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Wallaceochromis gen. nov, a new chromidotilapiine cichlid genus (Pisces: Perciformes) from West Africa

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Abstract

A new genus, *Wallaceochromis*, is described for the chromidotilapiine cichlids of the *Pelvicachromis humilis* group. It differs from *Pelvicachromis* sensu stricto in the number and arrangement of tubular infraorbitals, a straighter and sloping dorsal head profile with a low supraoccipital crest, higher abdominal vertebral counts (14–15 vs. 13–14), and in displaying a pattern of vertical bars on the body in several behavioral situations.

Key words: *Wallaceochromis*, West Africa, key to species, biogeography

Introduction

Pelvicachromis was erected by Thys van den Audenaerde (1968) as a subgenus of *Pelmatochromis* Steindachner, 1894 and subsequently established as a genus by Trewavas (1974). Among *Pelvicachromis* species, Greenwood (1987) noted for *P. humilis* (Boulenger, 1916) a higher vertebral count of 27 (vs. 23–26) with 15 abdominal centra (vs. 13 or 14), with additional differences between this species and congeners known at the time being the possession of a straight and sloping dorsal head profile (vs. rounded, decurved), a lower supraoccipital crest, an ethmovomerine region slightly longer and sloping at a less steep angle, and a narrower interorbital region. These differences were confirmed in general by Lamboj (2004a), along with an additional observation that *P. humilis* has two contiguous tubular infraorbital ossicles instead of three, with a gap between the second and third. Among the species currently included in *Pelvicachromis, P. rubrolabiatus* Lamboj, 2004 and *P. signatus* Lamboj, 2004 share these features with *P. humilis*. Lamboj (2004b) had previously distinguished two groups within *Pelvicachromis*: Group 1, including *P. humilis*, *P. rubrilabiatus* and *P. signatus* and Group 2, containing all other members of the genus.

Also, a preliminary molecular study (Lamboj & Kratochvil, 1997) indicated paraphyly for the genus, a conclusion supported by two more detailed molecular analyses (Lamboj *et al.*, 2014, Schwarzer *et al.*, 2014). Here we provide a formal generic assignment for the *Pelvicachromis humilis* group.

Materials and methods

External counts and measurements follow Barel *et al.* (1977). All measurements were taken on the left side of the specimens using digital calipers. Clearing and staining of bones and cartilage followed Dingerkus & Uhler (1977). Radiographs were produced for the entire type series of *Pelvicachromis rubrolabiatus*, for the MRAC material of *P. signatus*, and for several specimens of *P. humilis, P. pulcher, P. kribensis* and *P. taeniatus*.

3D X-ray microtomographic images were made of the heads of unstained, intact specimens of *P. humilis*, *P. rubrolabiatus*, *P. signatus*, *P. pulcher*, *P. kribensis*, and *P. roloffi* with a SkyScan 1174 benchtop microCT scanner (tungsten source at 50kVp/800µA, 0.25° rotation interval). Reconstructed volume images were examined and evaluated with AMIRA 5.4.0 (Visualization Sciences Group), which allowed viewing of the skeletal elements from any arbitrary angle as well as virtual dissections.

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The IO series of additional specimens of remaining species were observed by scraping away skin on left side of heads. Descriptions of coloration in each species were based on living material observed by A.L. All comparative material was counted and measured.

Abbreviations used: AMNH, American Museum of Natural History, New York; BMNH, Natural History Museum, London; MRAC, Musée Royal de l'Afrique Centrale, Tervuren; NMW, Naturhistorisches Museum, Wien; ZCUV, Zoological Collection, University of Vienna; ZMA, Zoologisch Museum, Amsterdam; SL, standard length; HL, head length.

