Hemitaeniochromis pumba, a new species of cichlid fish from Lake Malawi, Africa, with comments on related species.

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Abstract

A new species of haplochromine (Pseudocrenilabrini) cichlid fish, *Hemitaeniochromis pumba* is described from Lake Malawi, named for its outwardly angled, tusk-like oral jaw teeth, recalling those of a pig or warthog. It is assigned to the genus *Hemitaeniochromis* Eccles & Trewavas 1989 on the basis of its dark horizontal midlateral band, broken anteriorly but continuous posteriorly, with a dotted supralateral band anteriorly, and possessing conical teeth. It is distinguished from *H. urotaenia* by its smaller mouth and the oral teeth in the outer series of the lower jaw, which are very small, deeply embedded in the oral mucosa and angled outwards (labially). *Hemitaeniochromis brachyrhynchus* and *Protomelas spilopterus* (which are compared and distinguished) have similar oral teeth, but a more steeply-angled gape. Although nothing is presently known of its diet, the form of the jaws and teeth are similar to species known or believed to be paedophagous among the cichlid assemblages of Lakes Edward, Malawi and Victoria. The species has previously been reported as *H*. sp. 'insignis' and *H.* sp. 'deep' and probably also as *H*. sp. 'insignis mumbo', *H*. sp. 'urotaenia mumbo', *H.* sp. 'spilopterus jalo' and *H.* sp. 'spilopterus kande'.

Keywords: new species, cichlidae, Lake Malawi, paedophage

1. INTRODUCTION

African Great Lakes Malawi, Tanganyika and Victoria are known for their extraordinary biodiversity, and particularly for their abundance of cichlid fishes which have evolved in comparatively short time periods (Won et al., 2005; Seehausen 2006; Meier et al., 2023). This has proved valuable for research into African cichlid speciation, ecological differentiation and divergent evolution (Lowe McConnell, 2009; Malinsky & Salzburger, 2016; Salzburger 2018). Among these, Lake Malawi stands out for its exceptional cichlid diversity, with under 400 species formally described and an estimated total of over 1000 species, many of which are endemic (Turner, 2007; Konings, 2016). A major challenge in cichlid taxonomy is the difficulty of distinguishing species, particularly from preserved material. Many cichlid species exhibit minimal morphological differentiation despite significant ecological and genetic divergence, making traditional classification methods challenging (Santos et al., 2014). Increasingly, the export of specimens for basic science or biodiversity-related research has been caught up in well-intended international legislation aimed at ensuring commercialisation of natural products does not occur without benefit local communities in biodiversity-rich, less wealthy countries (Bouchet *et al.,* 2023; Sherman *et al.,* 2026). At the same time, host countries often lack both museum infrastructure and trained personnel able to devote resources to research without obvious immediate socioeconomic benefit, and of course, would still face the problem that the type material of existing species is mostly elsewhere. Thus, there is a persistent taxonomic deficit in taxa such as freshwater fishes, which are among the most critically endangered animal groups (Darwall *et al.,* 2009).

The aim of the present study is to formally describe a new species of Lake Malawi cichlid fish from the genus *Hemitaeniochromis* Eccles & Trewavas 1989, previously recognised as distinct and referred to as *Hemitaeniochromis* sp. ‘insignis’ (Turner, 1996; Snoeks, 2004) or *H*. sp. ‘insignis mumbo’ (Konings, 2016). The genus *Hemitaeniochromis* comprises cichlid fishes endemic to Lake Malawi, characterised by distinctive melanic colour patterns and specialised dentition. A defining feature of the genus is a horizontal midlateral stripe that starts behind the operculum, appearing as a series of spots at the front, becoming more continuous towards the rear and extending to the caudal peduncle. A second supralateral stripe above this, broken into a series of spots, is also visible on the anterior part of the flanks (Turner, 1996; Snoeks, 2003; Konings, 2016). The dentition of *Hemitaeniochromis* is characterised by widely spaced, conical outer teeth (Oliver, 2012). Currently, the genus contains only two recognised species: *Hemitaeniochromis urotaenia* (Regan, 1922) – the type species of the genus, and *Hemitaeniochromis brachyrhynchus* Oliver, 2012.

2. MATERIALS AND METHODS

Specimens of the new species were obtained from collections at Bangor University obtained in the 1990s (Turner, 1996) and later deposited at the Natural History Museum in London, specimens at the Africa Museum, Tervuren, originally obtained during the Lake Malawi SADC/GEF project in the late 1990s (Snoeks, 2004) and a single specimen at Cambridge University collected in 2016 and subsequently included in a genome sequencing project (Blumer *et al.,* 2025). Specimens were collected in a variety of ways, generally from experimental trawl surveys, and initially fixed in formalin and later preserved in alcohol. Comparative material was sourced from the London and Cambridge collections. Data for *Hemitaeniochromis brachyrhynchus* was obtained from the species description and illustrations of both types. Counts and measurements were carried out following the methods

of Snoeks (2004). Gape angles were taken from published values or measured from photographs using an online protractor, https://www.ginifab.com/feeds/angle_measurement/, with horizontal body plane defined as a line reaching from the tip of snout to the point where the lower lateral line crosses the line of flexion of the hypurals (H_2 in Barel *et al.,* 1977; Arnegard & Oliver, 2010), although this was not possible in specimens where the mouth was fixed open.

