0.73	-2.778	0.252	0.992
Orbital diameter	11	7.8	9.4	8.8	0.53	2.573	0.062	0.964
Interorbital width	11	4.6	5.6	4.9	0.29	-0.771	0.056	0.955
Preorbital depth	11	4.8	6.5	5.7	0.50	-2.507	0.082	0.984
Caudal peduncle depth	11	9.5	10.5	10.1	0.31	-0.061	0.101	0.984
Caudal peduncle length	11	15.6	17.7	16.8	0.65	1.389	0.155	0.973
Pectoral-fin length	11	20.1	22.4	20.7	0.69	-0.077	0.215	0.979
Upper jaw length	11	12.7	14.2	13.3	0.48	-1.807	0.151	0.987
Lower jaw length	11	15.8	17.5	16.8	0.54	-0.728	0.176	0.985
Last dorsal spine length	11	13.3	15.1	13.8	0.55	1.630	0.121	0.982

TABLE 4. Standard length (in millimeters) and proportional measurements in percents of standard length of *L. mimicus*. SD= standard deviation. Regression line parameters, a (intercept), b (slope), and r (Pearson's correlation coefficient) are calculated from measurements expressed in millimeters.

	N	Min	Max	Mean	SD	a	b	r
SL (mm)	5	103.8	150.7	125.7	17.67			
Head length	5	32.5	33.9	33.1	0.60	2.069	0.314	0.992
Snout length	5	11.8	12.9	12.4	0.42	-1.453	0.185	0.996
Body depth	5	22.2	24.2	23.3	0.75	-3.488	0.261	0.988
Orbital diameter	5	7.4	8.6	8.1	0.43	3.251	0.55	0.930
Interorbital width	5	6.0	6.8	6.4	0.32	-2.315	0.083	0.988
Preorbital depth	5	5.3	6.4	6.0	0.43	-0.726	0.066	0.929
Caudal peduncle depth	5	9.3	10.0	9.7	0.28	1.325	0.086	0.977
Caudal peduncle length	5	16.4	18.4	17.5	0.71	-2.750	0.197	0.966
Pectoral-fin length	5	17.9	19.7	18.9	0.79	5.710	0.142	0.966
Upper jaw length	5	13.8	14.5	14.1	0.33	-2.100	0.158	0.995
Lower jaw length	5	16.7	18.5	17.3	0.68	-1.453	0.185	0.972
Last dorsal spine length	5	11.8	12.7	12.2	0.40	3.032	0.098	0.989

Only a single specimen of *L. profundicola* was available for examination. It is a large species, reaching 305 mm total length (Poll 1956). Poll (1956) reported specimens from Vua north to Uvira along the western coast. Konings (1988: 118, fig. p. 121) reported a "variety" from the central Tanzanian coast, photographed by H.W. Dieckhoff. Our specimen is dark overall, and has indistinct darker blotches along the dorsal-fin base, and on the upper lateral line. A short white marginal stripe is very evident at the posterodorsal tip of the caudal fin, whereas the rest of the caudal fin is plain dark. Published images of living specimens of *L. profundicola* show a rather indistinct blotch pattern on the side as in our specimen, but also examples of a row of blotches along the middle of the flanks (Konings 1998: 117, fig. 3). Dieckhoff's photo of the "variety" (Konings 1988: 121, lower photo), later called *profundicola* Tanzania (Konings 1998: 117, figs. 4–6) from Fulwe Rocks and Kipili, on the Tanzanian coast, shows specimens more similar to *L. elongatus*, featuring a distinct third row of blotches along the middle of the side. Judging from the yellow anal fin in the young specimen (Konings 1998: 117, fig. 5), they may represent *L. mimicus*. *Lepidiolamprologus profundicola* differs from *L. elongatus*, *L. kamambae*, *L. kendalli*, and *L. mimicus* in the presence of numerous small scales covering most of the cheek. The scales are relatively large, 61 in the longitudinal row in our specimen and 63–65 counted by Poll (1956), which is lower than in *L. elongatus* and *L. mimicus* and overlapping only slightly with *L. kamambae* and *L. kendalli*. Because our specimen is much larger (261 mm SL) than the largest specimens at hand of *L. kamambae* we do not include it in the morphometric analysis. *Lepidiolamprologus kamambae* is clearly distinct from *L. profundicola* in the absence of scales on the cheek, presence of more scales in a longitudinal series (64–71 vs. 61–65), lower lateral line extending anterior to the anal-fin base, and presence (vs. absence) of marbled pattern on the top of the head and a dark stripe across the cheek.

