

# Six New Species of the Cichlid Genus *Otopharynx* from Lake Malaŵi (Teleostei: Cichlidae)

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## ABSTRACT

The endemic Lake Malaŵi cichlid genus *Otopharynx* is increased from 14 species to 20 by the description of six new species collected from inshore sandy or intermediate rocky/sandy areas or trawled in depths to 59 m. *Otopharynx alpha* is distinguished from congeners by its unique melanin pattern with suprapectoral spot discrete but supraanal and precaudal spots connected to form a stripe, and by its distinctively shaped pharyngeal bone with numerous small, crowded teeth. *Otopharynx mumboensis*, thought to be endemic to Mumbo Island, is separated from most congeners by a suprapectoral spot placed entirely below the upper lateral line, and from all others by the combination of 13 gill rakers, pharyngeal bone with posterior margin nearly straight, crowns of all pharyngeal teeth in the median columns broadened and flattened, head length 30.9–32.2% SL, body depth 35.5–36.1% SL, and lower jaw 35.7–36.2% HL. *Otopharynx styrax* has a more elongate body (depth 24.3–28.6% SL) than any congener. *Otopharynx aletes* can be diagnosed by the combination of a suprapectoral spot overlapping the upper lateral line, seven or eight vertical bars below the dorsal-fin base, 10 or 11 gill rakers, 34–36 scales in the lateral line, lower pharyngeal bone with molariform posteromedian teeth, and caudal peduncle length 1.6–2.0 times its depth. *Otopharynx panniculus* is diagnosed by the combination of a prominent square suprapectoral spot spanning subdorsal bars 3 to 4, no dorsal midline spots, 13–15 gill rakers, 31–33 scales in the lateral line, 15 or 16 dorsal-fin spines, absence of a lacrimal notch, and slightly enlarged teeth in the median columns of the lower pharyngeal bone. *Otopharynx peridodeka* most closely resembles *O. panniculus* and shares the loss of the lacrimal notch, but has 34–35 scales in the lateral line and 11–13 gill rakers. Photographs of living or freshly collected specimens of five of the new species are provided.

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## KEYWORDS

Pseudocrenilabrinae, Haplochromini, endemic species, Lake Malaŵi Trawling Survey

## Introduction

The hyperdiverse family Cichlidae likely comprises about 3,000 species, counting those already described and the many that are known but await description and extrapolating from the rate of new discoveries. Over one-quarter of all cichlid species occur only in Lake Malaŵi, which probably contains between 800 (Snoeks 2001) and 1,000 species (Konings 2016). Currently, 406 species of cichlid, assigned to 58 genera, have been described from Lake Malaŵi (Oliver 2018).

The genus *Otopharynx* was established in a footnote. Regan's (1920) description of this Lake Malaŵi cichlid genus reads, in full: "Differs from *Tilapia* in that the prootic forms part of the pharyngeal facet on each side; very near *Chilotilapia*." The type and, initially, only species was *Tilapia auromarginata* Boulenger, 1908, but later Regan added a second species, *Otopharynx selenurus* Regan, 1922. Trewavas (1935:69), however, was unable to confirm Regan's observations on the pharyngeal facet in *O. auromarginatus*, noting that "As in *Haplochromis*, the edge of the prootic

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may at one point rise nearly or quite to the level of the facet, but it never expands to form an important part of it. The genus *Otopharynx* must, therefore, in the present state of our knowledge, be merged in *Haplochromis*.” Subsequently, Greenwood (1979) restricted *Haplochromis* to five species in Lakes Victoria, Edward, George, and Kivu, leaving more than 100 Lake Malaŵi species then classified in *Haplochromis* without a generic name. He proposed that *Cyrtocara* Boulenger, 1902, whose type species is *C. moorii* Boulenger, 1902, of Lake Malaŵi, be used as a provisional generic name “until the Malaŵi species are revised” (Greenwood 1979:317).

Eccles and Trewavas (1989) did undertake a generic revision of the Lake Malaŵi haplochromines, excluding those of the mbuna group, describing 23 new genera and resurrecting *Otopharynx* for 11 species with spots on the flanks. In addition to *O. auromarginatus* and *O. selenurus*, these were: *O. heterodon* (Trewavas, 1935), *O. ovatus* (Trewavas, 1935), *O. tetrastigma* (Günther, 1894), *O. speciosus* (Trewavas, 1935), *O. decorus* (Trewavas, 1935), *O. argyrosoma* (Regan, 1922), *O. tetraspilus* (Trewavas, 1935), and two species newly described in Eccles and Trewavas (1989): *O. brooksi* Oliver, 1989, and *O. lithobates* Oliver, 1989. Beyond Lake Malaŵi proper, some of these species can also be found in its outflow, the upper Shire River. A few occur further downstream in Lake Malombe. One, *O. tetrastigma*, has even been documented in the middle Shire at Walkers Ferry, Malaŵi (Tweddle et al. 1979)—some 125 km south of Lake Malaŵi, and considerably farther in river distance.

In addition to the species they assigned to *Otopharynx*, Eccles and Trewavas (1989) allocated some other laterally spotted cichlids with distinctive specializations to eight further genera. Their diagnosis of *Otopharynx* contrasts it with five of these other genera, but omits mention of their newly established genera *Naevochromis*, *Copadichromis*, and *Tramitichromis*, each of which also includes one or more cichlids with suprapectoral and supraanal spots. Their diagnosis of *Otopharynx* reads, in full: “Medium-sized haplochromines endemic to Lake Malaŵi attaining little more than 200 mm SL, characterised by the possession of supra-pectoral and supra-anal spots lying on or below the upper lateral line. Differ from *Hemitalapia* and *Trematocranus* in that the

spots never extend to the dorsal surface, from *Ctenopharynx* in the dentition and the usually lower number of gill-rakers on the lower outer arch and from *Stigmatochromis* and *Exochochromis* in the jaws and dentition” (Eccles and Trewavas 1989:154). Thus, *Otopharynx* is simply an assemblage of less-apomorphic cichlids with dark lateral spots, in effect “defined” by characters its members lack, and is almost certainly paraphyletic.

A twelfth species of *Otopharynx*, *O. pachycheilus*, was described by Arnegard and Snoeks (2001).

Two further *Otopharynx* species (*O. antron* and *O. spelaeotes*) were added by Cleaver et al. (2009), bringing the total to 14. Their concept of the genus was unchanged from that of Eccles and Trewavas (1989). Cleaver et al. (2009) did provide a new diagnosis of *Otopharynx*, but it consists primarily of the identical characteristics they repeat in their diagnosis of *Stigmatochromis*.

No comprehensive phylogenetic analysis of Lake Malaŵi haplochromines exists. Thus, few monophyletic genera can be delimited that comprise more than one species. Nevertheless, pending availability of data to define monophyletic groups within the flock, *Otopharynx* sensu Eccles and Trewavas (1989) remains pragmatically useful as a formal receptacle for the 14 species previously described and for many of the still-undescribed, laterally spotted Lake Malaŵi cichlids already known or awaiting discovery. It is the purpose of this article to describe six of these new species from both inshore and offshore localities in the southern third of the lake (Figure 1).

## Materials and Methods

I have examined the type specimens of all species assigned to the genus *Otopharynx*, with the exception of *O. pachycheilus* Arnegard and Snoeks, 2001, *O. antron* Cleaver et al., 2009, and *O. spelaeotes* Cleaver et al., 2009, which are recognizable from their well-illustrated original descriptions. Further specimens examined are listed in the Appendix.

I made 36 measurements (including total length) of each specimen. All measurements—except caudal peduncle length, a projected measurement—were taken point to point, on the left side when possible, with digital calipers (iGaging



FIGURE 1. Southern Lake Malawi, showing collection localities of the type series and other specimens of newly described *Otopharynx* species. Map symbols: ■, *O. aletes* (holotype YPM ICH 031030; paratypes YPM ICH 007820). ●, *O. peridodeka* (holotype YPM ICH 031026; paratypes YPM ICH 014120). ★, *O. mumboensis* (holotype YPM ICH 031031; paratypes YPM ICH 024990). ▲, *O. panniculus* (holotype YPM ICH 031027; paratypes YPM ICH 014162; △, nontypes AMNH I-221760 SW). ◆, *O. alpha* (holotype YPM ICH 031028; paratypes YPM ICH 014359; ◇, paratype YPM ICH 028511). +, *O. styrax* (holotype YPM ICH 031029; paratypes YPM ICH 014270).

OriginCal IP54, San Clemente, CA) interfaced directly to a spreadsheet (Microsoft Excel 2010, Redmond, WA). Except for total length, measurements were made with a Zeiss (Jena, Germany) Stemi 2000 zoom stereo microscope (magnification 6.5–50 $\times$ ). Angles were estimated to the nearest degree with a digital protractor (iGaging #35–407). Counts and measurements follow Snoeks (2004). Some further measurements, angles, and anatomical descriptors not available in that source follow Barel et al. (1977) including gape inclination, snout acuteness, and lower-jaw length–width ratio (narrow, intermediate, or broad). However, vertebral counts include the compound terminal half-centrum in contrast to Barel et al., who excluded it. Additional measurements: Upper-jaw length was measured from the most rostral point of the premaxilla to the most ventral point of the maxilla. Lower-jaw underside angle, premaxillary pedicel angle, interorbital angle, and nuchal angle were measured relative to the lateral midline (an imaginary straight line from the premaxillary symphysis to the lower lateral line at the hypural fold). The count of lateral-line kink scales follows Oliver (2016).

In order to record measurements between repeatable homologous landmarks (Bookstein et al. 1985), facilitating future comparative morphometric studies, I have added several further measurements. Most are new or rarely used in cichlid taxonomy, including pelvic-fin origin to anal-fin origin, dorsal-fin origin to anal-fin origin, dorsal-fin origin to end of anal-fin base, pelvic-fin origin to end of dorsal-fin base, dorsal-fin origin to pelvic-fin origin, end of dorsal-fin base to end of anal-fin base, anal-fin origin to end of dorsal-fin base, end of dorsal-fin base to end of hypurals at lower lateral line, and end of anal-fin base to end of hypurals at lower lateral line. Only experience will decide if these novel measurements enable enough added resolution between similar species, and reduction of measurement error, to justify the time and effort expended in recording them.

Most of the specimens described herein were trawled, dumped into boxes, and sorted aboard the ship. Therefore, many are missing quite a few scales. I found it helpful to paint a solution of Cyanine Blue (Acid Blue 113, Sigma–Aldrich, St. Louis, MO) dissolved in distilled water onto scaleless parts of the lateral line, following the reversible technique described by Saruwatari et al.

(1997). Often, this outlined the scale pockets and made an accurate count possible. The dye also facilitated examination of very small scales such as those between pectoral- and pelvic-fin bases.

Terms for the three principal lateral spots—“suprapectoral,” “supraanal,” and “precaudal”—were introduced by Oliver (1977, 1984), popularized by Eccles and Trewavas (1989), and adopted by subsequent workers (e.g., Arnegard and Snoeks 2001, Cleaver et al. 2009, Dierickx et al. 2018). I also continue to refer to the series of 4–6 small, distinct dark markings spaced along the back just below the dorsal fin of some *Otopharynx* and other species as “dorsal midline spots.”

I examined the shape of the lacrimal bone in all six new species (Figure 2). Terminology of lacrimal bone morphology follows Anker (1986) with the addition of “lacrimal notch” referring to a distinct U- or V-shaped indentation of the orbital margin immediately ventral to the lacrimal process.

The numbers of outer teeth in the upper and lower jaws are bilateral totals. Teeth represented by empty alveoli were included. If absence of numerous teeth on one hemijaw prevented an accurate count, the count of the other side was doubled. In several of the species here described, the posterior teeth in both jaws are small and nearly or completely hidden in the mucosa, complicating attempts to count them accurately. Thus, the tooth counts herein should be considered best estimates.

I photographed the overall habitus and heads of the new species on a copy stand using a Nikon (Tokyo, Japan) D90 camera with AF MicroNikkor 60mm f/2.8D macro lens. I processed the image layers with Helicon Focus software, v. 6.3.7. The resulting merged images were cleaned and optimized for brightness, contrast, clarity, and sharpness in Corel PaintShop Pro X6 software, v. 16.2.0.20 x64. Pharyngeal bones were photographed with a QImaging 01-MP5.0-RTV-CLR-10-C CCD camera mounted on a Zeiss Stemi 2000–CS zoom stereo microscope and controlled by Q-Capture Pro7 software. Merged image layers were processed and optimized as for habitus photos, except that image stacks were processed using CombineZP software (Hadley 2012) or PICOLAY v. 2017-12-06 (Cypionka 2017).

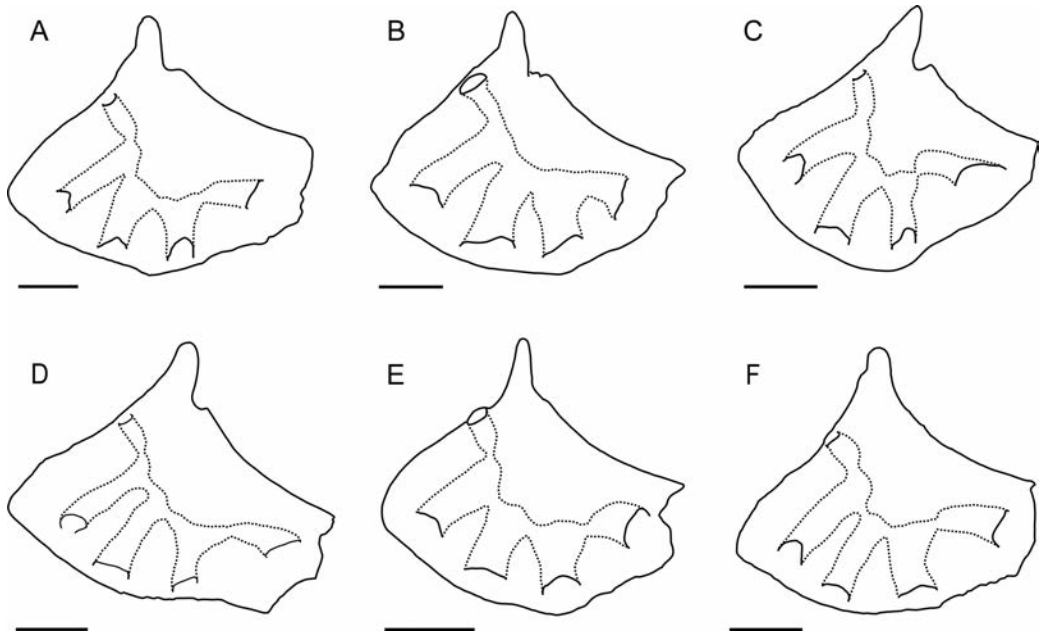


FIGURE 2. Lacrimal bones of the new *Otopharynx* species, showing their outline, lateral-line canals and pores. Drawn from lacrimal of right side and reversed. **A.** *Otopharynx alpha*, YPM ICH 014359 (paratype), 117.9 mm SL. **B.** *O. mumboensis*, YPM ICH 024990 (paratype), 107.3 mm SL. **C.** *O. styrax*, YPM ICH 014270 (paratype), 95.2 mm SL. **D.** *O. aletes*, YPM ICH 007820 (paratype), 94.5 mm SL. **E.** *O. panniculus*, YPM ICH 014162 (paratype), 69.7 mm SL. **F.** *O. peridodeka*, YPM ICH 014120 (paratype), 91.0 mm SL. Scale bars equal 2 mm.

The type specimens are deposited in the Division of Vertebrate Zoology Ichthyology collections, Peabody Museum of Natural History, Yale University, New Haven, CT (YPM ICH). Other institutional abbreviations: AMNH, American Museum of Natural History, New York; BMNH, The Natural History Museum, London; MRAC, Royal Museum for Central Africa, Tervuren, Belgium; USNM, National Museum of Natural History, Washington, D.C. Additional abbreviations in the text: HL, head length; SL, standard length; TL, total length.

## Results

### *Otopharynx* Regan, 1920:38

Type. *Tilapia auromarginata* Boulenger, 1908:241, by original designation.

#### Diagnosis.

No synapomorphies have been discovered to support a hypothesis that *Otopharynx* is a monophyletic group. *Otopharynx* is distinguishable from 32 of the other 40 currently recognized

genera of non-mbuna haplochromines occurring in Lake Malawi by the melanic markings, which include at least a suprapectoral spot and usually also a supraanal spot and a pre-caudal spot (vs. these lateral spots lacking). *Otopharynx* can be separated from the remaining eight genera, with which it shares these lateral spots, as follows: Distinguished from *Ctenopharynx* by having 9–18 (vs. 16–41) gill rakers on lower limb of outer arch, and lower pharyngeal bone varying from subtriangular to Y-shaped but always at least moderately robust (vs. Y-shaped, the halves slender, fragile); from *Copadichromis* by having premaxillary pedicels relatively short, mouth not very protrusible, species with various diets but never shoaling zooplankton feeders (vs. premaxillary pedicels elongated, mouth protrusible to form a sucking tube, shoaling species specialized for zooplankton feeding in open water); from *Exochochromis* by a nonpredatory, usually deep-bodied facies (vs. elongate, subfusiform piscivorous predatory facies), jaws equal anteriorly or lower projecting slightly (vs. lower jaw shorter than upper), and premaxilla not beaklike, with relatively short ascending process (pedicel) that is not conspicuous in head profile (vs. premaxilla beaklike, with pedicel nearly as long as its denticerous ramus, prominent in head profile); from *Hemtilapia* by outer oral teeth generally bicuspid or unicuspid with occasional tricuspid teeth intermixed in some species (vs. specialized teeth with elongated shafts that are movably implanted and inclined toward symphysis, crowns broad, convexly rounded and obliquely truncate), and suprapectoral and supraanal spots variously shaped and placed, but not reaching dorsal-fin base (vs. both spots in adults extending to

dorsal-fin base, like two saddles); from *Stigmatichromis* by a nonpredatory and usually deep-bodied facies (vs. more elongate predatory facies) and by having snout shorter than postorbital head (vs. snout equal to or longer than postorbital head); from *Trematocranus* by suprapectoral and lateral spots not reaching dorsal-fin base (vs. both spots in adults extending to dorsal-fin base, like saddles), and cephalic lateral-line pores and canals not appearing inflated (vs. enlarged, inflated); from *Tramitichromis intermedius* (the only spotted species assigned to that genus) by suprapectoral and supraanal spots not reaching dorsal-fin base (vs. both spots in adults extending to dorsal-fin base, forming saddles), and blade of lower pharyngeal bone shallow to rather deep and varying from nearly straight to angled slightly downward (vs. blade keellike, more than twice depth of remainder of bone, angled steeply downward  $\sim 32^\circ$  relative to plane of dentigerous surface, see Trewavas 1935:109, fig. 11); from *Naevochromis* by outer jaw teeth with shafts and crowns exposed, extending well beyond surface of oral mucosa (vs. oral teeth buried to crowns in thickened mucosa), premaxilla toothed for most of its length (vs. teeth restricted to anterior part), and dentary at symphysis not conspicuously deeper than premaxilla (vs. dentary about twice depth of premaxilla).

*Otopharynx alpha*  
new species

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Figures 2A, 3, 4, Tables 1, 2

*Otopharynx* 'auromarginatus stripe': Turner (1996:170, 178).

*Otopharynx* sp. 'tetraspilus elongate spot': Snoeks and Hanssens (2004:292).

Holotype.

YPM ICH 031028, 127.8 mm SL, male; Malawi: Lake Malawi, Nankumba Peninsula, trammel nets set overnight 75 m from shore in 9 m depth, at about  $14^\circ 01' 45''$ S  $34^\circ 49' 43''$ E; M. K. Oliver, K. McKaye, T. D. Kocher, 24–25 August 1980. Field number MKO80–133.

Paratypes.

YPM ICH 014359, two (male), 155.0–178.6 mm SL; collected with the holotype. YPM ICH 028511, 1 (male), 136.8 mm SL; Malawi: Lake Malawi, southeast arm, bottom trawl across Mazinzi Bay, M/L *Eithelwynn Trewavas*, depth 9–10 m; approx. 1-km haul at roughly  $14^\circ 08' 34''$ S  $34^\circ 58' 58''$ E; M. K. Oliver, K. McKaye, T. D. Kocher, 28 June 1980. Field number MKO80–40. [Note added in proof: Two further (nontype) specimens, 135.9–146.4 mm SL from Monkey Bay, YPM ICH 032353, were found in a misidentified lot while this article was in press.]