2.1 Ethical statement

The study did not use live animals. It was carried out on preserved specimens that had been collected for other purposes and deposited in museum collections. Specimens were exported under legislation and permits relevant at the time.

3. RESULTS

Hemitaeniochromis pumba sp. nov.

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3.1 Holotype

BMNH 2024.7.16.1, unsexed, 132mm SL, collected from experimental trawl at 24-28m depth off Palm Beach-Maldeco, Oct 1991, G.F. Turner.

3.2 Paratypes (9)

BMNH 2024.7.16.2, 1 specimen, unsexed, 125m SL, collected from experimental trawl at 126m depth, off Domwe Island, 16th February 1992, G.F.Turner; BMNH 2024.7.16.3, 1 specimen, unsexed, 117mm SL, collected from experimental trawl at 90m depth, off Monkey Bay, 21 May 1992, G.F. Turner; BMNH 2024.7.16.4, 1 specimen, unsexed, 95mm SL, collected from commercial midwater trawl, 1991, G.F. Turner; BMNH 2024.7.16.5, 1 specimen, unsexed, 94mm SL, collected from experimental trawl at 74m depth, at Kolowilo III trawl station, 28 September 1991, G.F. Turner; UMZC 2016.40.78 (field ID D12-B08), 1 specimen, unsexed 132mm SL, collected from experimental trawl at 85-95m depth, north east of Monkey Bay (-14.001, 34.975), 2 March 2016, by Malawi Cichlid Genomic Diversity Survey (MCGDS); MRAC 99-014-P-1747-1749, 3 specimens, unsexed, 122-148mm SL, at -14.01, 34.622 on trawl survey transect Chipoka to Makanjila, 75-85m depth, 18 Nov 1997, SADC/GEF project; MRAC 99-014-P-1755, 1 specimen, unsexed, 168mm SL, trawled from 79-84m depth, -14.116, 34.722, SW Arm, 18 Dec1996, SADC/GEF project.

3.3 Etymology

The specific name ‘pumba‘ is latinized from the Swahili ‘pumbaa’ meaning foolish, silly or careless, but better known as the personal name of a Warthog character in the ‘The Lion King’ film and theatre franchise, in reference to the tusk-like outer teeth in the lower jaw.

3.4 Diagnosis

Among Malawian Pseudocrenilabrini, *Hemitaeniochromis* can be distinguished by its melanin pattern, with a wide midlateral band arising at least an eye-diameter behind the operculum, generally broken anteriorly and continuous posteriorly, with a broken midlateral band confined to the anterior portion of the flank, with a few dark spots at the base of the dorsal fin, teeth simple in specimens above 100mm SL (Oliver, 2012). Species of the genus *Protomelas* Trewavas, 1935 are the most similar, but generally have a continuous midlateral stripe beginning on or just behind the operculum. *Hemitaeniochromis pumba* can be distinguished from *H. urotaenia* by its shorter jaws (lower jaw length 34.8-43.2% head length, v 44.4-53.5% in *H. urotaenia*) and predorsal length (33.7-37.8% SL v 38.7-41.1%), as well as by its much smaller, labially directed outer lower jaw teeth (v large erect). *Hemitaeniochromis pumba* is distinguished from *H. brachyrhynchus* by its longer snout (31.1-36.8% head length v 28.2-28.7%), deeper lachrymal bone (18.0-23.4% head length v 12.5-12.8%), smaller eye (23.6-30.2% HL v 36.2-38.2%) and less steep gape angle (41-49º v ~60º). The stripe pattern of *Protomelas insignis* (Trewavas, 1935) is rather variable and can sometimes appear more like the *Hemitaeniochromis* pattern: it tends to have a relatively longer snout (37.5-40.6% head length v 31.1-36.8% in *H. pumba*) and larger, erect teeth.

3.5 Description

Morphometric ratios and meristic counts are given on Table 1. Whole body proportions can be seen in Figures 1-4, and those of comparator species in Figure 5. Oral dentition is compared in Figure 6.

Hemitaeniochromis pumba (Figure 1) is a medium sized (up to 168mm SL) moderately laterally compressed (maximum body depth 2.1-2.7 times maximum head width) cichlid fish with a moderately long snout (31.1-36.8% head length) and a concave head profile. Females and immature males have a distinctive melanin pattern shared with other species currently classed in the genus *Hemitaeniochromis*.