Lepidiolamprologus kamambae is here recognized by one character state distinguishing from all other species of the *L. elongatus* group, viz. the prominent suborbital blotch or stripe. It is otherwise diagnosed by morphometric, meristic, and color characters in combination. Apparently *L. kamambae* and *L. kendalli* are more similar to each other in morphometry and meristics, and in the presence of a marbled pattern on the top of the head, and potentially represent sister species.

The morphometric analysis (Fig. 6; Tables 1–5) suggests that there are only minor differences between the species of the *L. elongatus* group. *Lepidiolamprologus elongatus* differs from the remainder, particularly in deeper body (Figs. 6A, C). *Lepidiolamprologus kendalli* and *L. kamambae* are relatively similar in proportional measurements, overlapping in the PCA (Fig. 6C), and distinguished from both *L. mimicus* and *L. elongatus* by a narrow interorbital space (Fig. 6B). Much of the variability in the PCA is referable to the pectoral-fin length with wide variation within *L. elongatus* only. In proportional measurements *L. kamambae* and *L. kendalli* both differ from both *L. elongatus* and *L. mimicus* in more slender body (depth 20.8–23.6% of SL vs. 22.2-23.9% of SL), and

narrower interorbital width (4.6–5.9% vs. 6.0–7.0 %) (Tables 1–4). Specifically *L. kamambae* differs from *L. elongatus* in more slender body (20.8–22.7 % of SL vs. 23.9–29.0%) and narrower interorbital width (4.9–5.9% of SL vs. 6.0–7.0%); from *L. kendalli* in shorter last dorsal-fin spine (11.2–13.3% of SL vs. 13.3–15.1%); and from *L. mimicus* in narrower interorbital space (4.9–5.9% of SL vs. 6.0–6.8%) and upper jaw length (12.5–13.5% of SL vs. 13.8–14.5%).

TABLE 5. Variable loadings on principal components 1–3 and sheared components 2–3 from pooled morphological dataset of *Lepidiolamprologus elongatus*, *L. kamambae*, *L. kendalli*, and *L. mimicus* (N=42). Highest loadings in bold.

	I	II	Sheared II	III	Sheared III
SL (mm)	0.252	0.173	0.148	-0.102	-0.106
Head length	0.252	0.186	0.161	-0.053	-0.057
Snout length	0.313	0.205	0.174	-0.006	-0.011
Preorbital depth	0.375	-0.159	-0.193	**0.464**	**0.458**
Body depth	0.304	**-0.321**	**-0.347**	0.290	0.285
Orbital diameter	0.161	0.262	0.245	-0.111	-0.113
Interorbital width	0.377	**-0.628**	**-0.658**	-0.292	-0.298
Pectoral-fin length	0.203	**0.488**	**0.465**	0.038	0.035
Upper jaw length	0.287	0.101	0.074	-0.243	-0.248
Lower jaw length	0.265	0.179	0.153	-0.251	-0.255
Caudal peduncle depth	0.260	0.045	0.021	0.236	0.232
Caudal peduncle length	0.265	-0.057	-0.081	**-0.450**	**-0.454**
Last dorsal-fin spine length	0.204	0.122	0.102	**0.456**	**0.453**
Eigenvalue	0.403	0.018	N/A	0.0045	N/A
Cumulative Variance %	92.6%	96.7%	N/A	97.7%	N/A

Meristic data (Tables 6–10) show considerable overlap. *Lepidiolamprologus elongatus* and *L. mimicus* tend to have more dorsal- and pectoral-fin rays; and *L. kendalli* averages lower metameric meristics (scales, dorsal-fin, and vertebral counts). Only the ceratobranchial gill-raker count seems to separate *L. kendalli* and *L. kamambae* from the other two species. *Lepidiolamprologus kamambae* and *L. kendalli* also tend to have less epibranchial gill rakers, 4 (10), 5 (1), and 4 (5), 5 (6), respectively, compared with *L. elongatus* (4 in 2, 5 in 13, 6 in 1) and *L. mimicus* (5 in 3, 6 in 6).