Diagnosis.

A medium-sized (<20 cm TL) laterally spotted haplochromine separable from all previously described species of *Otopharynx* both by its unique melanin pattern and by its distinctive lower pharyngeal bone. The suprapectoral spot is rectangular, 2–2½ scales high, longitudinally elongate, covering 7–8 consecutive

scales starting with the seventh scale of the upper lateral line, extending vertically from just above the lateral midline to slightly above the upper lateral line. The supraanal and precaudal spots are conjoined, forming a continuous stripe (paler at its midlength in some specimens) from the level of the anal-fin origin to the base of the caudal fin. The lower pharyngeal bone is broadly triangular, somewhat heart-shaped, with numerous uniformly small, laterally compressed, crowded, bicuspid teeth.

Description.

Morphometric and meristic data are given in Tables 1 and 2.

Deep-bodied; body depth 34.0–38.5% SL (Figure 3A). Dorsal profile of snout straight, profile above eye straight to slightly concave, then evenly convex from nape to end of dorsal-fin base. Premaxillary pedicels not prominent, their angle  $42\text{--}49^\circ$ , interorbital angle  $39\text{--}43^\circ$ , nuchal angle  $24\text{--}36^\circ$ . Ventral profile nearly straight from caudal end of lower jaw to chest, irregularly convex from pelvic-fin origin to end of anal-fin base. Jaws equal anteriorly (Figure 1B); lips neither thickened nor lobate; lower jaw somewhat flattened, the dentary walls appearing outwardly rotated. Gape inclination  $30\text{--}39^\circ$ . Lower-jaw length–width ratio intermediate, the hemijaws, as seen from below, parallel and well separated posteriorly (Figure 3C). Lower-jaw underside angle  $37\text{--}40^\circ$ . Snout acuteness  $71\text{--}77^\circ$ . Eyes large, slightly oval, orbit length 32.8–34.3% HL, vertical eye diameter 28.8–31.4% HL; pupil rounded anteriorly and posteriorly (Figure 3B); eye not reaching dorsal head profile. Caudal peduncle 15.0–18.1% SL, its length 1.3–1.6 times its depth.

Soft dorsal and anal fins acutely pointed and elongated posteriorly (at least in males). Caudal fin deeply emarginate; upper and lower lobes acutely pointed, subequal. Pectoral fin long, 31.0–36.2% SL, acute, upper rays elongated, reaching level of anus. Pelvic fins with first soft ray elongate, reaching base of first anal-fin spine in holotype and one paratype.

Dental arcade broadly arched in each jaw. Upper jaw with 53–62 teeth (total) in outer row. Anterior and lateral teeth unequally bicuspid, occasional tricuspid teeth laterally; posterior teeth unicuspid. Anterior teeth of outer row loosely implanted, easily lost, leaving visible holes in lips. Lower-jaw outer tooth row of haplochromis type, with 36–46 teeth (total); crowns as in upper jaw. Inner teeth of both jaws unequally tricuspid, in 1–2 rows.

Lower pharyngeal bone dissected from holotype (Figure 3D–G) and all three paratypes; subtriangular; posterior contour of each half convexly curved, the halves meeting at nearly a  $90^\circ$  angle, giving a somewhat heart-shaped outline to the bone (Figure 3F); horns short, thin, narrowing distally. Median suture straight (Figure 3G). Keel short, deep, scarcely descending; dentigerous surface concave in lateral view (Figure 3E). Bone shallow in posterior view (Figure 3D). Teeth bicuspid, laterally compressed, uniformly small except for slightly larger teeth in posterior row; crowded, especially on posterior and lateral areas (Figure 3F). Teeth in posterior row 45–50 (holotype: 49); in each median column 11–16 (holotype: 13–14); in each oblique row 10–14 (holotype: 13–14).

Lacrimal bone (Figure 2A) bearing four neuromasts and five lateral-line pores; lacrimal notch distinct.

Gill rakers 12 or 13, closely spaced, rather short, of nearly uniform length along lower limb of outer arch; unpigmented (completely lacking melanophores).

TABLE 1. Morphometric characters of *Otopharynx alpha*. Abbreviations: LLL, lower lateral line.

	Holotype		Paratypes	
	YPM ICH 031028	YPM ICH 028511	YPM ICH 014359	YPM ICH 014359
Standard length (mm)	127.8	136.8	141.0	117.9
Head length (mm)	35.7	37.4	40.4	34.3
Percentage of standard length:				
Head length	28.0	27.4	28.7	29.1
Body depth	35.3	38.5	34.0	35.2
Dorsal-fin base length	59.6	61.3	59.3	58.3
Predorsal length	31.4	30.5	31.1	32.1
Prepectoral length	28.0	26.9	30.0	28.6
Prepelvic length	37.2	34.9	38.6	37.3
Preanal length	69.0	67.0	68.9	68.3
Pelvic fin origin to anal fin origin	33.3	34.2	31.4	31.9
Anal-fin base length	18.3	17.2	17.5	18.3
Caudal peduncle length	15.0	17.8	17.7	18.1
Caudal peduncle depth	11.2	11.6	10.9	11.4
Pectoral-fin length	34.2	31.0	36.2	33.2
Pelvic-fin length	28.5	32.0	34.1	30.8
Dorsal-fin origin to anal-fin origin	53.6	55.1	52.5	54.4
Dorsal-fin origin to end of anal-fin base	63.1	64.6	62.5	63.4
Pelvic-fin origin to end of dorsal-fin base	55.6	57.2	54.4	53.3
End dorsal-fin base to end anal-fin base	15.2	14.6	14.2	15.7
Anal-fin origin to end of dorsal-fin base	29.1	28.4	28.9	30.2
Dorsal-fin origin to pelvic-fin origin	29.1	37.3	34.7	34.5
End dorsal-fin base to end hypurals at LLL	18.4	19.4	17.5	18.9
End anal-fin base to end hypurals at LLL	18.1	19.2	19.7	20.1
Percentage of head length:				
Head width	45.9	48.1	45.0	46.2
Interorbital width	25.6	26.7	24.7	24.7
Snout length	33.4	30.9	34.0	31.4
Snout width	32.9	33.4	33.8	34.7
Lower-jaw length	37.2	38.4	35.3	36.5
Lower-jaw width	23.7	20.3	27.2	23.5
Premaxillary pedicel length	30.1	29.5	30.6	30.2
Upper-jaw length	26.5	27.5	29.7	26.8
Cheek depth	20.9	24.5	21.0	22.2
Orbit length	33.9	34.2	32.8	34.3
Vertical eye diameter	30.6	29.7	28.8	31.4
Lacrimal (preorbital) depth	21.4	22.0	24.1	22.0
Postorbital head length	39.2	40.7	40.3	39.3

Scales ctenoid; 35–36 in lateral line. Lateral line discontinuous; upper section with downward kink 1–6 scales long, or (in one paratype, bilaterally) absent. Caudal fin scaled heavily to near tips of upper and lower lobes, stiffening them; scaled on basal one-half of middle rays. Soft dorsal and anal fins with a single small scale between bases of some rays. Scales transition gradually in size from larger on belly to smaller on chest.

*Coloration in life.* Unknown; however, three fresh subadult male specimens trawled in the southeast arm are shown in

Figure 4. They appear brownish on upper head, nape, and dorsum, silvery to white on the flanks and lower head surfaces. Traces of about nine narrow gray vertical bars on flanks below dorsal-fin base. All three individuals show the characteristic dark suprapectoral spot and posterior stripe. Dorsal-fin lappets yellow; dorsal has dark-edged yellow maculae throughout, most distinct in soft part of fin. Broad upper and lower leading edges of caudal fin are pale yellow, remainder of fin darker. Anal fin bears about four oval yellow eggspots in two rows along middle and near distal edge

TABLE 2. Meristic characters of *Otopharynx alpha*.

	Holotype		Paratypes	
	YPM ICH 031028	YPM ICH 028511	YPM ICH 014359	YPM ICH 014359
Squamation:				
Lateral-line scales	35	36	35	36
Upper lateral-line scales	29	26	24	26
Lower lateral-line scales	18	16	13	15
Lateral-line scales on caudal fin	2	1	2	3
Kink length	6	1	0	2
Upper transverse line scales	5	5	5	6
Lower transverse line scales	10	10	10	11
Cheek scale rows	3	3	2	2
Scales between pectoral- and pelvic-fin bases	9	10	9	9
Fins:				
Dorsal-fin spines	17	17	17	17
Dorsal-fin segmented rays	11	12	12	12
Dorsal-fin total elements	28	29	29	29
Anal-fin spines	3	3	3	3
Anal-fin segmented rays	9	10	9	9
Anal-fin total elements	12	13	12	12
Pectoral-fin rays	15	14	14	14
Gill rakers:				
Epibranchial	5	4	5	5
Angle	1	1	1	1
Lower limb	12	13	13	12
Total	18	18	19	18
Oral teeth:				
Outer upper-jaw teeth:	28/28 = 56	27/26 = 53	31/31 = 62	29/? = ~58
left/right = total				
Outer lower-jaw teeth:	22/23 = 45	22/22 = 44	23/23 = 46	18/18 = 36
left/right = total				

of fin. Pelvic fins yellow with white leading edges. Pectoral fins are yellowish.

*Coloration in preservative* (Figure 3A–C). Head and flanks brown above, becoming silvery below. Head with distinct opercular spot and an indefinite dark oblique bar from below front of eye to rear half of upper jaw. Underside of head and branchiostegal membrane brownish (Figure 3C). Suprapectoral spot a longitudinally elongate rectangle 2–2½ scales high, covering 7–8 consecutive scales starting with seventh scale of upper lateral line, based just above lateral midline and reaching to one-half scale above upper lateral line. Supraanal and precaudal spots united into a continuous stripe, which may or may not be paler at its midlength, from level of anal-fin origin to base of caudal fin. Lower edge of stripe on scale row containing lower lateral line, which is one scale row lower than bottom of suprapectoral spot. About eight faint vertical bars visible on flanks of two paratypes. Dorsal fin with series of dark-edged oval maculae between all spines and rays, more distinct in soft dorsal; lappets

pale (but fin margin of largest paratype continuous, without lappets). Caudal fin yellowish to brownish with indistinct marbling. Anal and pelvic fins dark brown, anal with no eggspots. Pectorals hyaline.

*Maximum size.* The largest specimen known to me is a paratype measuring 178.6 mm TL.

#### Parasites.

The holotype has several lernaeid copepods, *Lamproglana nyasae* Fryer, 1956, attached to filaments of the outermost gill arches bilaterally. Two individuals were removed and deposited in the YPM invertebrate collection (YPM IZ 102202); photograph available at <http://collections.peabody.yale.edu/search/Record/YPM-IZ-102202>.

#### Distribution.

The known range of *O. alpha* includes the central part of the southeast arm, where Turner (1996:178) recorded it (as *O. auro-*



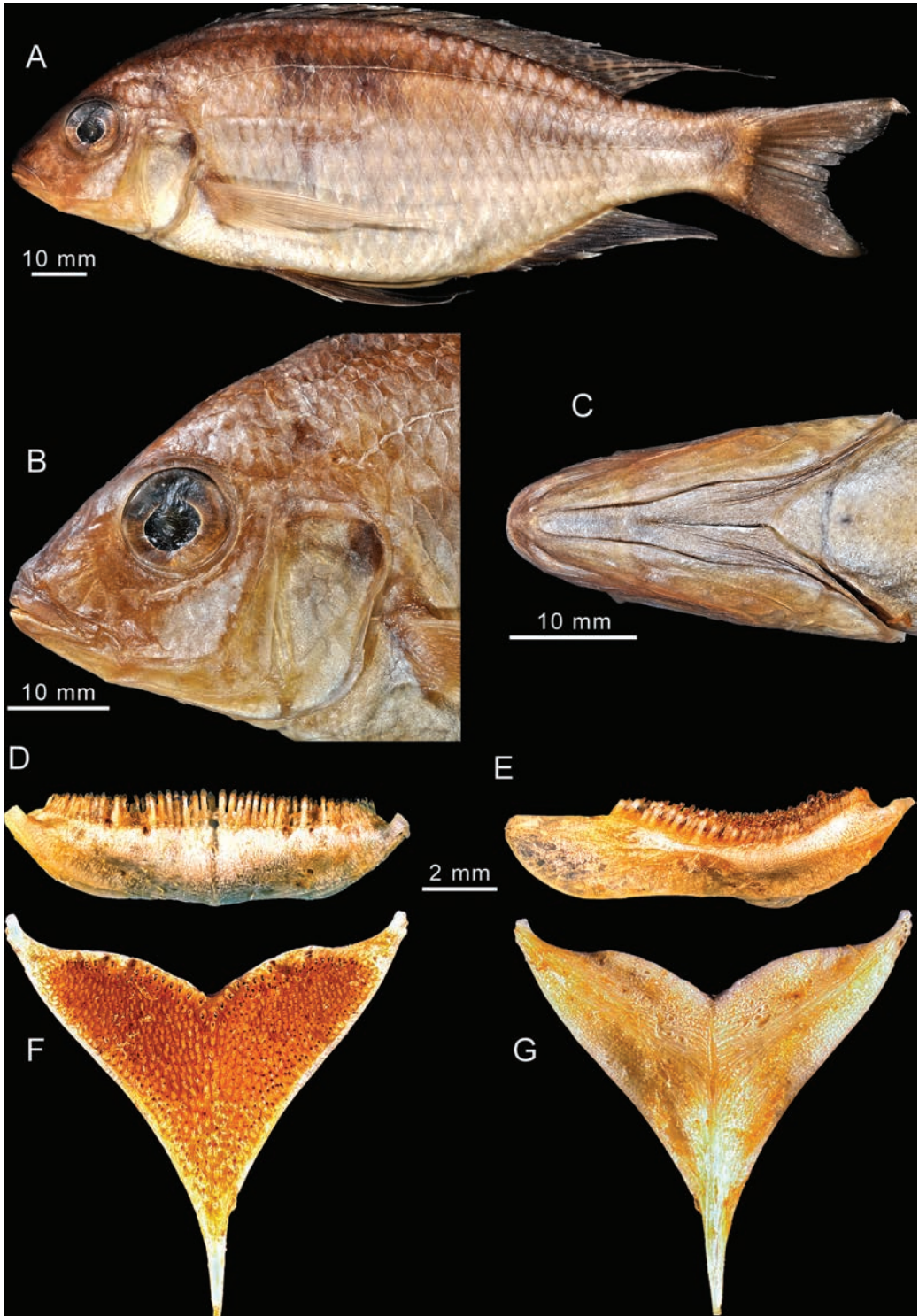


FIGURE 3. *Otopharynx alpha*. A. Holotype, YPM ICH 031028, 127.8 mm SL, male. B. Head of holotype. C. Under-side of head of holotype. D–G. Lower pharyngeal bone of holotype, in posterior (D), left lateral (E), dorsal (F), and ventral (G) views.



FIGURE 4. *Otopharynx alpha*, freshly captured individuals trawled in 5–10 m depth on Chapola Shoal, east of Boadzulu Island in the southeast arm of Lake Malaŵi, 31 July 1991. Apparently subadult or young nonbreeding males. Photograph by George Turner.

marginatus stripe”) from trawl stations off Nkope, Mazinzi, Fowo, Chiponda, and Chekopa as well as at Chapola Shoal, all over sand at depths of 5–30 m. Snoeks and Hanssens (2004:292) illustrated two specimens (as *Otopharynx* sp. “tetraspilus elongate spot”), one from Mazinzi to Kadango in the southeast arm,

the other from Chembe at the head of the Nankumba Peninsula between the southwest and southeast arms; capture depths were not stated. (These two specimens were not available for loan from MRAC when I was preparing this description.) The type locality (Figure 1), west of Chembe and about 1.4 km northeast of

Otter Point in 9 m depth, is the furthest west occurrence known to me. It would not be surprising if it also occurs in the southwest arm.

#### Etymology.

From  $\alpha\lambda\phi\alpha$  (alfa), first letter of the Greek alphabet. The suprapectoral spot and posterior stripe suggest a dot and dash, which represents “A” in International Morse Code. A noun in apposition.

#### Remarks.

At the type locality, the substrate in 9 m depth consists of fine sand with few if any macrophytes. Other species captured in the trammel nets together with the holotype and two paratypes of *O. alpha* included *Buccochromis lepturus*, *Hemitaeniochromis urotaenia*, *Hemitalapia oxyrhyncha*, *Protomelas spilopterus*, and *Trematocranus microstoma*. The remaining paratype was trawled over sand in 9–10 m along with numerous species including *Aulonocara rostratum*, *Gephyrochromis moorii*, *Lethrinops albus*, *L. cf. brevis*, *L. cf. christyi*, *L. furcifer*, *L. lethrinus*, *Mylochromis sphaerodon*, *Nyassachromis nigritaeniatus*, *N. sp.*, *Protomelas annectens*, *Taeniolethrinops furcicauda*, *T. praeorbitalis*, *Tramitichromis intermedius*, *T. lituris*, *Trematocranus microstoma*, *T. placodon*, and *Synodontis njassae*.

Gut contents were not examined. The diet, and the function of the specialized lower pharyngeal bone and its dentition, remains to be determined.

Snoeks and Hanssens (2004:294–295) briefly described and illustrated a cichlid resembling *O. alpha* that they called *Otopharynx* sp. “elongate spot” (distinct from their species *O. sp.* “tetraspilus elongate spot”). They stated that *O. sp.* “elongate spot” “may be conspecific with *O. auromarginatus* stripe” reported by Turner (1996).” However, this is unlikely, as they noted that their species, from Jafua Bay, Mozambique, has enlarged median pharyngeal teeth. In contrast, Turner (1996:178) describes the pharyngeal teeth of *O. auromarginatus* stripe” as “small crowded teeth, the three posterior teeth of innermost row slightly enlarged.” The latter description accords well with the types of *O. alpha*, which also lack clearly enlarged pharyngeal teeth in the median columns (Figure 3F).

According to Turner (1996), this species (as *O. auromarginatus* stripe”) was probably of minor commercial importance, being caught by pair trawling and seining. Turner (1996) remarked that in Malawi Fisheries Department records it had been confused with *Nyassachromis leuciscus*, a species lacking a suprapectoral spot. The current population status of *O. alpha* is unknown.

### *Otopharynx mumboensis*

new species

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Figures 2B, 5, 6, Tables 3, 4

*Protomelas* sp. ‘virgatus mumbo’: Konings (2001:227, 228, 2015:208, 2016:295).

#### Holotype.

YPM ICH 031031, 115.7 mm SL, male; Malaŵi: Lake Malaŵi, Mumbo Island, west shore, chased into ½” mesh gillnet with SCUBA in 6–9 m depth, at about 13°59’30”S 34°45’10”E; M. K. Oliver, K. McKaye, T. D. Kocher, 5 August 1980. Field number MKO80-96.

#### Paratypes.

YPM ICH 024990, two (one male, one female), 103.1–107.3 mm SL; collected with the holotype.