All *H.pumba* specimens are comparatively deep-bodied and laterally compressed, with the deepest part of the body sitting at around the third dorsal fin spine. The anterior upper lateral profile of the fish is gently curved from the tip of the snout to the vertical plane through the posterior edge of the eye. The slope is gradual and forms an angle of approximately 30 to 35 degrees relative to the horizontal plane, creating a streamlined head shape. The upper head profile ascends at a steeper angle from above the eye, creating a slightly humped look above a noticeable but subtle convexity over the eye. The premaxillary pedicel creates little or no interruption in the contour, giving the head a slightly angular appearance (contrasting to *H. urotaenia, Protomelas spilonotus* (Trewavas, 1935) and *P. insignis,* which all appear to have much more smoothly curved heads). The tip of the snout lies above the level of the upper margin of the insertion of the pectoral fin and below the lowest edge of the eye. The lower anterior profile of the fish is nearly straight back to the insertion of the pelvic fins, with a gentle downward angle of around 12-15 degrees relative to the horizontal plane. The transition at the posterior angle of the lower jaw is subtle, maintaining a smooth contour even when the mouth is closed. The lower profile remains mostly horizontal between the pelvic and anal fins, with some curvature along its length. The mouth is moderately sized, but on the smaller side compared to *H. urotaenia.* The caudal peduncle is relatively deep and laterally compressed (1.1 to 1.4 times longer than deep). The pectoral fins are relatively long and extend to the first anal spine, whereas the pelvic fins are shorter. When the dorsal and anal fins are folded, they end just short of the caudal fin

insertion, except in the mature males, where they may be slightly longer. The caudal fin is truncated and slightly emarginate. The eye is moderate-sized and circular, with some size variation between individuals.

177 **TABLE 1. Morphometric ratios and meristics of *Hemitaeniochromis pumba* sp. nov.**

		Paratypes		
	Holotype	**Mean**	**Minimum**	**Maximum**
Standard Length (SL, mm)	132.0	127.4	94.2	167.5
As % SL				
Body Depth	40.3	38.2	35.6	41.8
Head Length (HL)	32.5	33.5	32.3	34.6
Dorsal Fin Base Length	57.0	53.2	50.0	56.2
Anal Fin Base Length	17.7	18.1	15.8	19.8
Predorsal Length	34.3	36.4	33.7	37.8
Preanal Distance	69.1	71.3	69.4	73.8
Prepectoral Distance	33.3	35.9	33.7	42.0
Prepelvic Distance	42.5	44.7	42.4	48.9
As % HL				
Head Width	48.3	46.6	42.8	51.9
Interorbital Width	26.6	25.5	22.6	27.7
Snout Length	35.0	34.4	31.1	36.8
Lower Jaw Length	42.0	39.5	34.8	43.2
Premaxillary Pedicel	29.6	29.5	26.3	31.9
Cheek Depth	17.0	17.8	12.8	21.0
Eye Diameter	25.9	27.6	23.6	30.2
Lachrymal Depth	21.7	20.5	18.0	23.4
Ratios				
Caudal Peduncle Length/Depth	1.10	1.3	1.1	1.4
Body Depth/Head Width	2.57	2.5	2.1	2.7
Counts				
Epibranchial Gillrakers	4		3	5
Ceratobranchial Gillrakers	13		11	13
Dorsal Fin Spines	17		16	18
Dorsal Fin Rays	11		9	10
Anal Fin Rays	9		8	9
Longitudinal Line Scales	34		31	35
Cheek Scales	3		3	4

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FIGURE 1. *Hemitaeniochromis pumba*. Holotype, preserved, BMNH 2024.7.16.1; 132.0mm SL. (Natural History Museum, 2024).

FIGURE 2. *Hemitaeniochromis* sp. pumba. Holotype, freshly collected, Palm Beach, Lake Malawi, 24-28m, October 1991, BMNH 2024.7.16.1; 132.0mm SL (photo by Turner).

FIGURE 3. *Hemitaeniochromis* sp. pumba. Paratype, freshly collected, Monkey Bay, Lake Malawi, 90m, May 1992, BMNH 2024.7.16.3; 116.5mm SL (photo by Turner).

FIGURE 4. Probable *Hemitaeniochromis pumba* apparent male, photographed alive underwater at Boadzulu Island (modified from Konings, 2016, where it is labelled as *Hemitaeniochromis* sp. 'insignis mumbo').

The flank scales are weakly ctenoid, with a relatively smooth surface and no prominent spines, becoming more cycloid dorsally. From the flank to the chest, scale size decreases gradually, as is typical in Cyrtocarina (Snoeks, 2003). There are some small scales around the proximal part of the caudal fin. The cephalic lateral line pores are visible but not expanded, and the flank lateral line displays typical cichlid pattern of separate upper and lower segments.