TABLE 6. Dorsal-, anal-, and pectoral-fin counts in *Lepidiolamprologus elongatus*, *L. kamambae*, *L. kendalli*, and *L. mimicus*.

	N	Dorsal-fin count				Anal-fin count			Pectoral-fin count		
		XVII.11	XVIII.10	XVIII.11	XIX.11	V.8	V.9	VI.8	13	14	15
L. elongatus	16	1	4	10	1	15	1			13	3
L. mimicus	9				9	5	4			9	
L. kamambae	11		5	6		4	7		10	1	
L. kendalli	11	1	10				9	1	8	3	

All four species have distinctive color pattern, and no sexual dimorphism was observed in any of them. Only males were available of *L. kamambae*, however. *Lepidiolamprologus elongatus* has five or six dark blotches along the middle of the side, and typically five blotches on the upper lateral line. Along the dorsal-fin base there are six blotches, the last confluent with the last blotch on the lateral line. The blotches on the lateral line tend to be contiguous to varying degrees, varying from separate blotches to an irregular horizontal band. The flanks are light

brownish with numerous small off-white spots. There is a dark stripe across the nape, but the snout and interorbital space are uniformly greyish. Overall, *L. elongatus* is darker with the least contrasting color pattern of the species with three rows of spots along the side.

TABLE 7. Count of scales in a lateral row in *Lepidiolamprologus elongatus*, *L. kamambae*, *L. kendalli*, and *L. mimicus*.

	N	64	65	66	67	68	69	70	71	72	73	74	75
L. elongatus	16				1	3	1	1	5	4	1		
L. mimicus	9							2		1	1	4	1
L. kamambae	11	1			1	2	3	1	3			1	
L. kendalli	11		2	3	1		1	2	2				

TABLE 8. Count of scales in upper lateral line in *Lepidiolamprologus elongatus*, *L. kamambae*, *L. kendalli*, and *L. mimicus*.

	N	45	46	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
L. elongatus	16	1				1	1	1	3	4		2	1	1					1
L. mimicus	9				1	1			2		2	2	1						
L. kamambae	11						1		3		3	1	1		1		1		
L. kendalli	11		1	1		1	1	1	2		2	1		1					

TABLE 9. Count of scales in lower lateral line in *Lepidiolamprologus elongatus*, *L. kamambae*, *L. kendalli*, and *L. mimicus*.

	N	7	12	15	22	25	26	27	28	30	31	32	34	35	36	37	39	42	43	44	46	48	49	50	20
L. elongatus	16				1	1					1	1	1		1		2			1	1	1	1	1	
L. mimicus	9				1	2	1		1			1		2	1										
L. kamambae	11	1	1	1		1		2	1	1	1	1				1									
L. kendalli	11				1	2		1		2				1	2			1	1						

TABLE 10. Count of gill rakers externally on first ceratobranchial, and vertebrae in *Lepidiolamprologus elongatus*, *L. kamambae*, *L. kendalli*, and *L. mimicus*.

	Ceratobranchial gill-rakers					Vertebrae				
	N	9	10	11	12	13	15+19	15+20	16+17	16+18	16+19
L. elongatus	16			3	1	12	1	1		2	12
L. mimicus	9			2	6	1					9
L. kamambae	11	9	2						1	4	6
L. kendalli	11	4	6	1			1			10	

Lepidiolamprologus mimicus has a distinct pattern of dark blotches similar to that of *L. kamambae*, and lacks the off-white spots present in *L. elongatus*. The anal fin has a distinctive whitish outer margin and the fins are usually pale with only indistinct spotting. There are two dark bars across the nape close to the dorsal fin origin, but the rest of the top of the head and snout is uniformly greyish.