#### Diagnosis.

A smallish (~14 cm TL) laterally spotted haplochromine distinguished from most *Otopharynx* species by its suprapectoral spot, which is situated entirely below the upper lateral line and separated from it by about half the spot height. This spot is roughly rectangular, longitudinally elongate (1–1½ scales high, covering about seven consecutive scales), about three times as long as tall. The placement and shape of the suprapectoral spot immediately distinguish *O. mumboensis* from *O. antron*, *O. argyrosoma*, *O. auromarginatus*, *O. decorus*, *O. heterodon*, *O. pachycheilus*, *O. selenurus*, *O. speciosus*, *O. spelaotes*, *O. tetraspilus*, and *O. tetrastigma*, all of which have the suprapectoral spot touching or usually extending above the upper lateral line, or (*O. selenurus*) may have no suprapectoral spot. Only *O. brooksi*, *O. lithobates*, and *O. ovatus* have a suprapectoral spot similar to that of *O. mumboensis*. Compared to *O. brooksi*, *O. mumboensis* has a shorter head (31–32% SL vs. 36–39%), fewer outer teeth in the upper jaw (47–50 vs. 69–87), and more gill rakers (13 on lower limb vs. 11–12). Compared to *O. lithobates*, *O. mumboensis* is deeper bodied (body depth 35.5–36.1% SL vs. 29.5–34.4%), has a shorter lower jaw (35.7–36.2% HL vs. 36.9–42.0), and has a lower pharyngeal bone with all teeth of the median columns somewhat enlarged, with subcylindrical shafts and submolariform crowns (vs. with slightly enlarged submolariform teeth confined to the posteromedian area). Compared to *O. ovatus*, *O. mumboensis* has a shorter lower jaw (35.7–36.2% HL vs. 43.2–44.3% in the lectotype and two paralectotypes), larger eye (orbit length 34.8–35.4% HL vs. 27.9–32.9%), narrower interorbital width (22.6–24.0% HL vs. 26.5–29.6%), more-triangular lower pharyngeal bone with the posterior contour nearly straight (vs. more Y-shaped and rather deeply notched posteriorly), and all teeth in the median columns of the lower pharyngeal bone somewhat molariform, the crowns broadened and flattened (vs. the teeth in these columns bicuspid, their crowns not molarized).

#### Description.

Morphometric and meristic data are given in Tables 3 and 4.

Deep-bodied; body depth 35.5–36.1% SL (Figure 5A). Dorsal profile straight from snout tip to above rear of orbit, evenly rounded from there to end of dorsal-fin base, more convex than ventral profile. Premaxillary pedicels not prominent, their angle 42–46°, interorbital angle 42–44°, nuchal angle 16–20°. Ventral profile nearly straight from lower-jaw tip to below pectoral-fin base, chest profile inclined ~20°. Jaws equal anteriorly, lower jaw not dorsoventrally flattened; lips neither

TABLE 3. Morphometric characters of *Otopharynx mumboensis*. Abbreviations: LLL, lower lateral line.

	Holotype	Paratypes	
	YPM ICH 031031	YPM ICH 007820	
Standard length (mm)	115.7	103.1	107.3
Head length (mm)	37.2	31.8	33.6
Percentage of standard length:			
Head length	32.2	31.3	30.9
Body depth	36.1	35.8	35.5
Dorsal-fin base length	56.5	58.0	56.8
Predorsal length	35.9	34.8	35.7
Prepectoral length	32.4	31.6	31.2
Prepelvic length	39.6	38.7	39.3
Preanal length	66.6	64.5	67.6
Pelvic fin origin to anal fin origin	27.8	27.6	29.5
Anal-fin base length	18.7	21.6	19.9
Caudal peduncle length	17.0	17.2	16.1
Caudal peduncle depth	10.9	11.5	11.9
Pectoral-fin length	25.7	25.6	32.3
Pelvic-fin length	25.8	28.8	26.9
Dorsal-fin origin to anal-fin origin	48.9	48.1	49.5
Dorsal-fin origin to end of anal-fin base	59.7	60.9	60.7
Pelvic-fin origin to end of dorsal-fin base	53.1	54.6	55.0
End dorsal-fin base to end anal-fin base	13.6	14.5	15.4
Anal-fin origin to end of dorsal-fin base	28.3	31.3	30.8
Dorsal-fin origin to pelvic-fin origin	36.2	34.8	34.9
End dorsal-fin base to end hypurals at LLL	17.1	16.1	16.6
End anal-fin base to end hypurals at LLL	19.1	19.2	18.5
Percentage of head length:			
Head width	47.6	47.5	47.0
Interorbital width	24.0	23.5	22.6
Snout length	31.7	29.6	31.3
Snout width	34.2	33.3	34.6
Lower-jaw length	36.2	35.7	36.2
Lower-jaw width	26.3	25.4	25.5
Premaxillary pedicel length	26.8	27.5	28.4
Upper-jaw length	32.7	30.8	28.9
Cheek depth	23.1	22.1	20.5
Orbit length	35.2	35.4	34.8
Vertical eye diameter	33.7	33.3	33.2
Lacrimal (preorbital) depth	19.7	19.6	20.4
Postorbital head length	37.9	38.7	38.8

thickened nor lobate. Gape inclination 39–45°. Lower-jaw length–width ratio intermediate, the hemijaws, as seen from below, parallel or diverging and well separated posteriorly (Figure 5C). Lower-jaw underside angle 34–42°. Snout acuteness 71–77°. Eyes large, circular (Figure 5B), orbit length ~35% HL; pupil nearly round; eye not reaching dorsal head profile. Caudal peduncle 16.1–17.0% SL, its length 1.4–1.6 times its depth.

Dorsal and anal fins rounded posteriorly, without elongated rays. Caudal fin shallowly emarginate. Pectoral fin 25.6–32.3% SL, reaching level of anus.

Dental arcade in each jaw rounded. Upper jaw with 47–51 teeth (total) in the outer row. Outer upper-jaw teeth stout, bicuspid (an occasional one tricuspid), crowns slightly recurved with major cusp rounded; last three to four unicuspid or with small shoulder of minor cusp. Anterior teeth closely spaced, inclined slightly toward symphysis. Outer row of lower jaw of haplochromis type, with 37–40 teeth (total); teeth similar to those of upper jaw; anterior teeth erect, crowns slightly recurved. Many outer teeth of both jaws, especially in holotype, have crowns broken or heavily worn. Inner teeth in (two) three to four rows in

TABLE 4. Meristic characters of *Otopharynx mumboensis*.

	Holotype	Paratypes	
	YPM ICH 031031	YPM ICH 024990	
Squamation:			
Lateral-line scales	35	35?	34
Upper lateral-line scales	25	26+	27
Lower lateral-line scales	16	—	16
Lateral-line scales on caudal fin	1	—	2
Kink length	1	3	4
Upper transverse line scales	5	5	5
Lower transverse line scales	9	9?	10?
Cheek scale rows	3	3	3
Scales between pectoral- and pelvic-fin bases	8	6	7?
Fins:			
Dorsal-fin spines	16	17	16
Dorsal-fin segmented rays	11	11	11
Dorsal-fin total elements	27	28	27
Anal-fin spines	3	3	3
Anal-fin segmented rays	9	10	9
Anal-fin total elements	12	13	12
Pectoral-fin rays	14	14	14
Gill rakers:			
Epibranchial	5	5	4
Angle	1	1	1
Lower limb	13	13	13
Total	19	19	18
Oral teeth:			
Outer upper-jaw teeth: left/right = total	23/27 = 50	25/26 = 51	23/24 = 47
Outer lower-jaw teeth: left/right = total	21/19 = 40	18/21 = 39	19/18 = 37

each jaw; tricuspid with major cusp often semicircular; inner teeth relatively large although clearly smaller than outer teeth; unusual in that crowns are pigmented red-brown as in outer teeth.

Lower pharyngeal bone dissected from holotype (Figure 5D–G) and one paratype (107.3 mm SL); subtriangular, lightly built, dorsoventrally compressed in posterior view (Figure 5D); posterior contour nearly straight (slightly emarginate); horns slender, each horn terminating in an L-shaped facet whose caudal flange is autapomorphically elongated into a fingerlike process three to four times as long as its lateral flange. Median suture straight to slightly sinuous, without interdigitations (Figure 5G). Keel short, scarcely descending, its depth nearly equal to its length, strongly convex below (Figure 5E). All teeth of median four to six columns enlarged, stouter than more lateral teeth, crowns somewhat molarized, more strongly so in the caudal half of these columns (Figure 5F). Posterolateral teeth small, laterally compressed, crowded, and bicuspid. Teeth in posterior row 36 (holotype)–42; in each median column 9–10; in each oblique row 7–8.

Lacrimal bone (Figure 2B) bearing four neuromasts and five lateral-line pores; lacrimal notch distinct.

Gill rakers 13 on lower arch; slender, unbranched; a few widely spaced melanophores on each raker.

Scales ctenoid; 34–35 in lateral line. Lateral line discontinuous, upper section with downward kink one to four scales long. Squamation extending onto caudal fin between fin rays, to near tips of upper and lower lobes and on basal one-half along middle rays. Soft dorsal and anal fins with one to three small scales between bases of some rays. Size transition gradual between larger abdominal and smaller thoracic scales.

*Coloration in life* (Figure 6A, B). Live coloration of males unknown. A young fish, possibly female, shown (as *Protomelas* sp. “virgatus mumbo”) in a published underwater photo (Konings 2015:208, 2016:295) and reproduced here as Figure 6A, shows the head and body gray to creamy white. Each flank scale has a yellow-orange basal spot. Melanic markings comprise three prominent midlateral dark spots including a suprapectoral spot about three times as long as high, situated entirely below upper lateral line and separated from it; a supraanal spot about twice as long as high; and a precaudal spot at end of caudal peduncle. A row of three small dark spots above anterior part of upper lateral line: one at the level of hind edge of operculum and others just above lateral line over front and rear of suprapectoral spot. Five small dorsal midline spots just below dorsal-fin base. About nine faint, narrow vertical bars below base of dorsal fin. A faint opercular spot. No dis-

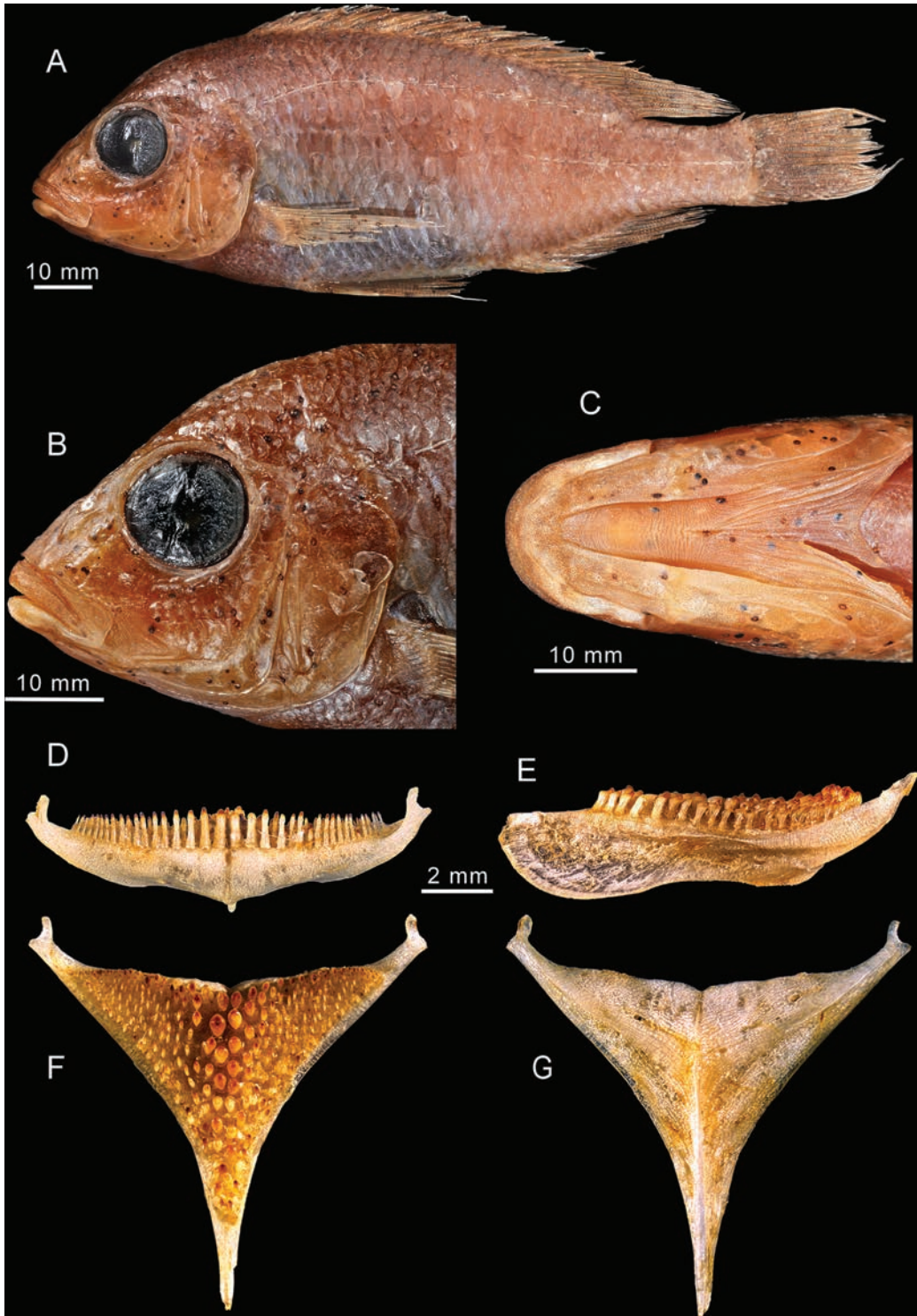


FIGURE 5. *Otopharynx mumboensis*. A. Holotype, YPM ICH 031031, 115.7 mm SL, male. B. Head of holotype. C. Underside of head of holotype. D–G. Lower pharyngeal bone of holotype, in posterior (D), left lateral (E), dorsal (F), and ventral (G) views.

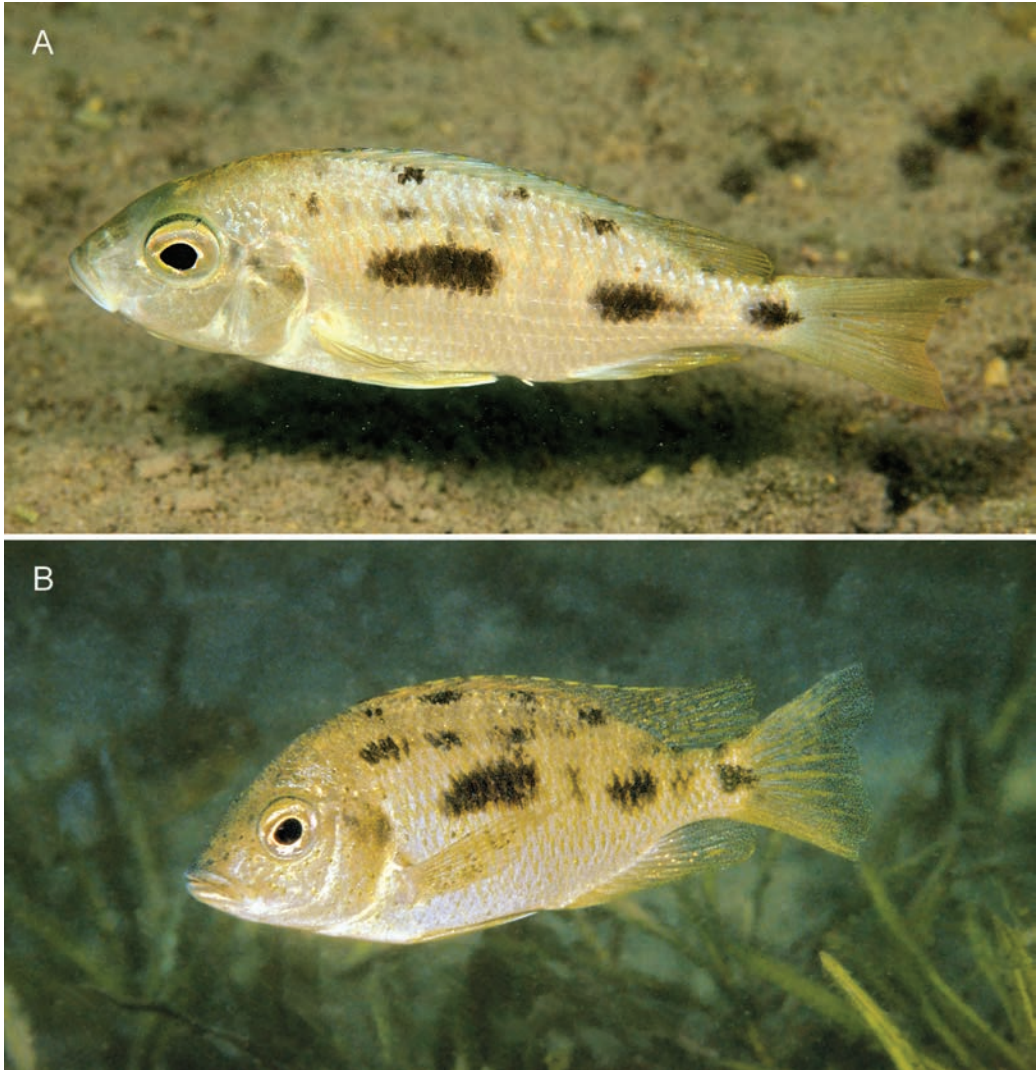


FIGURE 6. *Otopharynx mumboensis*, living individuals, underwater at Mumbo Island (depths not reported). **A.** Young, apparently female individual. **B.** Larger adult (right side reversed), apparently female, over *Vallisneria* bed. Photographs by Ad Konings.

tinct markings on snout, nape, or fins. This melanic pattern is essentially identical to that of *O. lithobates*, *O. brooksi*, and *O. ovatus*. The yellowish scale spots and the dark markings on a larger individual (Figure 6B) are similar; however, the dorsal midline spots and the spots just above the upper lateral line are darker and more prominent, and indistinct dark marks are present between the midlateral spots. The dorsal fin has pale yellowish lappets and there are yellow oval maculae between the soft dorsal rays. Between the caudal-fin rays the membrane is yellow. There appears to be a yellow eggspot in the soft anal fin.

*Coloration in preservative* (Figure 5A–C). Although the type specimens are slightly cleared, possibly because they were fixed

in inadequately buffered formalin prepared from paraformaldehyde, their melanic markings remain visible when the specimens are rotated in the hand and closely correspond to those of the living individuals described above. Head and body almost uniformly brown. Suprapectoral spot 1–1½ scales high, covering about seven consecutive scales, below and separated from upper lateral line by about half height of spot; supraanal spot slightly longer than high; precaudal spot at end of caudal peduncle, shaped like supraanal spot. Three spots above anterior part of upper lateral line as described for living specimen. Five dorsal midline spots, evenly spaced, just below base of dorsal fin. Traces of vertical bars, too faint to count accurately. Head lacking bars or stripes; with an opercular spot. Dorsal-fin lappets pale distally, brown proximally grading into poorly defined sub-

marginal dark stripe; dorsal-fin membrane brown overall, with vague maculae between segmented rays. Caudal, anal, and pelvic fins brown; anal fin without eggspots or other distinct markings; pectorals hyaline.

*Maximum size.* The largest known specimen is the holotype, 140.6 mm TL.

#### Parasites.

All of the type specimens have metacercariae of a digenetic trematode on the head, body, and fins; the holotype is especially heavily covered (Figure 5B, C). Similar metacercarial cysts are visible on the head, chest, and pectoral fin of the fish in Figure 6B. The cysts may be those of *Astiotrema turneri*, the only identified digenean from mbuna and non-mbuna cichlids of Lake Malaŵi (Bray et al. 2006; Bray and Hendrix 2007).

#### Distribution.

Known only from Mumbo Island in the southwest arm of Lake Malaŵi (Figure 1).

#### Etymology.

The name is an adjective referring to the type locality, Mumbo Island.

#### Remarks.

The intestine, observed in situ in the holotype and one paratype, has multiple coils. That of the holotype contains fine gravel along much of its length, which was not noted in the examined paratype. The diet is unknown.

*Otopharynx mumboensis* appears to be a rare species. The types, apparently the only museum specimens extant, were collected in 6–9 m depth in the intermediate zone (80% rocks / 20% sand). Small isolated patches of the invasive *Myriophyllum spicatum* L. (Weyl and Coetzee 2014) were the only evident macrophytes in the area. (Figure 6B shows an individual of *O. mumboensis* over sand with *Vallisneria spiralis* L.) Other cichlid species collected with the type series include *Buccochromis heterotaenia*, *Cheilochromis euchilus*, *Docimodus johnstoni*, *Mylochromis epichorialis*, *Otopharynx lithobates*, *O. ovatus*, *Stigmatochromis woodi*, *Protomelas fenestratus*, *Tyrannochromis macrostoma*, *T. nigriventer*, and *Labeotropheus trewavasae*. Mbuna were not specifically sought in this particular collecting effort.