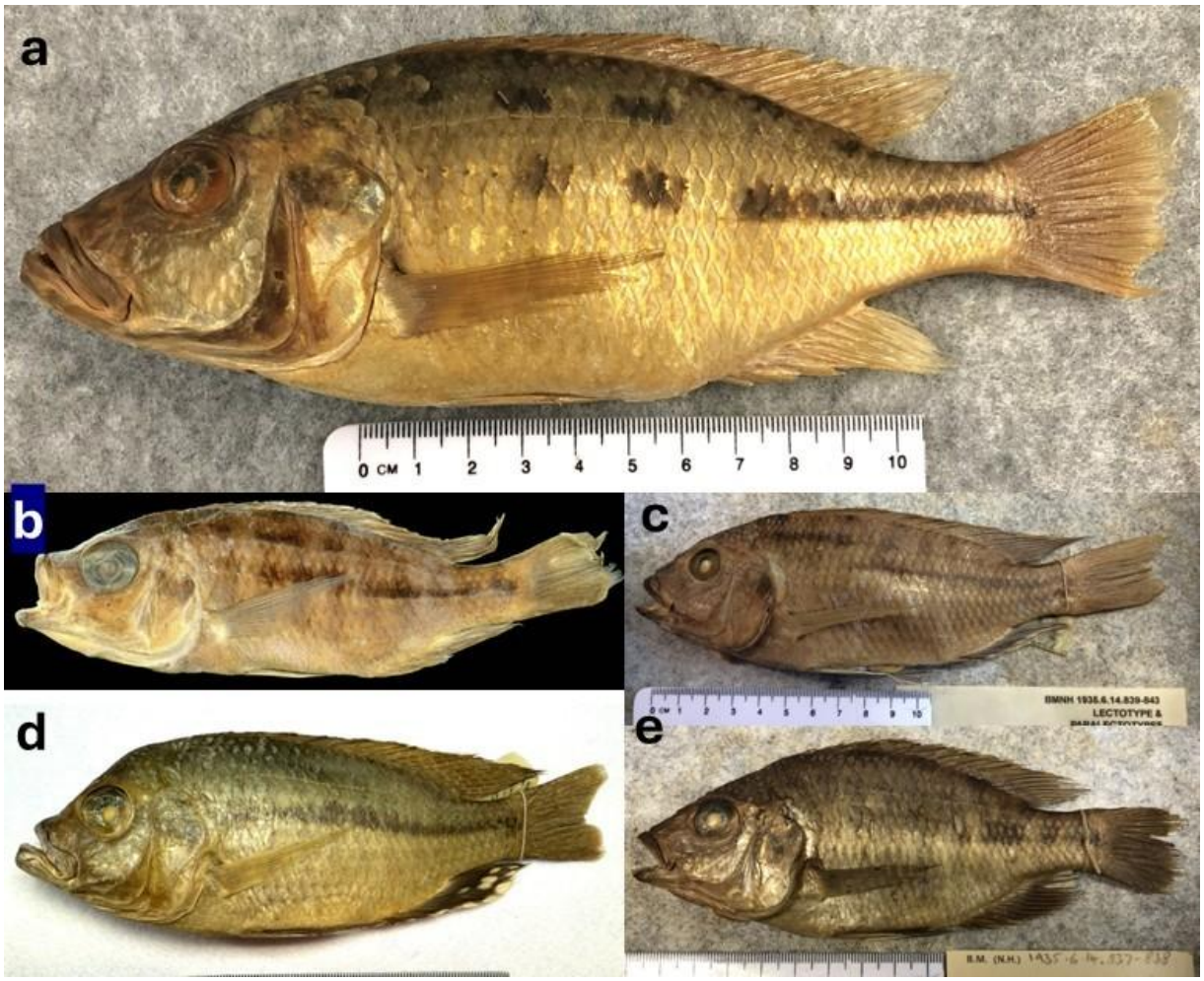

FIGURE 5: Comparator species: (a) *Hemitaeniochromis urotaenia* lectotype; (b) *Hemitaeniochromis brachyrhynchus* holotype; (c) *Protomelas insignis* paralectotype; (d) *Protomelas spilopterus* lectotype; (e) *Protomelas insignis* lectotype. *H. brachyrhynchus* photo modified from image by Mike Oliver.

The mouth is moderate-sized, with both upper and lower jaws of moderate thickness, although the caudal part of the maxilla appears to be dorsoventrally enlarged or 'bullate' (Barel et al., 1977). The teeth are generally small and deeply embedded in the labial mucosa. The teeth in the outer series of the lower jaw (Figure 6A) are small, conical, erect and bent labially (towards the 'lips'). The outer series in both the upper jaw are short, conical, erect, with some unequally bicuspid particularly in smaller specimens. There is also an inner series of smaller, more pointed teeth. Similar teeth are shown by *H. brachyrhynchus* (Oliver 2012) and *P. spilopterus* (Trewavas, 1935) (Figure 6E-F). Other superficially similar species have larger teeth, generally erect with recurved tips (Figures 6B-D), those of *H. urotaenia* being particularly large (Figure 6C), and those of *P. spilonotus* densely packed (Figure 6D).