Lepidiolamprologus kendalli has an overall much more contrasted pattern than the other species. The blotches on the lateral line are elongate and more or less confluent to form a horizontal dark band. The blotches along the middle of the side are mediated by dark pigment, and each blotch has two, parallel extensions ventrad to the dark field along the lower side. The dark blotches close to the dorsal-fin base are elongated. Thus is formed a contrasting pattern with a prominent dark horizontal bands with thin light margins along the upper lateral line, a row of less

distinct contiguous blotches long the middle of the side, and a row of light spots along the lower side. The top of the head has the same marbled color pattern as in *L. kamambae*. The unpaired fins are generally darker than the other species, with large light spots. The cheek is pigmented, leaving a contrasting light stripe dorsally, and usually leaving a lighter area posteriorly. In all four species of the *L. elongatus* group the size, shape and absolute position of dark pigmentation varies slightly between the two sides of the fish, and between individuals, so that two specimens of the same species do not have exactly the same pattern of dark pigment. *Lepidiolamprologus kamambae* and *L. mimicus* are similar to each other in the overall body coloration, with distinct lateral blotches. This blotch pattern is present but less distinct in *L. kendalli* and *L. elongatus*. Only *L. kendalli* and *L. kamambae* have strongly pigmented cheek and a contrasting pattern of light spots surrounded by dark brown on the top of the head. In *L. kendalli* the cheek pigmentation is diffuse, whereas in *L. kamambae* a distinct broad band is formed.

Aside from the color pattern, *L. kamambae* and *L. kendalli* are very similar, with about the same body shape and meristics. The marbled pattern on the top of the head is a unique pattern within the genus indicating close relationship. The difference in overall coloration between the two species, *L. kendalli* predominantly dark brown, and *L. kamambae* considerably lighter, probably reflects differences in preferred habitats. *Lepidiolamprologus kamambae* forages over relatively open bottoms with considerable sand, and *L. kendalli* occupies rocky substrates.

Although *L. elongatus*, *L. kendalli*, *L. nkambae*, and *L. mimicus* were all described from the very southern end of Lake Tanganyika, Staeck did not comment on the sympatry of *L. nkambae* with *L. kendalli*, and Schelly *et al.* (2007) did not comment on the sympatry and syntopy of *L. mimicus* with *L. elongatus*. We now present Tanzanian localities for *L. mimicus* and *L. kendalli*, and the new *L. kamambae*, still in the southern part of the lake, suggesting an extended area of sympatry. The only species of the *L. elongatus* group with a very wide distribution is *L. elongatus*, which is known from along the length of Lake Tanganyika.

Lamprologus cunningtoni nyassae was described by Borodin (1936) on the basis of seven specimens from Mwaya, Lake Nyasa (now Lake Malawi). Borodin's description refers to 90 scales in the horizontal row, lateral line with 34 scales in the upper and 21 scales in the lower, and 9 rows of scales on the cheek. He also notes that the lower lateral line does not reach the caudal fin. Those characters would not place it close to *L. elongatus* or any other species of *Lepidiolamprologus*. Trewavas (1946), however, examined six syntypes and assigned them to *L. elongatus*. She counted 71–75 scales in the longitudinal row in three specimens of *L. c. nyassae*, and 71 and 73 in the two syntypes of *L. elongatus*. The locality given by Borodin (1936) is obviously incorrect. His paper is based on collections made by Arthur Loveridge in 1930 in Lakes Tanganyika, Victoria and Nyasa. From Lake Tanganyika he lists samples from the NW shore, southern end, and W. [western shore?]. The majority of the Lake Tanganyika samples are listed as coming from the NW shore, and although labels seem to have been misplaced between Malawi and Tanganyika materials, it seems likely that the bulk of Tanganyika material came from the north-western part of the lake, including the type series of *L. c. nyassae*. Nevertheless it remains possible that it came from the southern part of the lake and may need to be considered in future revisions of *L. mimicus*, as well as in future analyses of variation of the more widespread *L. elongatus*. We exclude here the possibility that *L. kamambae* is the same as *L. c. nyassae* on the basis in particular on the wide interorbital space, given as 5 times in head by Trewavas (1946). In *L. kamambae* the proportion is 5.6–6.3, median 6.1, whereas in our material of *L. elongatus* it is 4.7–5.5, median 5.1.

Schelly *et al.* (2007) described part of the color pattern, viz., the yellow pelvic and anal fins as mimicry, resembling female *Paracyprichromis brieni* and permitting the *L. mimicus* to approach the *Paracyprichromis* and prey on young and juveniles of that species. Although our field observations suggest that *L. kamambae* also feeds on small cichlids, we did not observe any characteristic suggesting mimicry.

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