Mumbo Island occupies an isolated position in the southwest arm of Lake Malaŵi. Its petricolous, philopatric cichlids are isolated by the surrounding sandy substrate. The nearest rocky or intermediate rocky/sandy shores are at Zimbabwe Rock 5.3 km to the northeast, Thumbi Island West 5.7 km to the southeast, and Domwe Island 6.7 km to the east-northeast. Observations at Zimbabwe Rock and multiple collecting stations on various rocky and intermediate zone sites at Thumbi West and Domwe, employing a variety of techniques, including use of ichthyocide, yielded no individuals referable to *O. mumboensis* (Oliver, unpublished).

*Otopharynx mumboensis* is the first formally named non-mbuna cichlid species that is apparently restricted to Mumbo

Island. Among described mbuna species, only *Labidochromis mylodon* Lewis, 1982, has a known distribution restricted to Mumbo Island. *Labeotropheus artatorostris* is known from both Mumbo and Thumbi West islands (Pauers 2017). The type locality of *Maylandia chrysomallos* is Mumbo Island, but this species also occurs on the lake's eastern shore from Meponda to Makanjila Point (Konings 2015). *Melanochromis mellitus*, described from "off Mumbo Island," has been synonymized with the widespread *M. melanopterus* (Konings-Dudin et al. 2009). Lundebe et al. (2011) described *Petrotilapia mumboensis*, but they state that this mbuna species occurs not only at Mumbo but also at Mbenji and Thumbi West islands. In addition, several distinctively colored undescribed species of mbuna at Mumbo (Konings 2015) may prove to be endemic to the island.

Although the known range of *O. mumboensis* is within the boundaries of Lake Malaŵi National Park, this species should be considered vulnerable, given its evidently restricted range, its rarity there, and the presence of illegal net fishing operations reported at Mumbo Island and elsewhere in Lake Malaŵi National Park despite the legal prohibition against fishing within 100 m of the shore (e.g., Nyanyale 2005; McKenzie and Swalls 2010; Further developments 2011). The ban is "routinely flouted by artisanal fishermen" within the park (IUCN World Heritage Outlook 2017).

Konings (2016:295) does not explain the basis of his belief that this species (as *Protomelas* sp. "virgatus mumbo"), despite sharing the identical apomorphic, laterally spotted color pattern of several other *Otopharynx* species, actually belongs in *Protomelas*—a genus whose major diagnostic character is a plesiomorphic unbroken midlateral stripe (Eccles and Trewavas 1989).

### *Otopharynx styrax*

new species

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Figures 2C, 7, 8, Tables 5, 6

*Mylochromis* sp. 'torpedo blue': Konings (1995:232, 260, 261).

*Otopharynx* 'productus': Turner (1996:171, 179); Duponchelle et al. (2000:127).

*Otopharynx* sp. 'torpedo blue': Konings (2001:258, 260, 2016:341).

*Otopharynx* sp. 'productus sharp snout': Snoeks and Hanssens (2004:292, fig. 75).

#### Holotype.

YPM ICH 031029, 97.3 mm SL, immature male; Malaŵi: Lake Malaŵi, southeast arm, Lake Malaŵi Trawling Survey station Mazinzi II, M/L *Ethelwynn Trewavas*, two 0.5-hr bottom trawls off Mazinzi in 42 m depth, at about 14°07'17"S 35°00'14"E–14°06'15"S 34°59'53"E; M. K. Oliver, J. Tarbit, K. Stride, 25 June 1971. Field number MKO71-VI-25.

#### Paratypes.

YPM ICH 014270, eight (five male, three female), 88.8–116.7 mm SL; collected with the holotype.



TABLE 5. Morphometric characters of *Otopharynx styrax*. Abbreviations: LLL, lower lateral line; S.D., standard deviation.

	Holotype	Paratypes			
		N	Mean	S.D.	Range
Standard length (mm)	97.3	8	97.6	8.8	88.8–116.7
Head length (mm)	27.8	8	28.6	2.7	26.8–34.9
Percentage of standard length:					
Head length	28.6	8	29.3	0.7	28.2–30.2
Body depth	24.3	8	26.4	1.4	24.9–28.6
Dorsal-fin base length	54.9	8	54.7	0.6	53.9–55.5
Predorsal length	31.1	8	33.2	0.7	32.1–33.8
Prepectoral length	28.5	8	29.4	0.9	27.9–31.1
Prepelvic length	32.9	8	34.5	1.3	33.3–37.0
Preanal length	63.1	8	63.7	0.5	62.5–64.1
Pelvic fin origin to anal fin origin	29.8	8	29.6	0.9	28.4–30.9
Anal-fin base length	18.6	8	18.2	0.5	17.7–18.9
Caudal peduncle length	18.6	8	19.5	0.8	18.7–20.9
Caudal peduncle depth	8.9	8	9.2	0.6	8.5–10.3
Pectoral-fin length	26.2	8	28.1	1.3	26.6–30.9
Pelvic-fin length	20.8	8	21.5	1.0	20.6–22.1
Dorsal-fin origin to anal-fin origin	42.6	8	43.3	0.8	42.1–44.3
Dorsal-fin origin to end of anal-fin base	56.4	8	56.0	1.0	54.5–57.1
Pelvic-fin origin to end of dorsal-fin base	52.6	8	52.4	0.8	51.7–53.6
End dorsal-fin base to end anal-fin base	12.7	8	12.9	0.6	12.1–14.0
Anal-fin origin to end of dorsal-fin base	26.2	8	26.5	0.7	25.9–27.6
Dorsal-fin origin to pelvic-fin origin	24.4	8	26.3	1.5	24.5–28.7
End dorsal-fin base to end hypurals at LLL	18.6	8	18.8	0.7	17.5–19.5
End anal-fin base to end hypurals at LLL	19.7	8	20.9	0.8	19.9–22.0
Percentage of head length:					
Head width	42.5	8	43.5	1.0	42.6–45.5
Interorbital width	15.4	8	17.2	1.0	16.0–18.9
Snout length	32.8	8	32.6	2.0	29.0–35.8
Snout width	25.6	8	26.5	1.0	25.5–28.8
Lower-jaw length	36.2	8	36.2	1.4	33.8–37.6
Lower-jaw width	14.5	8	16.6	1.6	15.0–20.3
Premaxillary pedicel length	30.2	8	30.7	2.1	27.1–33.5
Upper-jaw length	23.8	8	24.3	1.0	23.0–26.1
Cheek depth	20.7	8	20.5	2.0	16.8–22.5
Orbit length	35.1	8	36.0	1.2	34.1–37.7
Vertical eye diameter	28.5	8	28.6	1.4	26.1–30.5
Lacrimal (preorbital) depth	22.8	8	22.4	1.8	20.2–24.5
Postorbital head length	38.1	8	37.6	1.2	35.2–39.5

**Diagnosis.**

A medium-sized (~20 cm TL), laterally spotted haplochromine distinguishable from all previously described *Otopharynx* species by its more elongate body (depth 24.3–28.6% SL). The next-most-elongate *Otopharynx* species are *O. decorus* (depth 29.4–33.3% SL) and *O. lithobates* (depth 29.5–34.4% SL); all others have a body depth >31% SL (data from Oliver 1984 and Eccles and Trewavas 1989). *Otopharynx styrax* is further sepa-

rated from *O. decorus* by its longer caudal peduncle (length/depth 2.0–2.3, vs. 1.5–1.6 in *O. decorus*) and its narrower lower pharyngeal bone, the lateral edges of the horns diverging at ~70° (Figure 7G, H) vs. 79–87° in the lectotype and a paralectotype of *O. decorus* (Oliver, unpublished). *Otopharynx styrax* is further distinguished from *O. lithobates* by the absence of dark spots on the dorsum below the dorsal-fin base (vs. 4–6 distinct dorsal midline spots in *O. lithobates*) and longer caudal peduncle (length/depth 2.0–2.3, vs. 1.3–1.7 in *O. lithobates*).

TABLE 6. Meristic characters of *Otopharynx styrax*. Abbreviations: Q, quartile.

	Holotype	Paratypes				Range
		N	Median	1 <sup>st</sup> Q	3 <sup>rd</sup> Q	
Squamation:						
Lateral-line scales	37	7	37	37	37	36–39
Upper lateral-line scales	28	7	27	25	28	24–30
Lower lateral-line scales	≥17	7	16	15	17	14–20
Lateral-line scales on caudal fin	2	8	2	2	2	2–2
Kink length	1	6	0.5	0	2.50	0–4
Upper transverse line scales	6	7	7	7	8	7–8
Lower transverse line scales	8	8	10	8	10	8–11
Cheek scale rows	3	8	3	3	4	3–4
Scales between pectoral- and pelvic-fin bases	—	8	9	8	9.75	7–12
Fins:						
Dorsal-fin spines	16	8	17	17	17	16–17
Dorsal-fin segmented rays	13	8	13	12.25	13	12–14
Dorsal-fin total elements	29	8	30	29.25	30	29–30
Anal-fin spines	3	8	3	3	3	3–3
Anal-fin segmented rays	10	8	9.5	9	10	9–10
Anal-fin total elements	13	8	12.5	12	13	12–13
Pectoral-fin rays	15	8	15	15	15	15–15
Gill rakers:						
Epibranchial	5	8	5	4	5	15–15
Angle	1	8	1	1	1	1–1
Lower limb	12	8	12	12	12.75	11–13
Total	18	8	17.5	17	18.75	17–19
Oral teeth:						
Outer upper-jaw teeth (total both sides)	52	8	58	53	62.75	49–64
Outer lower-jaw teeth (total both sides)	46	6	54	49.5	55.50	48–57

Morphometric and meristic data are given in Tables 5 and 6.

Body elongate, its depth 24.3–28.6% SL (Figure 7A). Head sharply pointed in lateral view (Figure 7B) and narrowly rounded in dorsal view (Figure 7C). Dorsal profile evenly convex from tip of snout to end of dorsal-fin base, except snout profile nearly straight in some individuals. Premaxillary pedicels not prominent, their angle 34–50°, interorbital angle 27–38°, nuchal angle 15–25°. Ventral profile varying from a virtual mirror image of the dorsal profile, to less convex and with an almost straight lower head and chest profile. Jaws equal anteriorly or lower jaw slightly projecting, lower jaw somewhat dorsoventrally flattened; lips not thickened or lobate. Gape inclination 10–30°. Lower-jaw length–width ratio narrow, the hemijaws, as seen from below, converging toward the rear and nearly touching posteriorly (Figure 7D). Lower-jaw underside angle 10–30°. Snout acuteness 65–76°. Eyes large, elliptical (orbit length 34–38% HL, about 25% longer than vertical eye diameter); pupil pointed anteriorly, rounded posteriorly; eye reaching dorsal head profile, or nearly so. Caudal peduncle 18.6–20.9% SL, its length 2.0–2.3 times its depth.

Soft dorsal and anal fins pointed but short posteriorly. Fin spines slender, delicate, flexible (“featherfin” condition; Snoeks and Hanssens 2004). Caudal crescentically emarginate; upper and lower lobes acutely pointed, subequal. Pectoral fins short, 26.2–30.9% SL, acute, reaching level of anus. Pelvic fins shorter than pectorals (20.6–22.1% SL).

Dental arcade narrowly arched in each jaw. Upper jaw with 49–64 teeth (total) in outer row. Largest paratype (116.7 mm SL) and most other specimens have anterior teeth subequally bicuspid, lateral to posterolateral teeth mostly unequally bicuspid, a few posterior teeth unicuspid. Outer row of lower jaw of haplochromis type, with 46–57 teeth (total). Anterolateral teeth angled outward, procumbent, anterior teeth with shafts angled toward dentary symphysis. With jaws closed, anterior and anterolateral teeth of lower jaw lie outside upper-jaw teeth, but lateral and posterior teeth are inside those of upper jaw. Inner teeth of both jaws unequally tricuspid with middle cusp longest, acute, crowns lightly or not pigmented, arranged in two to three rows.

Lower pharyngeal bone dissected from holotype (Figure 7E–H) and four paratypes (90.1–116.7 mm SL); Y-shaped, narrow, rather lightly built; posterior contour deeply emarginate,

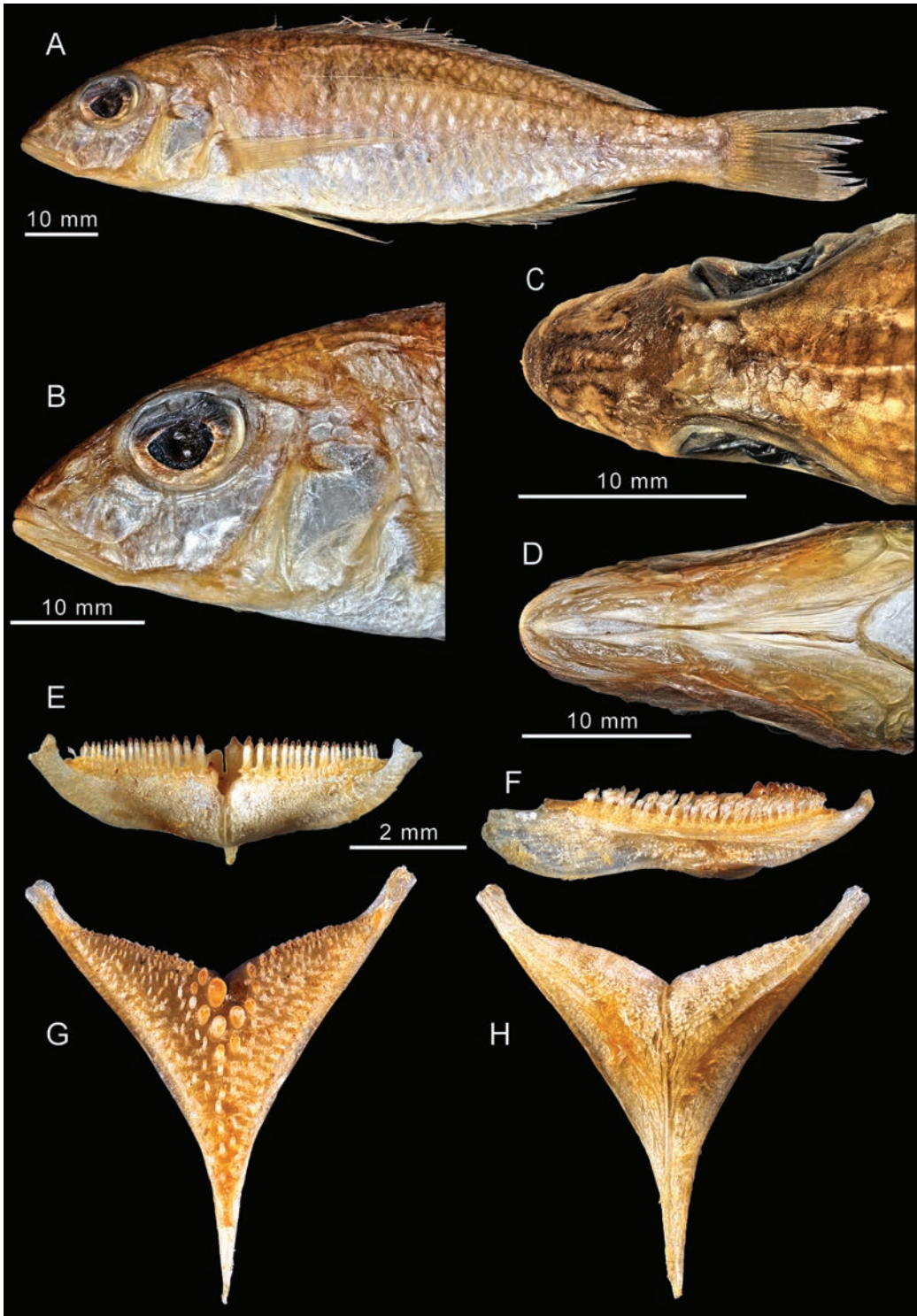


FIGURE 7. *Otopharynx styrax*. A. Holotype, YPM ICH 031029, 97.3 mm SL, immature male. B. Head of holotype. C. Dorsal view of head of holotype. D. Underside of head of holotype. E–H. Lower pharyngeal bone of holotype, in posterior (E), left lateral (F), dorsal (G), and ventral (H) views.

each half slightly convex, the halves meeting at an obtuse angle; horns moderately long, slender, of uniform diameter (Figure 7G). Median suture nearly straight (Figure 7H). Keel short, straight, moderately deep, convex below (Figure 7F). Bone moderately deep in posterior view (Figure 7E). Teeth in lateral fields small, closely set, laterally compressed and cuspidate, but six to nine posteromedian teeth enlarged, their crowns molarized but retaining a posterior cusp (Figure 7G). Teeth in posterior row 37–45 (holotype: 38); in each median column 9–10 (holotype: 9); in each oblique row 5–7 (holotype: 6–7).

Lacrimal bone (Figure 2C) bearing four neuromasts and five lateral-line pores; lacrimal notch distinct.

Gill rakers 11–13 on lower outer arch; slender, unbranched; lacking melanophores.

Scales ctenoid; 36–39 (median 37) in lateral line. Lateral line discontinuous; upper section with downward kink one to four scales long, or kink absent. Caudal fin scaled to near tips of upper and lower lobes and on basal one-half or more along middle rays. Soft dorsal and anal fins with a few small scales between bases of some rays. Large scales on lower flanks abruptly transition to much smaller scales on chest along a line between pectoral- and pelvic-fin bases (much as in *Thoracochromis wingatii*; see Greenwood 1979, fig. 2).

**Coloration in life.** Living subadult and adult males (Figure 8A–D) dark blue on dorsum and upper head surface, paler blue on sides of head and flanks, whitish on belly. Longitudinally elongate, blackish suprapectoral and supraanal spots and nearly circular precaudal spot variably present, probably dependent on emotional state. No dorsal midline spots. Seven or eight faint gray vertical bars visible below dorsal-fin base. Dorsal-fin lappets white, fin otherwise blue with orange maculae in both spinous and soft sections. Caudal fin blue with yellow or orange maculae. Anal fin blue with narrow orange distal margin and one to three series of pale yellow eggspots, third row (on distal fin margin) apparently only in largest males (Figure 8D). Pelvic fins white to pale blue with white leading edge. Pectorals hyaline.

A female shown (as *Otopharynx* “productus”) by Turner (1996:171) appears grayish tan on dorsum, silver on sides of head, silvery with bluish tinge on flanks, white on belly and underside of head. Three lateral spots visible but indistinct. Dorsal fin shows orangeish oval maculae between all spines and soft rays. Anal fin hyaline with faint orange flush distally. Caudal fin plain yellowish. Pelvics white flushed with orange. Pectorals hyaline.

**Coloration in preservative** (Figure 7A–D). Head and body light silvery brown, slightly darker on dorsum and upper head surfaces. No stripes or bars on head. Lips yellowish. A vague opercular spot in some specimens. Belly pale yellowish silver. Lateral spots faint, brownish; suprapectoral spot generally more distinct than supraanal and precaudal spots. No dorsal midline spots. Nape with indistinct brown spot above operculum. Dorsal fin yellowish, marbled with gray posteriorly. Anal fin yellowish with indistinct darker margin. Caudal fin yellow with faint maculae. Pelvics yellow, shading to brownish distally. Pectorals yellow.

**Maximum size.** At least 20 cm TL (see Remarks).

#### Distribution.

In addition to the type locality (Figure 1) in 42 m depth off Mazinzi Bay in the southeast arm, *O. styra*x has also been recorded

(as *Otopharynx* “productus”) in the southeast arm from trawl stations Nkope and Chilinda in 18–20 m, and from Ulande [Ulandi], Chekopa, near Boadzulu Island, and Chapola Shoal in 5–50 m (Turner 1996:179). It was also trawled from unspecified areas of the southwest arm in 10 m (Duponchelle et al. 2000:127) and, as *Otopharynx* sp. “productus sharp snout,” was recorded from Senga Bay at an unspecified depth (Snoeks and Hanssens 2004:292 and fig. 75). Konings (1995) reported this species (as *Mylochromis* sp. “torpedo blue”) from the east shore between Ntekete and Narungu, Malaŵi. Konings more recently (2016:341) reports it (as *Otopharynx* sp. “torpedo blue”) also from Chilolo, Mdoka, and Nkhudzi, Malaŵi. It was exported to the aquarium trade on one occasion from near Manda, Tanzania (Figure 8D). Although most specimens mentioned in the literature had been trawled, it is also captured near sandy shores in depths of less than 8 m (Figure 8A–D).