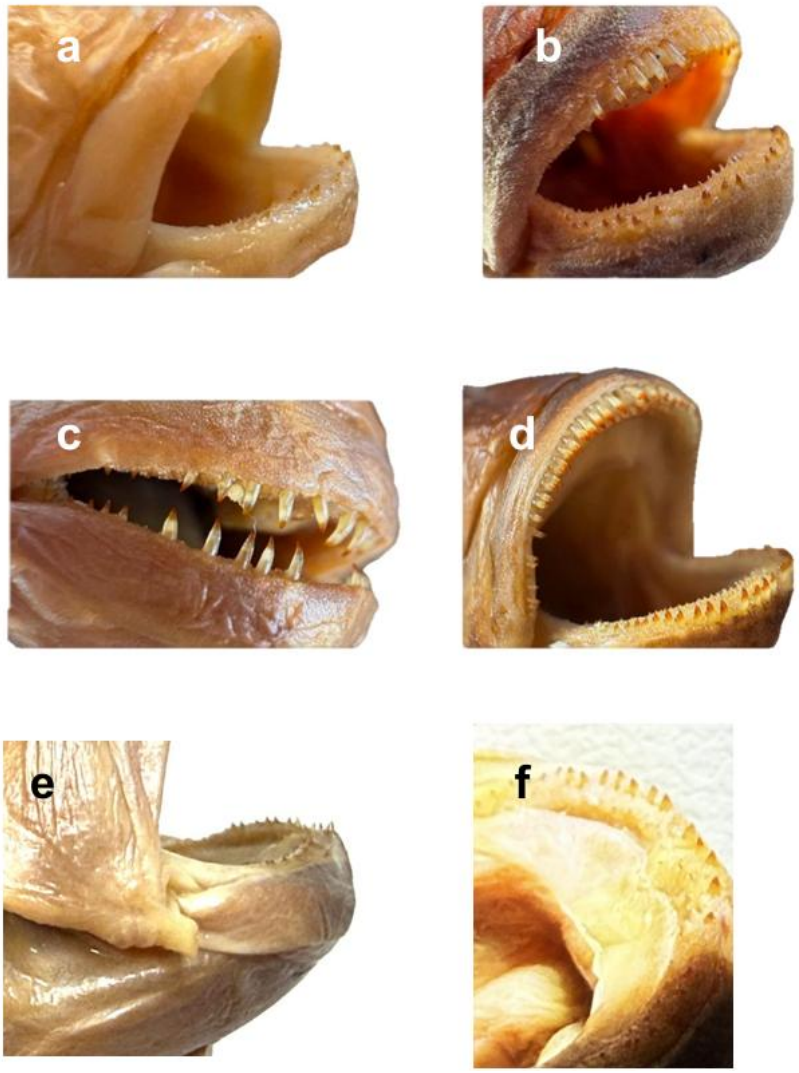

FIGURE 6: Variation in dentition: (a) *Hemitaeniochromis pumba* (Paratype, BMNH 2024.7.16.4) has small labially directed outer teeth in the lower jaw; (b) *Protomelas insignis* (BMNH 1935.6.14.839-43) has larger, triangular, pointed lower jaw teeth and columnar upper jaw teeth; (c) *Hemitaeniochromis urotaenia* (BMNH 1921.9.6.126-128) has very large erect conical teeth with recurved tips; (d) *Protomelas spilonotus* (BMNH 1935.6.14.837-8) has larger triangular pointed lower jaw teeth and closely packed columnar teeth in the upper jaw; (e, f) *Protomelas spilopterus* (164mm paralectotype, 1935.6.14.644-7) has very similar dentition to *H. pumba*.

There are 11-13 simple, unbranched ceratobranchial gillrakers, which are generally stubby and widely-spaced (Figure 7), in contrast to the long closely-packed rakers of *P. insignis* and *P. spilonotus*, and the sharply pointed rakers of *H. urotaenia*. Counts overlap with all comparator species, except *P. spilonotus*, which has 17-19 ceratobranchials (n=2 types). The lower pharyngeal bone is small and slender with relatively small pointed teeth (Figure 8), similar to other presumed paedophages such as *P. spilopterus* and *H. brachyrhynchus* (Oliver 2012), but contrasting with the robust bone and large sharp teeth of the predatory *H. urotaenia* (Figure 8).

FIGURE 7: Outer gill arch (right side) of *H. pumba* paratype 2024.7.16.3, showing relatively widely-spaced stubby gillrakers.