#### Etymology.

From the Greek masculine noun *στύραξ* (*styrax*), a metal spike at the lower end of a spear shaft, for the resemblance of this elongate cichlid with pointed head to the shape of that classical object. A noun in apposition.

#### Remarks.

Other species recovered in the same trawl hauls as the type specimens included the cichlids *Champsochromis spilorhynchus*, *Hemitaeniochromis urotaenia*, *Mylochromis spilostichus*, *M. subocularis*, *Nimbochromis polystigma*, *Otopharynx tetraspilus*, *Protomelas* cf. *pleurotaenia*, *Trematocranus microstoma*, and *T. placodon*; noncichlids caught included *Bagrus meridionalis*, unidentified Clariidae, and unspecified others.

The diet is unknown; gut contents were not examined.

Snoeks and Hanssens (2004) considered *Otopharynx* “productus” (Turner 1996) to represent a different species than their own *O.* sp. “productus sharp snout” solely because they found 13 lower gill rakers in their sample, whereas Turner (1996:292) reported 11 gill rakers. None of these authors stated the number of specimens examined for the count. In the type series of *O. styra*x, from two trawl hauls made at the same site and depth in rapid succession, the gill raker counts range from 11 to 13, with 12 the modal number. Judging by the photographs of the respective specimens, both provisional names represent the same distinctive species, now described as *O. styra*x. Turner (1996) stated that the (oral) teeth are in five rows, but in the types I can find only three to four rows (outer row plus two or three inner series).

Konings (2016) reported that the maximum total length of this species (as *O.* sp. “torpedo blue”) is ~12 cm, but this is incorrect. The largest paratype measures 145 mm TL. The holotype and all paratypes are either immature or sexually quiescent. The specimen illustrated next to a ruler by Snoeks and Hanssens (2004:293, fig. 75) is close to 20 cm TL. A living specimen captured near Manda, Tanzania (Figure 8D) was 20–22 cm TL (Mark Smith, pers. comm.). The largest specimen reported (as *Otopharynx* “productus”) by Duponchelle et al. (2000) was 134 mm SL; as some ripe females no larger than this were caught, the latter authors provide preliminary estimates of length–weight and fecundity–weight relationships.

This species was considered uncommon by Turner (1996) and very rare by Konings (1995). Duponchelle et al. (2000) con-

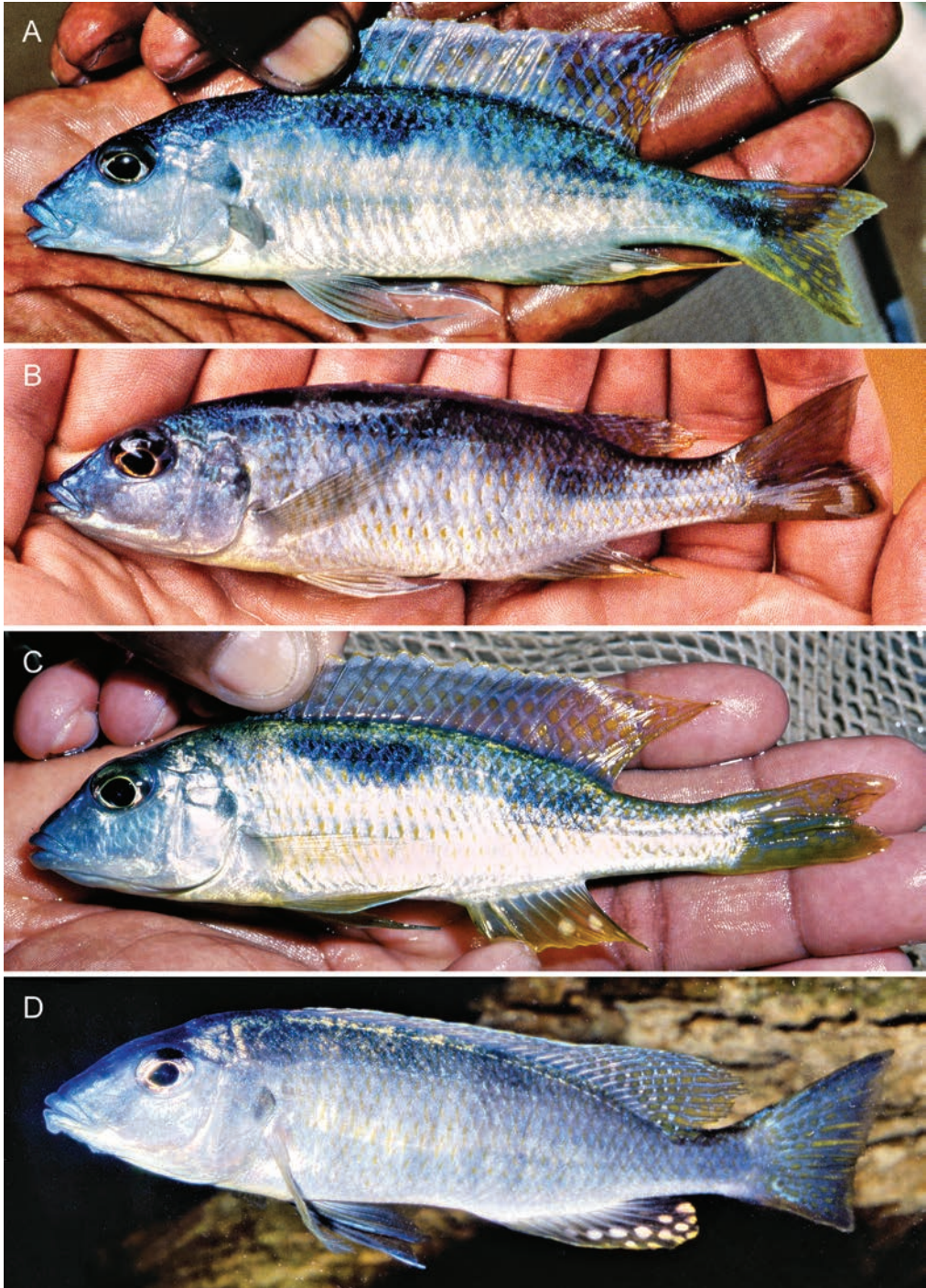


FIGURE 8. *Otopharynx styrax*, living individuals from various locations around Lake Malaŵi, all from inshore waters over sandy substrate in depths of less than 8 m. Specimens not preserved. **A.** Msinje (Masinje), Malaŵi (east shore about 3 km south of Mozambique border; right side reversed). **B.** Kambiri Point, Malaŵi (west shore about 12 km north of Maleri Islands). **C.** Kambiri Point, Malaŵi (right side reversed). **D.** Vicinity of Manda, Tanzania (northeast shore); specimen 20–22 cm TL collected by Charles Kacirek during 1990s; photographed in aquarium within one month of capture. All photographs by Mark Smith.

sidered it to be a rare species, captured in the southwest arm at a rate of 0.7 kg/20-min haul in 10 m depth and not captured below 30 m. The type series of *O. styrax* was, however, trawled in 42 m in the southeast arm.

*Otopharynx aletes*  
new species

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Figures 2D, 9, Tables 7, 8

*Otopharynx* sp. "molariform striped": Snoeks and Hanssens (2004:296).

Holotype.

YPM ICH 031030, 94.4 mm SL, male; Malaŵi: Central region, Lake Malaŵi, bottom trawl off Bua Point, Lake Malaŵi Trawling Survey station Bua III, M/L *Ethelwynn Trewavas*, depth >55 m, at about 12°45'21"S 34°17'07"E–12°44'24"S 34°16'34"E; 14 November 1972.

Paratypes.

YPM ICH 007820, seven (four male, three female), 85.9–106.9 mm SL; collected with the holotype.

Diagnosis.

A smallish (<14 cm TL) laterally spotted haplochromine distinguished by the following characters in combination: suprapectoral spot mostly below upper lateral line but extending above it by about one-half to one scale; 10 or 11 gill rakers on lower outer arch; and lower pharyngeal bone with posteromedian teeth molariform with stout shafts and rounded crowns. The placement of the suprapectoral spot overlapping the upper lateral line distinguishes *O. aletes* from *O. brooksi*, *O. lithobates*, and *O. ovatus*, all of which have the suprapectoral spot entirely below and usually separated from the upper lateral line. *Otopharynx aletes* has more scales in the lateral line (34–36) than *O. brooksi* (31–33), *O. spelaotes* (31–33), *O. antron* (29–31), *O. tetraspilus* (30–32), and *O. tetrastigma* (30–33), but fewer than *O. decorus*, which has 36–38 and which also has 13–14 soft dorsal rays vs. 11–12 in *O. aletes*. With 10 or 11 gill rakers on the lower outer arch, *O. aletes* is readily separated from *O. auromarginatus* (14–18). Its longer caudal peduncle (1.6–2.0 times as long as deep) and shallowly emarginate caudal fin distinguish *O. aletes* from *O. selenurus* (caudal peduncle 1.0–1.5 times as long as deep, caudal fin crescentically emarginate). The bicuspid outer jaw teeth, molariform pharyngeal teeth, and seven to eight subdorsal bars differentiate *O. aletes* from *O. speciosus* (outer jaw teeth unicuspid; pharyngeal teeth all small, bicuspid; about four subdorsal bars). The presence of seven to eight vertical bars below dorsal-fin base separates *O. aletes* from *O. argyrosoma*, which lacks vertical bars. The unthickened, nonlobate lips differentiate *O. aletes* from *O. pachycheilus* (lips thickened, medially lobate). The 16 dorsal-fin spines, absence of distinct equidistant dorsal midline spots, and offshore habitat on sand or soft bottom distinguish *O. aletes* from *O. heterodon*, which has 17–18 dorsal-fin spines, about five distinct dorsal midline spots, and inhabits

rocky shores. *Trematocranus brevisrostris* somewhat resembles *O. aletes*, but in *O. aletes* the suprapectoral spot is largely below the upper lateral line but extends above it by about one-half to one scale (vs. placed more above than below the upper lateral line, at least in the lectotype, see Eccles and Trewavas 1989: fig. 76), the cephalic lateral-line system is not enlarged (vs. pores and canals inflated), the dorsal fin has 11–12 (vs. 9) segmented rays, there are 54–67 (vs. ~43) outer upper-jaw teeth, the posteromedian teeth on the lower pharyngeal bone are molariform with stout shafts and rounded crowns (vs. slightly enlarged but cuspidate), and the caudal peduncle length/depth = 1.6–2.0 (vs. 1.2–1.4).

*Otopharynx aletes* and the following two new species are superficially similar but, at least in the available samples, can be distinguished as follows. Compared to *O. panniculatus*, *O. aletes* has more scales in the lateral line (34–36, vs. 31–33) and a heavier lower pharyngeal jaw bone and dentition (compare Figs. 9C–F and 10D–G), including enlarged, molarized teeth posteromedially (vs. small, laterally compressed, bicuspid teeth), posterior horns thickened (vs. slender), and anterior blade shorter, deeper (vs. longer, more shallow). Compared to *O. peridodeka*, *O. aletes* has the hemijaws in ventral view divergent caudally and distant from each other (vs. approximated, convergent; compare Figs. 9G and 13C), and a heavier lower pharyngeal bone, with horns thicker, posteromedian teeth enlarged, and molarized with nearly hemispherical crowns (vs. more lightly built, horns narrower, posteromedian teeth somewhat enlarged but more laterally compressed, cuspidate; compare Figs. 9C–F and 13D–G).

Description.

Morphometric and meristic data are given in Tables 7 and 8.

Deep bodied; body depth 32.1–36.9% SL (Figure 9A). Dorsal profile straight or slightly convex from snout tip to above center or rear of orbit (Figure 9B), about evenly rounded from there to end of dorsal-fin base, more convex than ventral profile. (Head profile and gape inclination are rather variable within the type series [compare Figure 9B, H, I]; however, counts, oral dentition, lower pharyngeal bone shape, and its distinctive dentition, and overall habitus support the inclusion of all specimens of the type series in a single species.) Premaxillary pedicels slightly prominent, their angle 42–53°, interorbital angle 34–47°, nuchal angle 16–25°. Ventral profile slightly convex from lower-jaw tip to posterior margin of branchiostegal membrane; hinge of lower jaw often protruding. Jaws equal anteriorly or lower projecting very slightly, lower jaw not dorsoventrally flattened; lips neither thickened nor lobate. Gape inclination 22–38°. Lower-jaw length-width ratio intermediate, the hemijaws diverging posteriorly (Figure 9G). Lower-jaw underside angle 27–40°. Snout acuteness 73–85°. Eyes large, nearly round (orbit length 34.1–37.4% HL, slightly longer than tall); pupil rounded both anteriorly and posteriorly; eye not reaching dorsal head profile. Caudal peduncle 17.6–20.8% SL, its length 1.6–2.0 times its depth.

Dorsal fin and, especially, anal fin with pungent spines, both fins with soft portion acute posteriorly. Caudal fin emarginate, lobes equal in length. Pectoral fin long, 32.3–39.3% SL, reaching level of base of third anal-fin spine or even that of third anal soft ray. Pelvic fins pointed.

Dental arcade of each jaw rounded. Upper jaw with 54–69 teeth (total) in outer row. Outer upper-jaw teeth small, closely

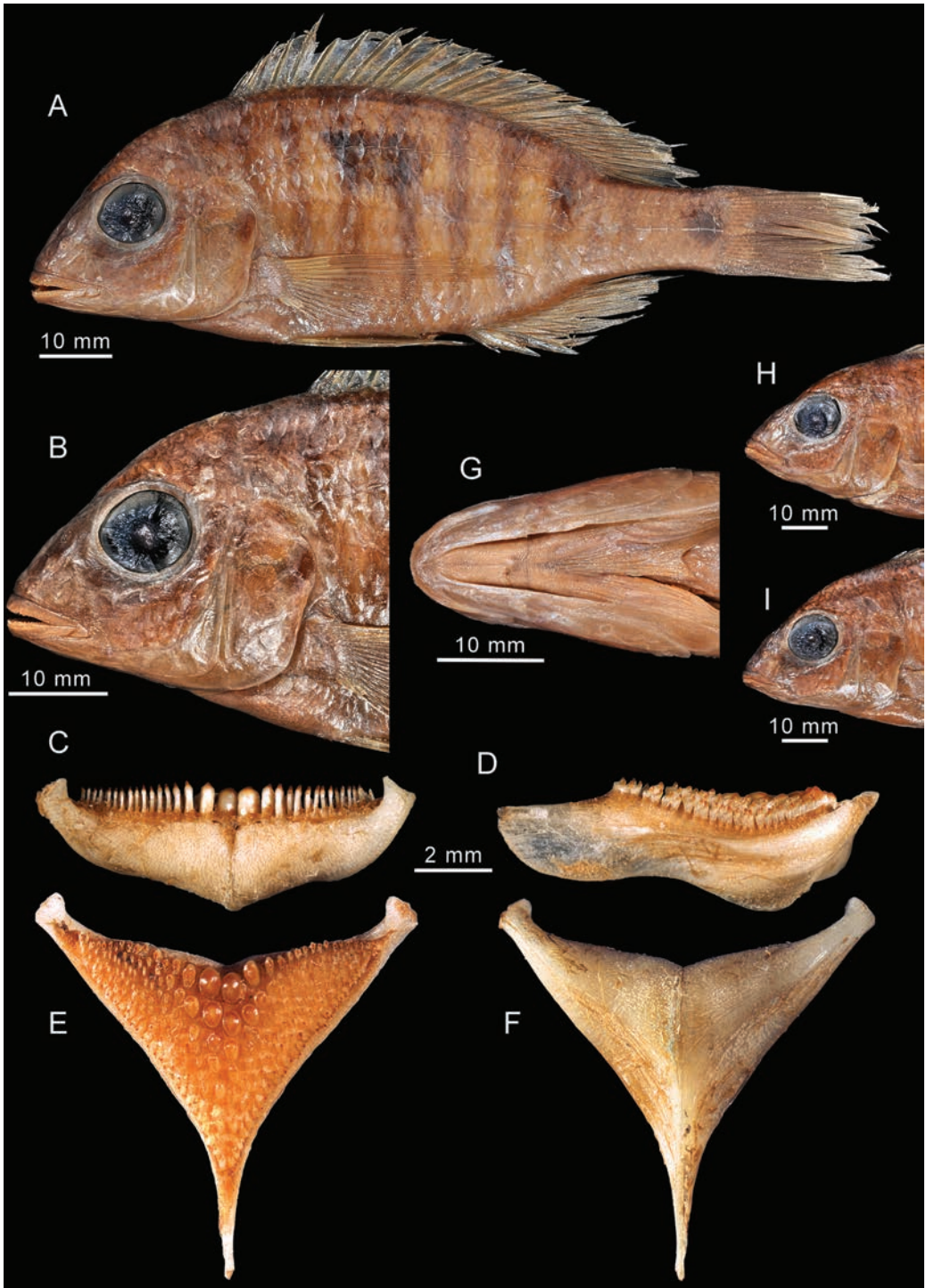


FIGURE 9. *Otopharynx aletes*. A. Holotype, YPM ICH 031030, 94.4 mm SL, male. B. Head of holotype. C–F. lower pharyngeal bone of holotype, in posterior (C), left lateral (D), dorsal (E), and ventral (F) views. G. Underside of head of a paratype (YPM ICH 007820, 101.4 mm SL, female). H, I. Two male paratypes (YPM ICH 007820; 106.9 (H) and 105.1 (I) mm SL), showing variation in snout profile and mouth angle.

TABLE 7. Morphometric characters of *Otopharynx aletes*. Abbreviations: LLL, lower lateral line; S.D., standard deviation.

	Holotype		Paratypes		
	YPM ICH 031030	N	Mean	S.D.	Range
Standard length (mm)	94.4	7	98.3	7.1	85.9–106.9
Head length (mm)	30.7	7	30.9	2.5	26.9–34.1
Percentage of standard length:					
Head length	32.5	7	31.3	0.7	30.2–32.4
Body depth	36.9	7	32.8	0.5	32.1–33.4
Dorsal-fin base length	55.0	7	54.1	1.3	53.0–55.6
Predorsal length	37.2	7	35.3	1.0	33.6–37.1
Prepectoral length	31.6	7	31.4	0.7	30.4–32.2
Prepelvic length	36.4	7	36.9	0.9	35.7–38.1
Preanal length	62.7	7	64.0	0.7	63.2–65.4
Pelvic fin origin to anal fin origin	26.7	7	28.1	0.9	26.4–29.1
Anal-fin base length	19.0	7	18.2	0.3	17.8–18.7
Caudal peduncle length	19.8	7	19.8	1.1	17.6–20.8
Caudal peduncle depth	11.7	7	10.7	0.3	10.1–11.2
Pectoral-fin length	39.0	7	36.0	2.8	32.3–39.3
Pelvic-fin length	28.5	7	26.3	3.1	22.6–30.0
Dorsal-fin origin to anal-fin origin	48.6	7	46.8	1.3	45.7–49.3
Dorsal-fin origin to end of anal-fin base	58.3	7	56.9	1.4	55.0–58.7
Pelvic-fin origin to end of dorsal-fin base	51.7	7	52.1	0.8	50.8–53.4
End dorsal-fin base to end anal-fin base	15.3	7	15.0	0.6	14.1–15.7
Anal-fin origin to end of dorsal-fin base	30.6	7	29.1	0.2	28.9–29.4
Dorsal-fin origin to pelvic-fin origin	36.0	7	32.5	0.4	32.0–33.0
End dorsal-fin base to end hypurals at LLL	19.9	7	19.3	0.6	18.6–20.3
End anal-fin base to end hypurals at LLL	21.8	7	21.9	0.5	20.8–22.5
Percentage of head length:					
Head width	43.3	7	44.6	0.9	43.5–45.8
Interorbital width	22.1	7	21.5	0.8	20.4–22.8
Snout length	35.1	7	32.2	0.8	30.9–33.3
Snout width	32.0	7	29.9	1.0	28.5–31.1
Lower-jaw length	38.0	7	36.7	1.1	35.2–38.1
Lower-jaw width	26.1	7	22.5	3.2	18.5–26.9
Premaxillary pedicel length	30.9	7	29.3	0.9	28.1–31.0
Upper-jaw length	31.4	7	27.2	0.9	26.2–28.2
Cheek depth	22.0	7	19.3	1.2	17.1–21.2
Orbit length	34.1	7	36.0	1.2	34.3–37.4
Vertical eye diameter	30.9	7	32.7	1.2	31.4–34.0
Lacrimal (preorbital) depth	22.3	7	21.0	0.6	20.0–21.8
Postorbital head length	38.6	7	37.4	1.7	35.6–39.6

spaced, with crowns slightly recurved; anterior 11–15 on each side unequally bicuspid, implanted with shafts angled slightly outward; an occasional unequally tricuspid tooth among the bicuspid; posterolateral and posterior teeth unicuspid; about six most posterior unicuspid larger than midlateral unicuspid. Lower jaw rather shallow but not flattened. Lower-jaw dentition of haplochromis type, the outer row with 44–65 teeth (total). Inner teeth of both jaws in two or (modally) three rows; unicuspid, crowns recurved slightly.