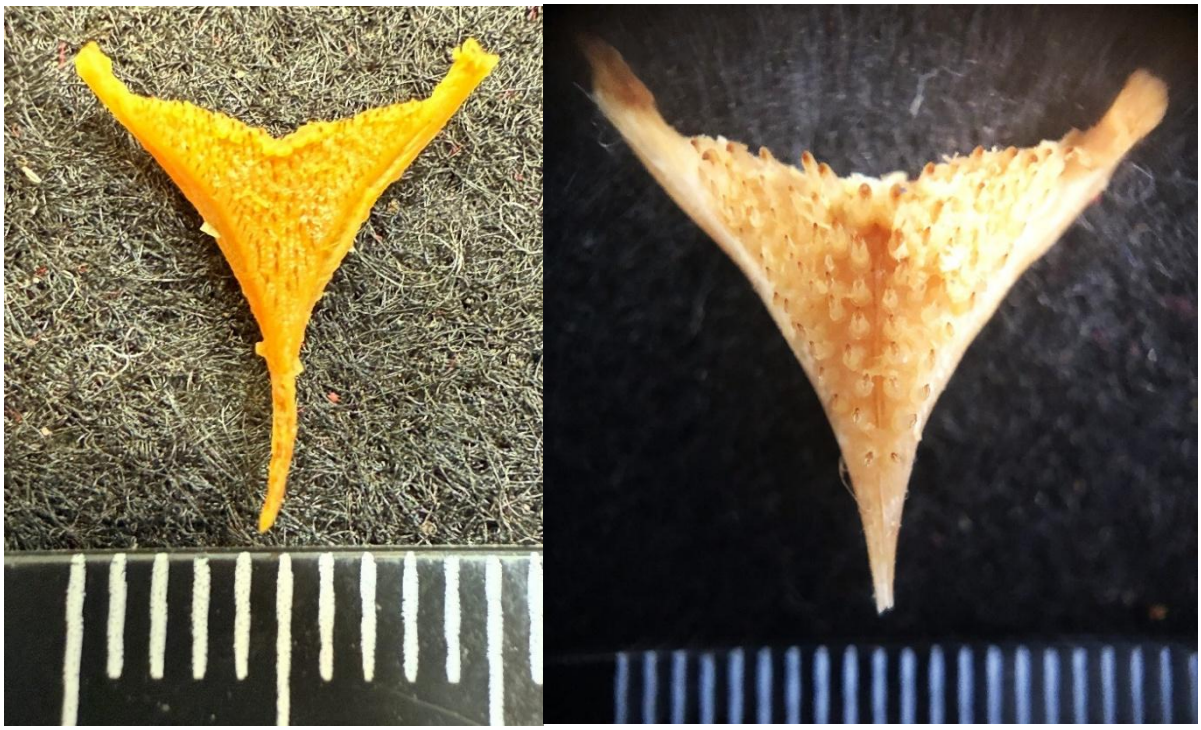

FIGURE 8: Lower pharyngeal bones, contrasting the delicate bone and small teeth of *Hemitaeniochromis pumb*a paralectotype 2024.7.16.3, 116.5mm SL (left) with the robust bone and larger teeth of *Hemitaeniochromis urotaenia* BMNH 1935.6.14.625-626, 168mm SL (right).

Colour

Females and immature males are countershaded, generally metallic grey in colour, with distinctive melanic markings showing as two rows of horizontal dark dashes, the lower (midlateral) band becoming more continuous posteriorly. They have a pale grey dorsal fin, with spotting on the soft dorsal (Figure 2). Flank scales often show a dark mark anteriorly. A mature male paratype photographed fresh from a trawl catch was generally darker, with dark fins, broad vertical bars and hints of blue dorsally, and yellow ventrally (Figure 3), but this may not be the full breeding dress. A photograph of *H*. sp. 'insignis mumbo' taken at Boadzulu Island by Konings could depict a breeding male *H. pumba:* it is a bright metallic blue, with hints of dark vertical bars, and a yellowish green cast towards the abdominal region. The dorsal fin has a white margin and there are large pale spots on the anal fin (Figure 4).

3.6 Ecology

The species has been collected from trawl catches deeper than 70m, suggesting a preference for deep soft-sediment habitats. However, Snoeks & Hanssens (2004) report smaller specimens from much shallower waters (7-9m), and the diving observation and illustrations by Konings (2016) suggest the species may frequent much shallower clearwater habitats at a variety of locations within the lake, assuming these represent the same species. Nothing is known of their diet, but the upward-angled gape and form of the dentition suggest that the species is a paedophage.

3.7 Notes on Related Species

Addition of *H. pumba* does not affect the current generic definition. *Hemitaeniochromis urotaenia* remains fairly unambiguous and easily identified, with its large mouth and teeth and overall predatory facies. During the course of this study, we were rather uneasy about the distinctness of *H. brachyrhynchus* in relation to *Protomelas spilopterus*. The species are presently allocated to different genera on the basis of their melanic markings (Oliver, 2012), a common practice following Eccles & Trewavas (1989). However, even they made exceptions, such as *Corematodus* Boulenger 1897 where two species with very different melanic patterns were included in the same genus on the basis of the similarity of their jaws and teeth. Likewise, their own *Copadichromis* Eccles & Trewavas 1989 included a range of melanin patterns- although this has been reduced by the removal of horizontally banded species to *Nyassachromis* Eccles & Trewavas 1989, and some of the largely unmarked species to *Mchenga* Stauffer & Konings 2006 by Stauffer & Konings (2006). Thus, it may be wise not to be too dogmatic about these things. Also, melanic markings may be more fluid than is apparent from a relatively small sample of specimens: *H. brachyrhynchus* is known only from 2 preserved type specimens. Oliver (2012) carefully compared morphology of *H. brachyrhynchus* with congeneric species and those with more ambiguous markings such as *P. insignis*, but not with *P. spilopterus*, so we examined a number of the types of the latter and compared them to the measurements of the types of *H. brachyrhynchus* in the original description. We found that there was a clear difference, independent of allometric

relationships over a substantial range of body sizes in the relative sizes of the eye and the lachrymal (Figures 9-10), visible in examination of the specimens: in particular the lachrymal is very narrow posteriorly in *H. brachyrhynchus*. This may not have show up so clearly in the lachrymal measurement method given in the widely followed Snoeks (2004) methods chapter, which follows the anterior end of the bone to give a maximum depth measurement. In our study, we followed the method used by Oliver (2012), taking the midline of the bone. Thus, we feel confident that *H. brachyrhynchus* is indeed distinct from *P. spilopterus* and that we have available an alternative means of distinguishing the species, which will also be useful for specimens in which the melanic markings are not visible (as mature males) or atypical.