Lower pharyngeal bone dissected from holotype (Figure 9C–F) and four paratypes (85.9–106.9 mm SL); subtriangular, rather heavily built; posterior contour variably concave medially a slight to moderate amount, with short robust horns that widen distally (Figure 9E). Median suture varying from straight or slightly sinuous to meandering posteriorly with several short interdigitations (Figure 9F). Keel slightly descending, deep, but with length greater than depth; strongly convex below (Figure 9D). Bone robust in posterior view (Figure 9C). Lateral edges of



TABLE 8. Meristic characters of *Otopharynx aletes*. Abbreviations: Q, quartile.

	Holotype	Paratypes				Range
		N	Median	1 <sup>st</sup> Q	3 <sup>rd</sup> Q	
Squamation:						
Lateral-line scales	34	7	35	35	36	34–36
Upper lateral-line scales	25	6	26	24.75	28	24–28
Lower lateral-line scales	14	4	14	13	16.5	13–17
Lateral-line scales on caudal fin	1	6	2	1	2	1–2
Kink length	1	4	0.5	0	1.75	0–2
Upper transverse line scales	6	7	5	5	5	5–5
Lower transverse line scales	10	5	10	10	10	10–10
Cheek scale rows	3	7	3	3	3	2–4
Scales between pectoral- and pelvic-fin bases	8	5	9	8	9.5	8–10
Fins:						
Dorsal-fin spines	16	7	16	16	16	16–16
Dorsal-fin segmented rays	11	7	12	12	12	11–12
Dorsal-fin total elements	27	7	28	28	28	27–28
Anal-fin spines	3	7	3	3	3	3–3
Anal-fin segmented rays	9	7	9	8	9	8–9
Anal-fin total elements	12	7	12	11	12	11–12
Pectoral-fin rays	15	7	15	14	15	14–15
Gill rakers:						
Epibranchial	4	7	4	4	4	4–4
Angle	1	7	1	1	1	1–1
Lower limb	10	7	11	11	11	10–11
Total	16	7	16	16	16	15–16
Oral teeth:						
Outer upper-jaw teeth (total both sides)	69	7	60	58	65	54–67
Outer lower-jaw teeth (total both sides)	49	7	52	45	61	44–65

dentigerous surface with a row of regularly and closely spaced, small, acutely cuspidate teeth. Posterior half of median dentigerous area with a roughly circular patch of enlarged, molariform teeth with domelike crowns, tooth size and degree of molarization decreasing beyond edges of circular area (Figure 9E). Teeth in anterior half of 2–4 median columns bicuspid and smaller than posterior molars, but clearly larger than lateral teeth. Posterolateral areas with teeth small, closely spaced, laterally compressed, bicuspid. Teeth in posterior row 33–41 (holotype: 33); in each median column 7–11 (holotype: 7–8); in each oblique row 5–7 (holotype: 6).

Lacrimal bone (Figure 2D) bearing four neuromasts and five lateral-line pores; lacrimal notch distinct.

Gill rakers 10–11 on lower limb of outer arch; unbranched, subequal in length; some specimens lacking any melanophores, others having several melanophores on each lower-limb raker.

Scales ctenoid; 34–36 in lateral line. Lateral line discontinuous; upper section with downward kink one to two scales long, or kink lacking. Squamation extending onto caudal fin between fin rays, to near tips of upper and lower lobes and on basal one-fourth to two-fifths along middle rays. Soft dorsal and anal fins with a few small scales between bases of some rays. Size transition gradual from larger abdominal to smaller thoracic scales.

*Coloration in life.* Not recorded.

*Coloration in preservative* (Figure 9A–C). Head and flanks medium brown, dorsal head surface and nuchal region a little darker; no silvery or whitish areas on chest or belly (Figure 9A). An opercular spot; an indefinite darker area between eye and rear of upper jaw, broadest along orbital margin; no distinct head stripes (Figure 9B). Branchiostegal membrane dark brown in males. Seven or eight narrow dark vertical bars below dorsal-fin base. Three lateral spots present but usually faint (most distinct in holotype), suprapectoral spot larger and usually darker than supraanal and precaudal spots. Suprapectoral spot trapezoidal with anterior edge sloping up and forward, this spot overlapping subdorsal bars 3 and 4, covering six to seven consecutive upper lateral-line scales, and extending vertically from just above lateral midline to one-half scale above upper lateral-line canals. Supraanal spot on last subdorsal bar between upper and lower lateral lines, when visible a little wider and darker than the bar. Precaudal spot at end of caudal peduncle. No dorsal midline spots. Dorsal fin with pale lappets, remainder of fin brownish with thinly scattered melanophores; vague maculae in soft part. Anal fin brownish, paler basally, without evident eggspots in available specimens. Caudal fin brown, darkest on upper and

lower leading edges; no obvious markings. Pelvics brown on leading half of fin, unmarked on remainder. Pectorals without melanophores.

*Maximum size.* The largest paratype measures 135.0 mm TL.

#### Distribution.

Snoeks and Hanssens (2004:296) reported what seems to be this species (as *Otopharynx* sp. “molariform striped”) from Senga Bay (depth not provided). Otherwise, it is known only from the type locality (Figure 1), off Bua Point in at least 55 m depth. These two localities are about 115 km apart. Current status of the species requires verification.

#### Etymology.

From the Greek masculine nominative singular noun ἀλέτης (alétes), a grinder. The name alludes to the well-defined group of conspicuously enlarged molariform teeth on the lower pharyngeal bone. A noun in apposition.

#### Remarks.

The type series was part of the catch from a half-hour bottom trawl. As the net was brought on deck, the fish dumped into boxes and sorted, most specimens received damage to the scales on the flanks, caudal peduncle, or both. As a result, accurate counts of certain squamation characters could not be obtained from some specimens, although application of Cyanine Blue dye to emphasize the scale pockets permitted some scale counts not otherwise possible.

The diet of the species is unknown; gut contents of the type specimens were not investigated.

Three paratypes are female. Their ovaries contain immature ova approximately ¼ mm in diameter. Several males including the holotype appear to be adult but nonbreeding.

### *Otopharynx panniculus* new species

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Figures 2E, 10, 12, Tables 9, 10

*Trematocranus brevirostris* [not of Trewavas, 1935]: Turner 1996:173, 188 [species more recently called *Otopharynx* “brevirostris yellow,” G. Turner, pers. comm. 13 June 2018].

#### Holotype.

YPM ICH 031027, 72.2 mm SL, male; Malaŵi: Lake Malaŵi, southwest arm, bottom trawl off Kasankha (or Kasanga) Bay, Lake Malaŵi Trawling Survey station Kasankha II, M/L *Ethelwynn Trewavas*, depth ~42 m; approx. 2-km haul at about 14°06'S 34°50'E; Malaŵi Fisheries Department staff, 7 March 1972.

#### Paratypes.

YPM ICH 014162, 9 (most apparently male, a few undetermined), 66.2–72.5 mm SL; collected with the holotype.

#### Additional Nontype Material.

AMNH I-221760 SW, two (females; cleared and stained, used for fin-ray and vertebral counts only), 66.0–69.0 mm SL; Malaŵi: Lake Malaŵi, southeast arm, bottom trawl off Nkopi Bay, Lake Malaŵi Trawling Survey station Nkopi III, M/L *Ethelwynn Trewavas*, depth ~55 m; approx. 2-km haul at about 14°09'00"S 35°06'30"E; Malaŵi Fisheries staff, 28 February 1972.

#### Diagnosis.

A small (<10 cm TL), laterally spotted haplochromine which is recognized by the following combination of characters: prominent, quadrate suprapectoral spot spanning subdorsal vertical bars 3–4, this spot below and touching the upper lateral line and usually extending slightly above it; 13–15 lower-limb gill rakers; and deep body (depth 34.4–38.2% SL). The shape and placement of the suprapectoral spot distinguish *O. panniculus* from *O. brooksi*, *O. lithobates*, and *O. ovatus*, in all of which this spot lies entirely below and usually separated from the upper lateral line. Its shorter lateral line of 31–33 scales discriminates *O. panniculus* from *O. decorus* (36–38), *O. argyrosoma* (34–36), and *O. selenurus* (34–35). Its higher gill-raker count (13–15 on lower limb) distinguishes *O. panniculus* from *O. tetrastigma* (9–11), *O. speciosus* (11–12), and *O. antron* (10–11). Its shorter head (31.9–33.7% SL) and longer caudal peduncle (18.8–21.7% SL) distinguish *O. panniculus* from *O. speleotes* (head 34.8–36.6% SL; caudal peduncle length 13.2–15.6% SL). Its 15–16 dorsal-fin spines and lack of dorsal midline spots separate *O. panniculus* from *O. heterodon*, which has 17–18 dorsal spines and five or six distinct, small, dark dorsal midline spots just below the dorsal-fin base. The presence of several slightly enlarged teeth in the median columns of the lower pharyngeal bone separates *O. panniculus* from *O. auromarginatus* and *O. tetraspilus*, which have only small, compressed, bicuspid pharyngeal teeth. In *O. panniculus* the lips are thin and lack median lobes, distinguishing it from *O. pachycheilus* (lips hypertrophied, with prominent median lobes). Compared to *O. aletes*, *O. panniculus* has fewer lateral-line scales (31–33 vs. 34–36) and a lighter lower pharyngeal jaw and dentition (compare Figs. 10D–G and 9C–F), with small, laterally compressed, bicuspid posteromedian pharyngeal teeth (vs. these teeth enlarged, molarized), slender posterior horns (vs. horns thickened), and anterior blade longer, shallower (vs. blade shorter, deeper). Compared to *O. peridodeka*, *O. panniculus* has fewer lateral-line scales (31–33 vs. 34–35), usually has more lower-limb gill rakers (13–15, median 14.5, vs. 11–13, median 12), and lower pharyngeal teeth more uniform in size (compare Figs. 10F and 13F), those of the median columns scarcely larger than the more lateral teeth (vs. posterior teeth of median columns distinctly enlarged relative to lateral teeth). *Otopharynx panniculus* superficially resembles *Trematocranus* “brevirostris deep” (Turner 1996), but that still-undescribed species is from substantially deeper water (90–102 m vs. ~42 m), the suprapectoral spot apparently spans subdorsal bars 2–3 (vs. bars 3–4 in *O. panniculus*) and there are 10–13 lower-limb gill rakers (vs. 13–15) (see further comments on *T. “brevirostris deep”* in Remarks under *Otopharynx peridodeka*, below). *Trematocranus brevirostris* itself (see Figure 11) is also similar, but in *O. panniculus* the suprapectoral spot is roughly square, covers four to

TABLE 9. Morphometric characters of *Otopharynx panniculus*. Abbreviations: LLL, lower lateral line; S.D., standard deviation.

	Holotype	Paratypes			
		N	Mean	S.D.	Range
Standard length (mm)	72.2	9	69.6	2.1	66.2–72.5
Head length (mm)	24.3	9	22.7	0.7	21.6–23.7
Percentage of standard length:					
Head length	33.6	9	32.6	0.6	31.9–33.7
Body depth	38.2	9	35.4	1.0	34.4–37.6
Dorsal-fin base length	54.9	9	54.2	0.8	52.9–55.6
Predorsal length	37.6	9	36.6	1.0	35.6–38.6
Prepectoral length	32.5	9	32.4	0.7	31.3–34.0
Prepelvic length	39.1	9	38.1	0.5	37.4–38.9
Preanal length	66.9	9	65.4	0.7	63.9–66.4
Pelvic fin origin to anal fin origin	27.9	9	28.1	0.5	27.7–29.0
Anal-fin base length	17.5	9	17.3	0.8	16.0–18.6
Caudal peduncle length	19.1	9	20.4	1.0	18.8–21.7
Caudal peduncle depth	11.4	9	11.1	0.2	10.9–11.5
Pectoral-fin length	38.7	8	40.5	1.7	38.0–42.3
Pelvic-fin length	29.3	9	27.7	2.4	23.1–31.7
Dorsal-fin origin to anal-fin origin	50.1	9	48.7	0.8	47.5–50.1
Dorsal-fin origin to end of anal-fin base	58.1	9	57.5	1.1	55.2–59.2
Pelvic-fin origin to end of dorsal-fin base	52.8	9	52.3	0.9	51.4–53.6
End dorsal-fin base to end anal-fin base	16.3	9	16.1	0.8	14.9–17.6
Anal-fin origin to end of dorsal-fin base	30.4	9	29.7	0.8	28.7–30.9
Dorsal-fin origin to pelvic-fin origin	36.5	9	34.8	0.9	33.8–37.0
End dorsal-fin base to end hypurals at LLL	19.6	9	19.0	0.6	17.9–19.9
End anal-fin base to end hypurals at LLL	21.5	9	22.3	0.8	20.7–23.1
Percentage of head length:					
Head width	43.1	9	43.5	0.6	42.6–44.5
Interorbital width	19.5	9	20.6	0.8	19.6–22.2
Snout length	29.5	9	29.1	0.9	28.1–30.4
Snout width	27.5	9	27.7	1.3	26.0–29.3
Lower-jaw length	39.3	9	38.5	1.2	36.7–40.4
Lower-jaw width	16.6	9	17.4	1.4	15.2–19.3
Premaxillary pedicel length	30.7	9	28.8	0.9	27.2–30.2
Upper-jaw length	28.3	9	28.0	0.8	27.0–29.4
Cheek depth	19.9	9	19.5	1.2	17.6–21.0
Orbit length	36.8	9	37.6	0.8	36.5–38.8
Vertical eye diameter	33.5	9	34.2	1.2	32.3–36.5
Lacrimal (preorbital) depth	19.5	9	18.8	0.6	18.1–19.9
Postorbital head length	37.9	9	37.8	0.7	36.7–39.0

five longitudinal scales, and is located almost entirely below the upper lateral line (vs. taller than long, covers three scales, and at least in the lectotype is placed more above than below the upper lateral line, see Eccles and Trewavas 1989: fig. 76), the cephalic lateral-line system is not enlarged (vs. pores and canals of the preorbital, nasal, dentary, and lacrimal bones inflated), there are 52–66 upper-jaw teeth (vs. ~43), and 3–4 cheek scale rows (vs. 2).

#### Description.

Morphometric and meristic data are given in Tables 9 and 10.

Deep-bodied, body depth 34.4–38.2% SL (Figure 10A). Dorsal profile straight above snout, then evenly convex to end of dorsal-fin base. Premaxillary pedicels not prominent, their angle 42–50°, interorbital angle 36–46°, nuchal angle 20–28°. Ventral profile a less-convex mirror image of dorsal profile. Jaws equal

TABLE 10. Meristic characters of *Otopharynx panniculus*. Fin-ray and tooth counts from two cleared and stained specimens are included. *Abbreviations*: Q, quartile.

	Holotype	Paratypes				Range
		N	Median	1 <sup>st</sup> Q	3 <sup>rd</sup> Q	
<b>Squamation:</b>						
Lateral-line scales	33	7	32	32	32	31–33
Upper lateral-line scales	21	7	20	19	24	19–26
Lower lateral-line scales	15	6	14.5	13.5	15	12–15
Lateral-line scales on caudal fin	2	7	2	1	2	0–2
Kink length	0	7	0	0	3	0–4
Upper transverse line scales	5	7	5	4	5	4–5
Lower transverse line scales	9	8	9	8	9	8–9
Cheek scale rows	3	8	3	3	3	3–4
Scales between pectoral- and pelvic-fin bases	8	4	8	8	8.75	8–9
<b>Fins:</b>						
Dorsal-fin spines	15	10	16	15.75	16	15–16
Dorsal-fin segmented rays	11	10	10	10	10.25	9–11
Dorsal-fin total elements	26	10	26	25.75	26	25–27
Anal-fin spines	3	10	3	3	3	3–3
Anal-fin segmented rays	8	9	8	8	9	8–9
Anal-fin total elements	11	9	11	11	12	11–12
Pectoral-fin rays	14	9	14	14	14	14–14
<b>Gill rakers:</b>						
Epibranchial	4	10	5	5	5.25	4–6
Angle	1	10	1	1	1	1–1
Lower limb	13	10	14.5	14	15	13–15
Total	18	10	20.5	20	21.25	18–22
<b>Oral teeth:</b>						
Outer upper-jaw teeth (total both sides)	63	10	61	55	64.25	52–66
Outer lower-jaw teeth (total both sides)	—	7	50	42	57	40–62

anteriorly or lower projecting very slightly, lower jaw dorsoventrally somewhat flattened; lips thin and not lobate. Gape inclination 30–42°. Lower-jaw length–width ratio narrow, the hemijaws, as seen from below, converging toward the rear and nearly touching posteriorly (Figure 10C). Lower-jaw underside angle 27–40°. Snout acuteness 77–80°. Eyes large (36.5–38.8% HL), round; pupil pointed anteriorly, rounded posteriorly; eye nearly reaching dorsal head profile. Caudal peduncle 18.8–21.7% SL, its length 1.7–2.0 times its depth.

Soft dorsal and anal fins produced, more so in males. Caudal fin emarginate. Pectoral fin 38.0–42.3% SL, reaching beyond level of third anal-fin spine base. Pelvic fin 23.1–31.7% SL.

Dental arcade of each jaw rounded. Upper jaw with 52–66 teeth (total) in outer row; movably implanted, rather closely spaced. Anterior and anterolateral teeth unequally bicuspid with acute cusps, crowns slightly incurved; occasional unequally tricuspid teeth present; posterior teeth unicuspid with acute crowns. Lower-jaw outer tooth row of haplochromis type, with 40–62 teeth (total). Crowns similar to those of upper jaw. Lower jaw somewhat flattened, dorsoventrally shallow, so that anterior and anterolateral teeth are implanted with shafts angled outward. Inner teeth small, unicuspid to weakly tricuspid, in two rows spaced closely one behind the other.

Lower pharyngeal bone dissected from holotype (Figure 10D–G) and all nine paratypes; subtriangular (Figure 10F), appearing lightly built in posterior view (Figure 10D); posterior contour emarginate, each half slightly convex, the halves meeting at an obtuse angle; horns slender, rather long (Figure 10F). Median suture straight (Figure 10G). Keel long, shallow, straight, its length about twice its depth; weakly convex below (Figure 10E). Dentigerous surface somewhat concave in lateral view. One to four posterior teeth of each median column slightly enlarged but cuspidate, not molarized (one paratype with no teeth enlarged); lateral teeth small, bicuspid, rather crowded. Teeth in posterior row 39–48 (holotype: 41), in each median column 9–13 (holotype: 11), in each oblique row 6–10 (holotype: 7).

Lacrimal bone (Figure 2E) bearing four neuromasts and five lateral-line pores; lacrimal notch obsolete.

Gill rakers 13–15 (median 15) on lower arch; slender, unbranched; melanophores variably present on outer surface of outer-arch rakers.

Scales ctenoid; 31–33 (median 32) in lateral line. Lateral line discontinuous, upper section with downward kink three to four scales long, or (modally) lacking a kink. Squamation extending onto caudal fin between fin rays, to near tips of upper and lower lobes and on basal one-third of fin along middle rays. Soft dor-

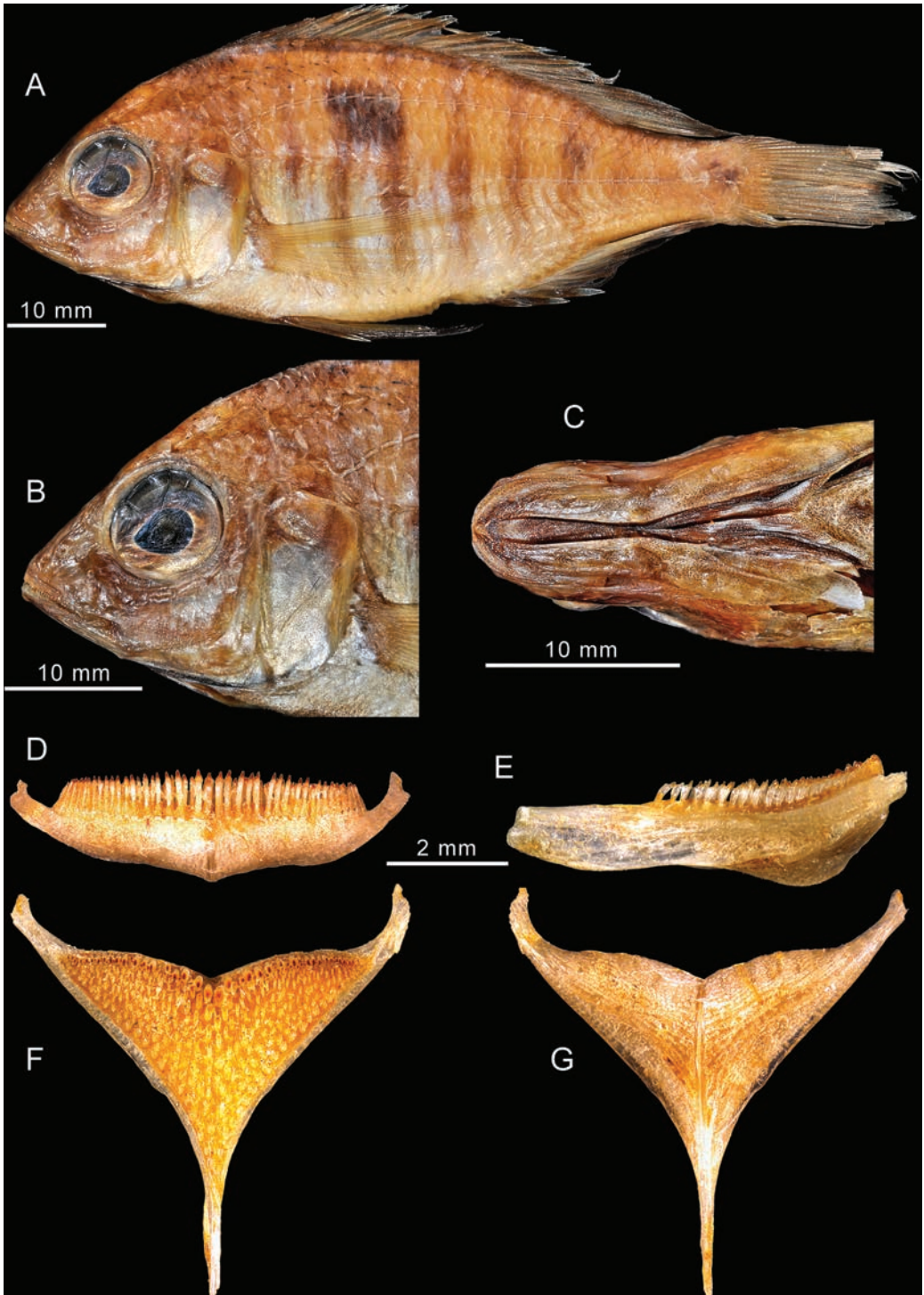


FIGURE 10. *Otopharynx panniculus*. **A.** Holotype, YPM ICH 031027, 72.2 mm SL, male. **B.** Head of holotype. **C.** Underside of head of holotype. **D–G.** Lower pharyngeal bone of a paratype (YPM ICH 014162, 68.9 mm SL, not sexed), in posterior (D), left lateral (E), dorsal (F), and ventral (G) views.



FIGURE 11. Possibly the true *Trematocranus brevirostris* Trewavas. This specimen (not examined) was seined in 2017 at the Palm Beach hotel located at the extreme south of the southeast arm. That locality resembles ecologically, and is near to, the type locality of *T. brevirostris*, “Bar House” (a previous hotel). Cuthbert Christy, who in 1925 made the collections studied by Trewavas (1935), described “Bar House and surrounding regions” as follows: “All shallow water. Coast consists of sandy bays and small inlets with almost everywhere a fringe, broken here and there, of tall matete reeds. Near the outlet of the Shire R. bulrushes and papyrus take the place of the tall reeds. Bottom almost everywhere sandy” (Christy 1925). Photograph by George Turner.

sal and anal fins with a few small scales between bases of some rays. Larger scales of lower flank transition gradually to smaller chest and belly scales between bases of pectoral and pelvic fins.

Vertebrae (counted in two cleared and stained specimens, see Additional material, above)  $13 + 19 = 32$ ,  $14 + 18 = 32$ .

**Coloration in life.** Live coloration of males and females is unknown. However, a freshly trawled male and female of *Otopharynx* “*brevirostris* yellow,” thought to be *O. panniculus*, are shown in Figure 12. The male (Figure 12A) is silvery on flanks, white on chest, with about six gray vertical bars below dorsal-fin base. Lower half of head bright orange-yellow. Suprapectoral spot and faint supraanal and precaudal spots steel-blue, shaped and placed as in holotype. Dorsal fin lappets orange distally, whitish proximally; orange maculae between soft rays. Caudal fin brownish with orange maculae. Anal fin pale with three or four large yellow eggspots. Pelvic fin apparently with black leading edge. Pectorals hyaline. The presumptive female (Figure 12B) is predominantly silvery to white on body, chest, and head. Three distinct lateral spots; vertical bars faint. Oval orange markings evident throughout dorsal and caudal fins.

**Coloration in preservative** (Figure 10A–C). Upper and lateral head surfaces light brown, nuchal area darker; upper half of lacrimal dark brown; operculum silvery with faint brown posterodorsal spot (Figure 10B). Underside of head, including branchiostegal membrane and geniohyoid area between left and right hemijaws, dark brown in males (Figure 10C). Flanks light brown above midline, silvery below; no distinct dorsal midline spots; chest peppered with dark pigment in males (Figure 10C). Eight (mode) or nine dark vertical bars below dorsal-fin base, narrower than or equal to the interspaces; two to three fainter

bars on caudal peduncle. Suprapectoral spot square to parallelogram-shaped, darker brown than bars, extending longitudinally between subdorsal bars 3 and 4, covering four (mode) to nearly five lateral-line scales, and vertically from just above lateral midline of flank to one-half scale above upper lateral line. Supraanal spot small, variably present, appearing as a darkening on last subdorsal bar between lateral lines. Precaudal spot on lower lateral line at end of caudal peduncle, slightly more distinct than supraanal spot. Dorsal fin brownish with pale lappets; no submarginal stripe; indistinct marbling in soft dorsal. Anal fin brownish, shading in males to black on distal half; no eggspots visible. Caudal brownish without distinct markings. Pelvics of males blackish with narrow pale leading edge. Pectorals pale yellow, transparent.

**Maximum size.** The largest known specimen is a paratype 92.8 mm TL. A female (AMNH I-221760 SW) as small as 69 mm SL had contained ripe ovarian ova before I cleared and stained it.

#### Distribution.

The type locality, in ~42 m off Kasankha Bay, is in the southwest arm off its eastern shore (Figure 1). The species has also been trawled in ~55 m off Nkopi (Nkope) Bay, Malawi, in the southeast arm off its western shore. Current population status is unknown.

#### Etymology.

From the Latin noun *panniculus*, a small cloth patch, with reference to the appearance of the quadrate suprapectoral spot neatly “stitched” between two vertical bars. A noun in apposition.

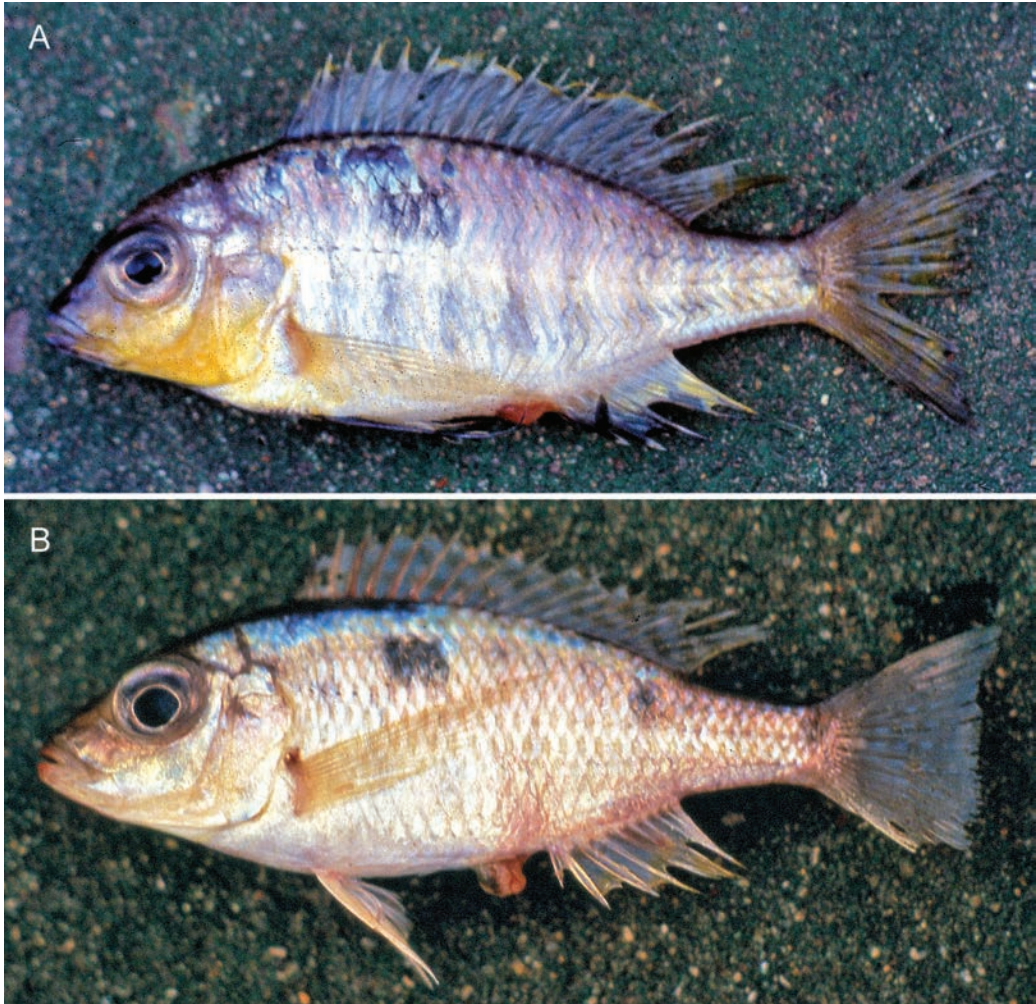


FIGURE 12. *Otopharynx* “brevirostris yellow,” freshly captured individuals apparently conspecific with *O. panniculus*. A. Male trawled in 35–40 m depth northwest of Boadzulu Island, southeast arm, 29 July 1991. Examination showed 14 lower gill rakers, 31 scales in lateral line, and lower pharyngeal bone with papilliform teeth. B. Female trawled in 19–26 m depth, center of southeast arm between Namiasi and Malindi, 19 July 1991. Photographs and data by George Turner.

#### Remarks.

Specimen labels suggest that the Lake Malaŵi Trawling Survey (LMTS) personnel referred to this species as *Haplochromis* sp. B and *Haplochromis* “cf. heterodon” during the early 1970s. The name *Haplochromis* sp. B has been applied to at least one other species by LMTS personnel.

Multiple scales and outer oral teeth have been lost in the type series, likely due to abrasion, as these small fish were brought on deck, dumped from the trawl net into boxes, and sorted. Some scale counts were made with the aid of Cyanine Blue dye.

Gut contents were not studied; the diet of this species remains unknown.

#### *Otopharynx peridodeka* new species

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Figures 2F, 13, 14, Tables 11, 12

? *Trematocranus* “brevirostris deep”: Turner (1996:173, 189).

#### Holotype.

YPM 031026, 92.2 mm SL, ripe male; Malaŵi: Lake Malaŵi, bottom trawl off Sungu Point, Lake Malaŵi Trawling Survey sta-

TABLE 11. Morphometric characters of *Otopharynx peridodeka*. Abbreviations: LLL, lower lateral line; S.D., standard deviation.

	Holotype	Paratypes			
		N	Mean	S.D.	Range
Standard length (mm)	92.2	11	79.8	10.0	62.7–92.1
Head length (mm)	29.2	11	25.8	3.1	19.9–29.8
Percentage of standard length:					
Head length	31.7	11	32.3	0.9	31.1–34.0
Body depth	33.5	11	33.0	1.4	30.7–35.0
Dorsal-fin base length	52.7	11	53.3	0.9	51.9–54.9
Predorsal length	35.4	11	36.7	1.3	34.4–38.6
Prepectoral length	31.5	11	32.4	0.6	31.6–33.9
Prepelvic length	38.6	11	38.0	0.7	36.7–39.1
Preanal length	64.5	11	64.9	0.6	63.4–65.6
Pelvic fin origin to anal fin origin	27.2	11	27.7	1.1	25.4–29.3
Anal-fin base length	17.7	11	17.9	0.8	16.3–19.0
Caudal peduncle length	20.0	11	19.7	0.8	18.2–21.0
Caudal peduncle depth	10.9	11	10.4	0.4	9.9–11.2
Pectoral-fin length	34.7	11	35.7	3.2	30.2–40.4
Pelvic-fin length	29.1	11	24.0	3.6	18.6–30.1
Dorsal-fin origin to anal-fin origin	46.8	11	46.5	1.1	44.8–48.1
Dorsal-fin origin to end of anal-fin base	56.3	11	56.2	0.9	55.2–57.8
Pelvic-fin origin to end of dorsal-fin base	50.7	11	50.8	0.8	49.7–52.6
End dorsal-fin base to end anal-fin base	16.1	11	14.7	0.6	13.4–15.7
Anal-fin origin to end of dorsal-fin base	28.8	11	28.3	0.7	27.2–29.4
Dorsal-fin origin to pelvic-fin origin	33.8	11	33.0	1.3	30.8–35.0
End dorsal-fin base to end hypurals at LLL	20.0	11	18.6	0.7	17.6–19.8
End anal-fin base to end hypurals at LLL	22.4	11	21.6	0.8	20.0–22.4
Percentage of head length:					
Head width	43.4	11	43.3	1.0	42.0–44.8
Interorbital width	20.5	11	20.8	1.2	18.7–22.7
Snout length	32.5	11	31.4	1.2	29.3–33.4
Snout width	27.4	11	27.6	1.4	25.2–29.6
Lower-jaw length	36.7	11	35.9	1.2	33.9–38.0
Lower-jaw width	17.7	11	17.1	1.4	15.3–20.3
Premaxillary pedicel length	28.5	11	29.2	1.2	27.0–30.8
Upper-jaw length	28.9	11	27.1	1.1	25.9–28.8
Cheek depth	18.7	11	18.7	0.9	17.1–19.8
Orbit length	34.7	11	36.8	0.8	35.0–38.2
Vertical eye diameter	31.2	11	33.8	0.9	31.5–35.0
Lacrimal (preorbital) depth	21.8	11	21.6	1.7	19.9–24.7
Postorbital head length	38.9	11	36.9	1.2	34.7–39.1

tion Sungu III, M/L *Ethelwynn Trewavas*, depth 59 m; approx. 2-km haul at about 13°30'26"S 34°31'44"E–13°31'05"S 34°32'36"E; Malaŵi Fisheries Department staff, 28 July 1971.

#### Paratypes.

YPM ICH 014120, 13 (six male, five female, two undetermined; meristic data taken from all; two distorted specimens were

excluded from morphometrics), 62.7–92.1 mm SL; collected with the holotype.

#### Diagnosis.

A small (<12 cm TL), laterally spotted haplochromine recognizable by the following combination of characters: spots often indistinct, the suprapectoral spot (when discernible) vaguely



TABLE 12. Meristic characters of *Otopharynx peridodeka*. Abbreviations: Q, quartile.

	Holotype	Paratypes				Range
		N	Median	1 <sup>st</sup> Q	3 <sup>rd</sup> Q	
Squamation:						
Lateral-line scales	34	6	35	34.75	35	34–35
Upper lateral-line scales	27	7	26	24	28	24–29
Lower lateral-line scales	13+	4	14.5	12.5	15	12–15
Lateral-line scales on caudal fin	1	5	2	0.5	2	0–2
Kink length	1	5	3	0	4.5	0–5
Upper transverse line scales	4	7	5	5	5	4–5
Lower transverse line scales	8	7	10	8	10	8–10
Cheek scale rows	3	12	3	3	3	2–3
Scales between pectoral- and pelvic-fin bases	8	7	9	9	9	8–9
Fins:						
Dorsal-fin spines	17	12	16	16	16	16–17
Dorsal-fin segmented rays	10	13	11	11	12	10–13
Dorsal-fin total elements	27	12	27	27	28	26–28
Anal-fin spines	3	13	3	3	3	3–3
Anal-fin segmented rays	8	13	9	9	9	8–10
Anal-fin total elements	11	13	12	12	12	11–13
Pectoral-fin rays	14	13	15	14	15	14–15
Gill rakers:						
Epibranchial	5	13	4	4	5	4–5
Angle	1	13	1	1	1	1–1
Lower limb	12	13	12	11	12	11–13
Total	18	13	17	16.5	18	16–19
Oral teeth:						
Outer upper-jaw teeth (total both sides)	78	13	60	56.5	64.5	48–73
Outer lower-jaw teeth (total both sides)	60	11	58	54	59	41–63

rectangular, centered on subdorsal bar 3 or connecting bars 3 and 4, and covering four to five consecutive lateral-line scales, extending vertically from just above lateral midline to half a scale above upper lateral line; about seven vertical gray bars below dorsal-fin base; 34–35 scales in lateral line; 11–13 (median 12) gill rakers on lower limb; 48–73 teeth in outer row of upper jaw; lower pharyngeal bone with a few posteromedian teeth enlarged (submolariform to molariform); lacrimal bone lacking a notch at base of lacrimal process (Figure 2F). *Otopharynx peridodeka* is superficially most similar to *O. panniculus*, which also lacks a lacrimal notch, but *O. peridodeka* has more scales in the lateral line (34–35, vs. 31–33 in *O. panniculus*), usually fewer lower gill rakers (11–13, median 12, vs. 13–15, median 14.5, in *O. panniculus*), posteromedian pharyngeal teeth distinctly enlarged relative to more lateral teeth (vs. median and lateral teeth of nearly uniform size), averages fewer teeth in the posterior row of the lower pharyngeal bone (37–44, vs. 42–48 in *O. panniculus*), and has a deeper lacrimal bone (19.9–24.7% HL, vs. 18.1–19.9% in *O. panniculus*). Compared to *O. aletes*, *O. peridodeka* has the hemijaws in ventral view posteriorly convergent, approximated (vs. divergent, distant; compare Figs. 13C and 9G); and lower pharyngeal bone more lightly built, with narrower posterior horns, posteromedian teeth somewhat enlarged but laterally

compressed, cuspidate (vs. bone heavier, horns thickened, posterior teeth of median rows enlarged, crowns molarized, nearly hemispherical; compare Figs. 13D–G and 9C–F). *Trematocranus brevivirostris* (see Figure 11) is somewhat similar, but in *O. peridodeka* the suprapectoral spot is rectangular, covering four to five longitudinal scales, and is located almost entirely below the upper lateral line (vs. taller than long, covering three scales and, at least in the lectotype, placed more above than below the upper lateral line), the cephalic lateral-line system is not enlarged (vs. pores and canals of the preorbital, nasal, dentary, and lacrimal bones inflated), and there are 48–73 outer upper-jaw teeth (vs. ~43).