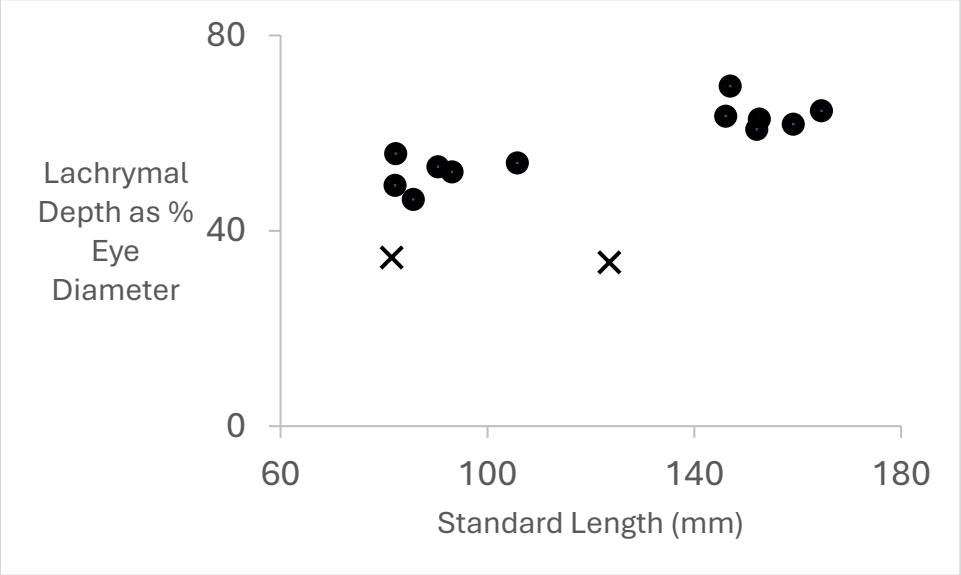

FIGURE 9: *Protomelas spilopterus* (●) has a relatively deeper lachrymal bone in comparison to eye diameter than *Hemitaeniochromis brachyrhynchus* (x). There is a weak allometric effect in the *P. spilopterus* data suggesting that the ratio may not be diagnostic in specimens smaller than 50-60mm SL.

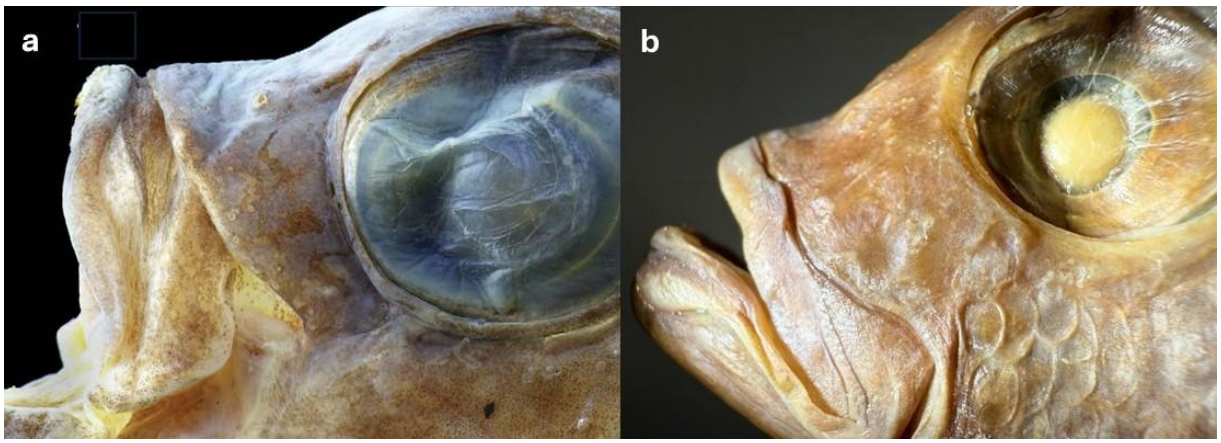

FIGURE 10: Comparison of relative sizes of lachrymal bone (midline depth) and eye diameter in (a) *Hemitaeniochromis brachyrhynchus* (holotype) and (b) *Protomelas spilopterus* (lectotype). It is noticeable that the lower/posterior edge of the bone is much shallower in *H. brachyrhynchus*. *H. brachyrhynchus* photo modified from image by Mike Oliver.

3.8 Comparative material examined

Hemitaeniochromis urotaenia: BMNH 1921.9.6.126-128, lectotype 169.8mm SL; paralectotypes (2) 143.4-170.5mm SL; BMNH 1935.6.14.625-26 (2) 159.4-168.0mm SL; BMNH 1935.6.14.632-34 (3) 138.5-173.5mm SL. *Protomelas insigns*: BMNH 1935.6.14.839-43, lectotype 150.3mm SL; paralectotypes (2) 120.1-156.7mm SL; BMNH 1986-2.5:115, 104.9mm SL, UMZC 2016.40.78 (1) 124.3mm SL. *Protomelas spilopterus*, BMNH 1935.6.14.648, lectotype, 146.9mm SL; BMNH 1935.6.14.644-7 paralectotypes (3) 151.6-164.6mm SL, BMNH 1935.6.14.652-7 paralectotypes (8) 82.2-159.2mm SL. *Protomelas spilonotus*, BMNH 1935.6.14.837-838 lectotype 133.2mm SL, paralectotype 106.3mm SL. *Hemitaeniochromis brachyrhynchus* (not physically examined: data from Oliver 2012): holotype: YPM 25201, holotype, 123.6mm SL; MRAC 99-41-P-1746, paratype (1), 81.5mm SL.