#### Description.

Morphometric and meristic data are given in Tables 11 and 12. Moderately deep-bodied, body depth 30.7–35.0% SL (Figure 13A). Dorsal profile of snout straight or slightly convex, head and nuchal profile nearly straight or variably convex, dorsum convexly curved to end of dorsal-fin base. Premaxillary pedicels slightly prominent in head profile, their angle 44–57°, interorbital angle 31–40°, nuchal angle 19–25°. Ventral profile almost a mirror image of dorsal profile. Jaws equal anteriorly, lower jaw

slightly flattened dorsoventrally; lips thin and not lobate. Gape inclination 26–36°. Lower-jaw length–width ratio narrow, the hemijaws, as seen from below, converging toward the rear (Figure 13C). Lower-jaw underside angle 25–35°. Snout acuteness 71–84°. Eyes large (orbit length 34.7–38.2% HL), slightly oval (vertical eye diameter 31.2–35.0% HL); pupil somewhat pointed anteriorly, rounded posteriorly; eye nearly reaching dorsal head profile. Caudal peduncle 18.2–21.0% SL, its length 1.7–2.1 times its depth.

Soft dorsal and anal fins produced, more so in males. Caudal fin emarginate. Pectoral fin 30.2–40.4% SL, reaching at least to the level of first anal-fin spine base and even as far as the base of second soft ray, the length apparently not correlated with sex, as one of the specimens with the extreme pectoral extent is an ovigerous female. Pelvic fin 18.6–30.1% SL, produced in males.

Dental arcade rounded in each jaw. Upper jaw with 48–73 teeth (total) in outer row; outer teeth closely spaced, larger near symphysis. Anterior to lateral teeth unequally bicuspid with long, acutely pointed major cusp, an occasional tricuspid tooth intermixed; about 10–12 posterior teeth unicuspid. Outer lower-jaw teeth similar in form to those of upper jaw; those in antero-lateral area angled somewhat outward whereas anterior and posterior teeth are more erectly implanted. Lower-jaw outer tooth row of haplochromis type, with 41–63 teeth (total). Inner teeth unequally tricuspid, in two to three rows.

Lower pharyngeal bone dissected from holotype (Figure 13D–G) and all 13 paratypes; subtriangular, somewhat lightly built; posterior contour emarginate, the halves meeting at an obtuse angle; horns moderately long and robust, widening distally (Figure 13F). Median suture straight to slightly sinuous (Figure 13G). Keel slightly descending, longer than deep, strongly convex below (Figure 13E). Bone of moderate depth in posterior view (Figure 13D). Several posteromedian teeth variably enlarged (Figure 13F). In holotype, six to seven teeth on each side of midline enlarged, a few with somewhat flattened crowns but only about three teeth submolariform. In a paratype of 81.3 mm SL about 11 posteromedian teeth enlarged to varying degree, four of them molariform, lacking any distinct cusp and with crown nearly flattened, other teeth less enlarged and cuspidate. In all specimens, lateral pharyngeal teeth small, bicuspid. Teeth in posterior row 37–44 (holotype: 42); in each median column 7–12 (holotype: 10–11); in each oblique row 5–8 (holotype: 6–8).

Lacrimal bone (Figure 2F) bearing four neuromasts and five lateral-line pores; lacrimal notch obsolete.

Gill rakers 11–13 (median 12) on lower arch, rather short (13 in only one paratype unilaterally, with lowermost two rakers very short and closely spaced, 12 on other side); few melanophores.

Scales ctenoid; 34 or (median) 35 in lateral line. Lateral line discontinuous, upper section with downward kink three to five scales long, or kink lacking. Squamation extending onto caudal fin between fin rays, to near tips of upper and lower lobes and on basal one-fourth along middle rays. Soft dorsal and anal fins with two to three series of small scales between bases of some rays. Larger scales of lower flanks transition gradually to smaller chest and belly scales between pectoral- and pelvic-fin bases.

*Coloration in life.* Coloration of living individuals is unknown. However, a fresh male and female identified as *O. "brevirostris deep"* (Figure 14) are thought to belong to this species. Both are gray dorsally, silvery on flanks, white on belly, chest, and head

below eye; six gray bars below dorsal-fin base; indistinct gray suprapectoral, supraanal, and precaudal spots; unpaired fins of male yellowish, dorsal with black lappets and orange maculae between spines and rays; pelvics yellow, those of male with distinct black leading edges; pectorals hyaline. Turner (1966:189) provides a detailed description of the coloration of breeding males of *O. "brevirostris deep."*

*Coloration in preservative* (Figure 13A–C). The holotype (Figure 13A), a ripe male, is brown on dorsum and upper head surfaces. Lower flanks silvery, grading to white ventrally on belly and sides of chest. Operculum silvery with dark spot; dark brown spot on upper part of lacrimal (Figure 13B). Lower jaw, gular region, and branchiostegal membrane dark brown (Figure 13C); ventral chest surface light brown. Seven narrow gray vertical bars below dorsal-fin base; two bars on caudal peduncle. Suprapectoral spot brown, darker than vertical bars; supraanal and precaudal spots indistinct. No dorsal midline spots. Dorsal fin with whitish lappets; submarginal fin area brown. Anal fin pale brown with no markings evident. Caudal fin brownish. Pelvics and pectorals hyaline.

*Maximum size.* The largest specimen known to me is a paratype 115.3 mm TL. Female paratypes as small as 65.1 mm SL have ovaries full of mature orange ova. The smallest paratype (62.7 mm SL) is an immature female.

#### Distribution.

This species is known with certainty only from the type locality (Figure 1) in 59 m depth off Sungu Point on the western shore (a locality distinct from the better known Sungu Spit). However, if, as suspected, it proves to be conspecific with *Trematocranus "brevirostris deep,"* the latter is "[k]nown only from deep water, 90–102 m depth, north of Monkey Bay" (Turner 1966:189) which would extend the range some 60 km to the southeast, and into considerably deeper water.

#### Etymology.

From the Greek adverb *περι* (*peri*: around, near) and noun *δωδέκα* (*duódeka*: 12), referring to the usually 12 lower-limb gill rakers of this species (a character separating it from the similar-looking *O. panniculus* with a higher count). The compound is treated as a noun in apposition.

#### Remarks.

The holotype is a ripe male with thick, sinuous testes.

All specimens in the type series are missing many scales due to abrasion during dumping the catch and sorting it. Furthermore, all had been slit for fishery research purposes from the vent forward to a point above and in front of the right pelvic fin, with the incision continued across the chest to in front of the left pectoral fin. As a result, the chest with pelvic fins is attached only by the skin and musculature of the left lower abdominal wall. Therefore, all body depth measurements of this species are approximate, as are measurements involving the pelvic-fin origin.

The diet of *O. peridodeka* remains unknown; gut contents were not investigated.

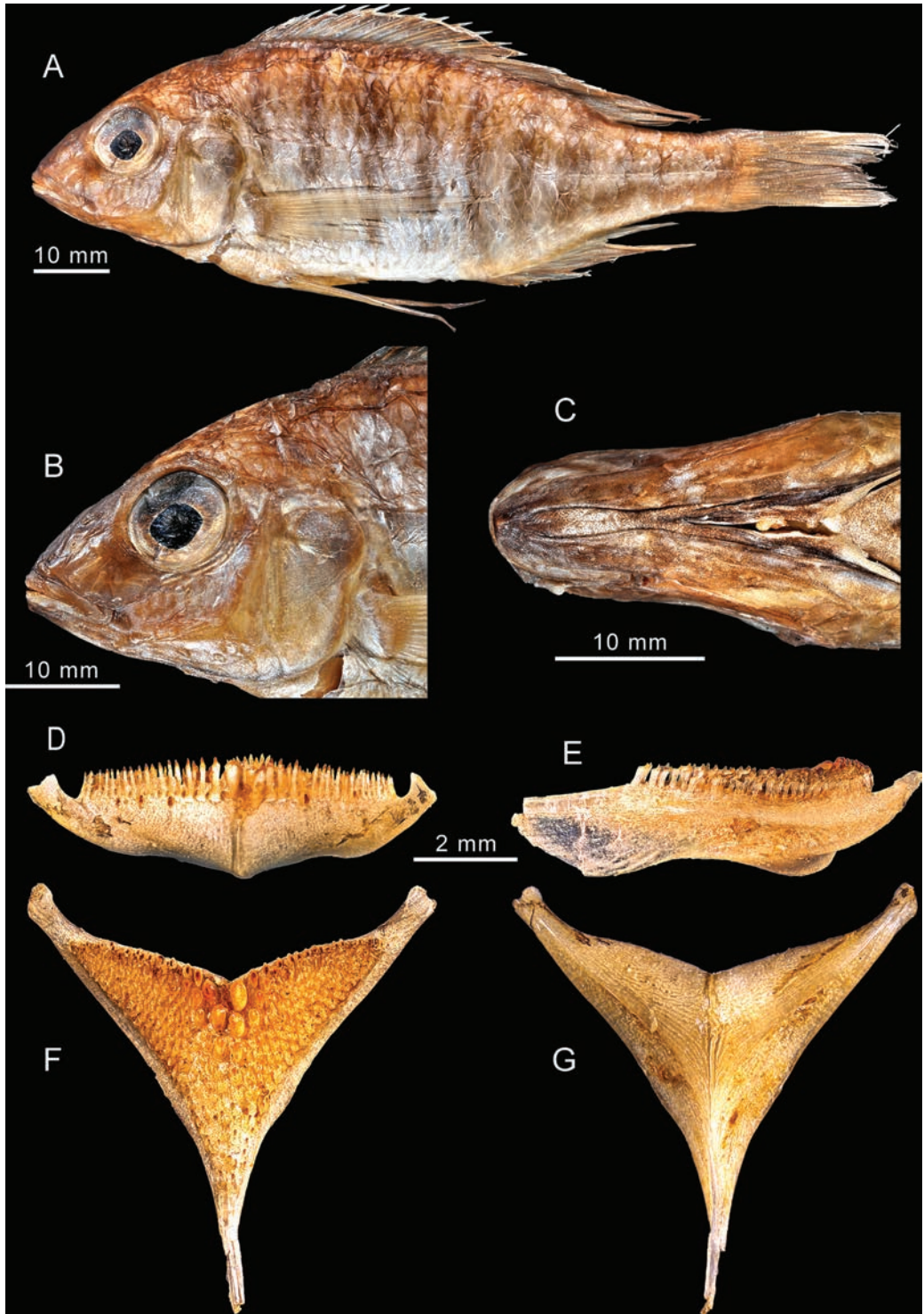


FIGURE 13. *Otopharynx peridodeka*. A. Holotype, YPM ICH 031026, 92.2 mm SL, ripe male. B. Head of holotype. C. Underside of head of holotype. D–G. Lower pharyngeal bone of holotype (keel broken during preparation), in posterior (D), left lateral (E), dorsal (F), and ventral (G) views.



FIGURE 14. *Otopharynx* “brevirostris deep,” freshly captured male (upper) and female (lower) apparently conspecific with *O. peridodeka*. Trawled in 90 m depth off Monkey Bay, southeast arm, 21 May 1992. Photograph by George Turner.

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## Appendix: Comparison Material

**Abbreviations:** KRM, K. R. McKaye; LMTS, Lake Malaŵi Trawling Survey; MKO, M. K. Oliver; TDK, T. D. Kocher. Note that Lake Nyassa, Lake Nyasa, and Lake Malaŵi all refer to the same lake.

*Copadichromis chrysonotus*: BMNH 1908.10.27.49, 1 (lectotype); "Lake Nyassa"; E. L. Rhoades. — YPM ICH 014471, 3; Malaŵi: Thumbi Island West; 18 Dec 1978.

*Copadichromis quadrimaculatus*: BMNH 1908.10.27.41, 1 (lectotype); "Lake Nyassa"; E. L. Rhoades. — YPM ICH 009826, 6; Malaŵi: Nkhunguni Point; KRM, 19 Mar 1979.

*Ctenopharynx intermedius*: YPM ICH 007817, 6; Malaŵi: station Namiasi I; LMTS.

*Ctenopharynx nitidus*: BMNH 1935.6.14.1763, 1 (lectotype); Lake Nyasa: Vua; C. Christy, 1925. — YPM ICH 007807, 2; Malaŵi: Monkey Bay; D. H. Eccles, 12 Jul 1973.

*Ctenopharynx pictus*: BMNH 1935.6.14.1773, 1 (lectotype); Lake Nyasa: Vua; C. Christy, Aug 1925. — YPM ICH 030223, 2; Malaŵi: Thumbi Island West; MKO, KRM, TDK, 8 Aug 1980.

*Exochochromis anagenys*: USNM 304657, 1 (holotype); Malaŵi: Thumbi Island West; MKO, KRM, TDK, 3–4 Aug 1980. — YPM ICH 023205, 1; captive.

*Hemilitapia oxyrhyncha*: BMNH 1906.9.7.38, 1 (lectotype); "Lake Nyassa"; J. E. S. Moore. — YPM ICH 007851, 5; Malaŵi: station Foo I; LMTS, 27 Sep 1972.

*Naevochromis chrysoaster*: BMNH 1935.6.14.1640, 1 (lectotype); Lake Nyasa: southwest arm; C. Christy, 1925. — YPM ICH 014344, 2; Malaŵi: 300 m S of Otter Island; MKO, KRM, TDK, 10 Jul 1980. — YPM 14414, 1; Malaŵi: Thumbi Island West; MKO, KRM, TDK, 18–19 Aug 1980. — YPM ICH 024323, 2; Malaŵi: off W end Chembe; MKO, KRM, TDK, 6–7 Aug 1980.

*Otopharynx argyrosoma*: BMNH 1908.10.27.99, 1 (holotype); "Nyasa"; E. L. Rhoades.

*Otopharynx auromarginatus*: BMNH 1908.10.27.86, 1 (lectotype); "Lake Nyassa"; E. L. Rhoades. — BMNH 1908.10.27.87, 1 (paralectotype); "Lake Nyassa"; E. L. Rhoades. — YPM ICH 030189, 1; Malaŵi: Nkhata Bay; MKO, KRM, TDK, 25 Jul 1980.

*Otopharynx brooksi*: USNM 304655, 1 (holotype); Malaŵi: Thumbi Island West; MKO, KRM, TDK, 18–19 Aug 1980. — USNM 304656, 5 (paratypes); Malaŵi: Thumbi Island West; MKO, KRM, TDK, 18–19 Aug 1980. — USNM 314127, 1 (paratype); Malaŵi: Thumbi Island West; MKO, KRM, TDK, 5–6 Aug 1980.

*Otopharynx decorus*: BMNH 1935.6.14.1651, 1 (lectotype); Lake Nyasa: Vua, C. Christy, 1925. — BMNH 1935.6.14.1652–1653, 2 (paralectotypes); Lake Nyasa: Vua, C. Christy, 1925.

*Otopharynx heterodon*: BMNH 1935.6.14.1586, 1 (lectotype); Lake Nyasa: Monkey Bay. — YPM ICH

014404, 6; Malaŵi: Thumbi Island West; KRM party (?), 23 Jun 1979.

*Otopharynx lithobates*: BMNH 1974.7.5.1, 1 (holotype); Malaŵi: Thumbi Island West; 24 May 1971. — YPM ICH 030203, 2 (paratypes); Malaŵi: Thumbi Island West; MKO, KRM, TDK, 1 Aug 1980.

*Otopharynx ovatus*: BMNH 1935.6.14.1487, 1 (lectotype); south end of L. Nyasa; C. Christy, 1925. — BMNH 1935.6.14.1488–1489, 2 (paralectotypes); south end of L. Nyasa; C. Christy, 1925. — YPM ICH 014292, 2; Malaŵi: Nankumba Peninsula, Otter Point; MKO, KRM, TDK, 29 Jul 1980.

*Otopharynx selenurus*: BMNH 1921.9.6.80, 1 (lectotype); "Lake Nyasa"; R. Wood. — BMNH 1921.9.6.81, 1 (paralectotype); "Lake Nyasa"; R. Wood.

*Otopharynx speciosus*: BMNH 1935.6.14.1650, 1 (lectotype); Lake Nyasa: Vua; C. Christy, 1925. — BMNH 1935.6.14.1649, 1 (paralectotype); Lake Nyasa: Monkey Bay; C. Christy, 1925. — YPM ICH 014311, 5; Malaŵi: station Malembo III, 30–35 fathoms; LMTS, 19 Jul 1971.

*Otopharynx spelaotes*: YPM ICH 026587, 3; Malaŵi: Nkhata Bay; MKO, KRM, TDK, 23 Jul 1980. — YPM ICH 030205, 1; Malaŵi: Nkhata Bay; MKO, KRM, TDK, 21 Jul 1980.

*Otopharynx tetraspilus*: BMNH 1935.6.14.1609, 1 (lectotype); Lake Nyasa: southeast arm between the Bar and Fort Maguire; C. Christy, 1925. — YPM ICH 014153, 4; Malaŵi: station Namiasi Ia, 15 fathoms; LMTS, 15 Jun 1971.

*Otopharynx tetrastigma*: BMNH 1893.11.15.34, 1 (lectotype); "Lake Nyasa and the upper Shire River"; H. H. Johnston. — BMNH 1893.11.15.35–37, 3 (paralectotypes); "Lake Nyasa and the upper Shire River"; H. H. Johnston. — YPM ICH 014159, 4; Malaŵi: Monkey Bay.

*Stigmatichromis modestus*: BMNH 1893.1.17.5, 1 (holotype); "Lake Nyassa"; J. E. S. Moore. — YPM ICH 014361, 1; Malaŵi: Monkey Bay; MKO, 8 Aug 1971.

*Stigmatichromis pholidophorus*: BMNH 1935.6.14.1544, 1 (holotype); Lake Nyasa: Vua; C. Christy, 1925. YPM ICH 014313, 4; Malaŵi: Lake Malaŵi; LMTS.

*Stigmatichromis pleurospilus*: BMNH 1935.6.14.1475, 1 (holotype); Lake Nyasa: Lupembe sandbank; C. Christy, 1925. — YPM ICH 026590, 2; Malaŵi: Nkhata Bay; MKO, KRM, TDK, 23 Jul 1980.

*Stigmatichromis woodii*: YPM ICH 014150, 1; Malaŵi: Monkey Bay; MKO, 9 Aug 1971. — YPM ICH 014593, 3; Malaŵi: Nankumba Peninsula, E of Otter Island; MKO, KRM, TDK, 4 Jun 1980.

*Tramitichromis intermedius*: BMNH 1935.6.14.2081, 1 (lectotype); southwest arm or Fort Johnston; C. Christy, 1925. — BMNH 1935.6.14.2082–2084, 3 (paralectotypes); southwest arm or Fort Johnston; C. Christy, 1925. — YPM ICH 030234, 11; Malaŵi: off beach at Chembe; MKO, KRM, TDK, 16 Jun 1980.

- Trematocranus brevirostris*: BMNH 1935.6.14.2224, 1 (lectotype); Malaŵi: Bar House; C. Christy, 1925. — BMNH 1935.6.14.2225, 1 (paralectotype); Malaŵi: Bar House; C. Christy, 1925.
- Trematocranus microstoma*: BMNH 1935.6.14.2232–2236, 5 (lectotype and paralectotypes); Malaŵi: Karonga; C. Christy. — YPM ICH 014433, 21; Malaŵi: TDK, 19–10 m across Mazinzi Bay; MKO, KRM, TADK, 28 Jun 1980.
- Trematocranus placodon*: BMNH 1921.9.6.134, 1 (lectotype); “Lake Nyasa”; R. Wood. — YPM ICH 007800, 2; Malaŵi: 4 miles SE of Monkey Bay; LMTS, 7 Dec 1973.

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