4. DISCUSSION

Hemitaeniochromis pumba represents a third species that fits comfortably within the current definition of the genus, as given by Oliver (2012). The species was reported by Turner (1996) as *Hemitaeniochromis* 'insignis', based on examination of specimens now included in the type series of *H. pumba*. Turner was uncertain about the relationship of this taxon to *Protomelas insignis*, having not examined the type material of that species at that time. Snoeks & Hanssens (2004) believed they were distinct, particularly based on their observation of the small labially-angled teeth in the outer series of the lower jaw of *H. pumba*. This is consistent with the present study.

More contentious is the status of various forms illustrated by Konings in the 5 editions of his 'Malawi Cichlids in their Natural Habitat' (1989-2016). Some of these are known only from underwater photographs of live specimens, often showing very different coloration to the preserved specimens or illustrations of recently killed individuals in our collections. Snoeks & Hanssens proposed that Konings' *H.* sp. 'urotaenia mumbo' was conspecific with what we now know as *H. pumba*. This was later illustrated as *H.* sp. 'insignis mumbo' (Konings 2016; see Figure 4 above). This has a very similar overall body shape to *H. pumba*, although the male colours are much more vibrant in Konings' illustration than in our dead specimens such as Figure 3 above. However, they do not differ qualitatively, showing the same dark vertical barring and gradation from blue anterior/upper surface to yellowish belly. Therefore, we feel quite confident in regarding them as conspecific.

Snoeks & Hanssens also suggested that Konings' *H.* sp. 'spilopterus jalo' and *H.* sp. 'spilopterus kande' are more similar to *H. pumba* than to *H. urotaenia*. We suggest that both are very likely also *H. pumba*. Konings' (2016; p. 172) illustration (alive, in hand) of *H.* sp. 'spilopterus jalo' looks like a non-breeding male of *H. pumba*, with the horizontal elements suppressed and the vertical bars developing but without any real sign of the blue and yellow markings. This could be due to state of reproductive maturity. Konings' illustrations (2016: p. 354) of *H.* sp. 'spilopterus kande' also fit well with *H. pumba* in terms of overall body shape and markings. Although the adult male photographed underwater lacks a yellow belly, this too could simply represent stages in development of the male breeding colour.

Konings' *Hemitaeniochromis* sp. 'spilopterus blue' is now identified as *H. brachyrhynchus* (see Konings 2016, index). *Hemitaeniochromis* sp. 'urotaenia yellow' appears to represent an additional undescribed taxon: we are aware of photographs of a few specimens believed to be

in collections presently at Bristol University and the Africa Museum, Tervuren, but we have not yet examined them fully.

Molecular phylogenetic analysis (Blumer et al. 2025) indicated that *H. pumba* (under the name *Hemitaeniochromis* sp. 'deep') is closely related to other probable paedophage species, *H. brachyrhynchus* and *Naevochromis chrysogaster* (Trewavas, 1935) the latter having a very different 3-spotted melanin pattern and a more slender body (Eccles & Trewavas 1989; Konings 2016). Later unpublished analyses by largely the same team indicates that *P. spilopterus* is also a member of this group and is sister to *H. brachyrhynchus*. This paedophagous group is resolved as the sister group to a clade comprising *H. urotaenia* and the sequenced species of the horizontally-striped predatory *Dimidiochromis* Eccles & Trewavas, 1989 currently comprising *D. compressiceps* (Boulenger, 1899), *D. kiwinge (*Ahl, 1926), *D. strigatus* (Regan, 1922). Sequences for *D. dimidiatus* (Günther 1864) are not yet available. Thus, it appears that a largely horizontally-striped melanin pattern is probably basal to this paedophage group, but that the pattern has proved to be evolutionarily plastic within the lineage, particularly in relation to *N. chrysogaster.* Whether this level of plasticity is unusual among Malawian cichlids awaits a thorough comparative analysis: if so, it may indicate that melanic patterns have higher adaptive significance in paedophages either through species mimicking their preferred victims or perhaps by benefitting from a frequency-dependent effect, for example, by making each distinct colour phenotype advantageous when rare, as prey species fail to recognise them. At present, little is known of evolutionary ecology of this group.

Finally, although *H. pumba* was originally confused with *P. insignis* (e.g. Turner 1996), that species was also included in the Blumer et al.(2025) analysis and was found to be distantly related.

Author Contributions

GFT: conception and design of study, data collection, analysis, preparation of figures, writing paper. AC: data collection, analysis, preparation of figures.

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