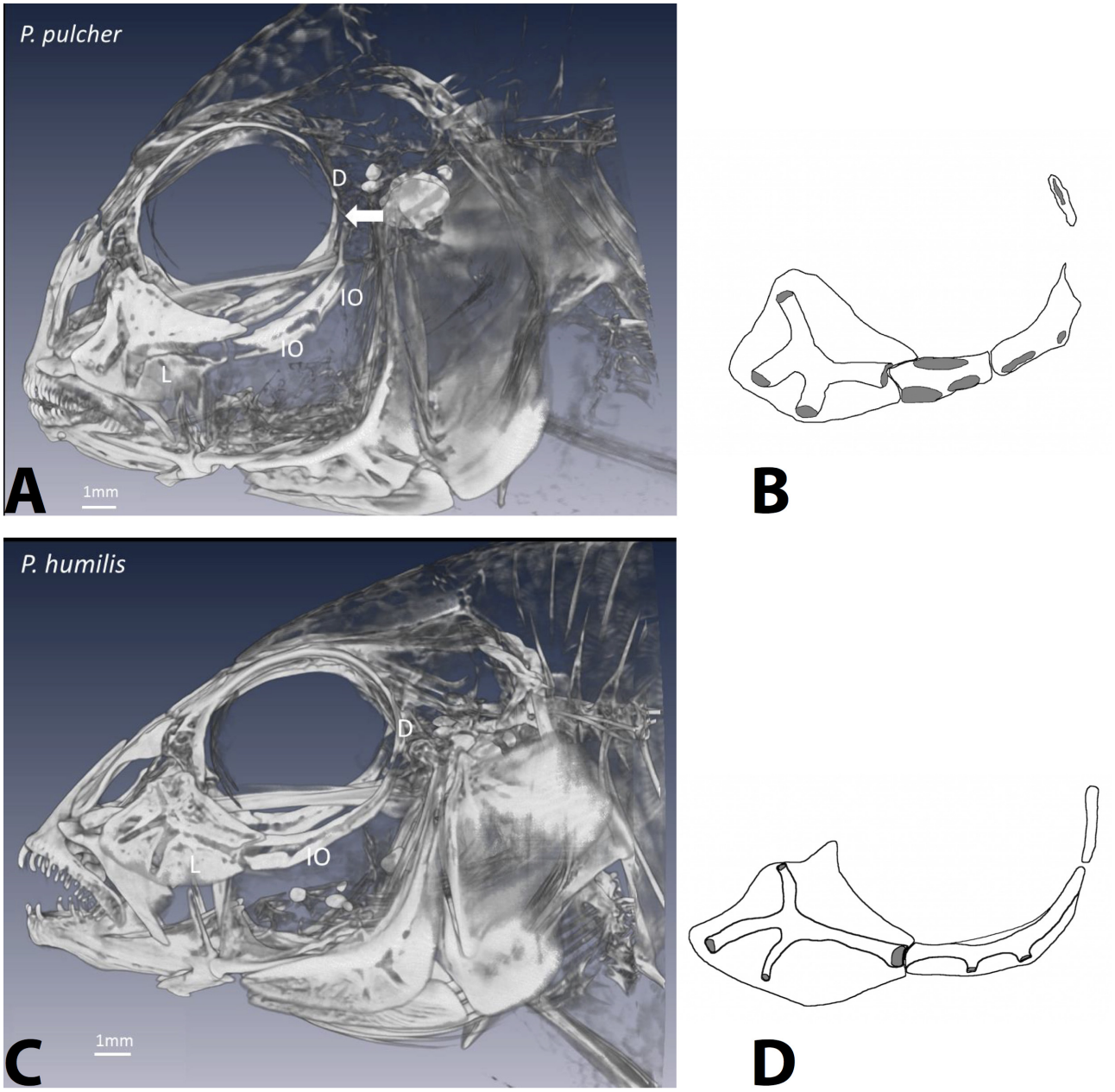

FIGURE 1. A—Head of *P. pulcher*, male, ZCUV-2015/4, SL 54.01 mm; L=Lachrymal, IO=tubular infrorbital, D=dermopsphenoticum; gap between second IO and D indicated by arrow; B—Infraorbital series of *P. pulcher;* C—Head of *W. (P.) humilis*, female, ZCUV-2015/6, SL 56,3 mm; L=Lachrymal, IO=tubular infrorbital, D=dermopsphenoticum; D—Infraorbital series of *W. (P.) humilis.*

FIGURE 2. *Wallaceochromis humilis*, holotype, BMNH 1915.4.13:44, SL 80.7 mm, Sierra Leone: North Sherbo District.

Results

In microCT-scanned specimens of the *P. pulcher* group (*P. pulcher*, *P. taeniatus*, and *P. roloffi)*, as well as in examined specimens of *P. subocellatus*, *P. silviae*, and *P. sacrimontis*, three tubular infraorbital bones were present, with a gap between second and third (dermosphenotic) element (Fig. 1A, B). In species of the *P. humilis* group (*P. humilis*, *P. rubrolabiatus*, and *P. signatus*) two contiguous, elongate tubular infraorbital bones were present, without a gap between first and second (dermosphenotic) (Fig. 1C, D).

Species of the *P. humilis* group exhibit vertical bars on the body in several behavioral situations (Fig. 3), a patterning not observed in species of the *P. pulcher* group. However, these vertical bars are usually not, or are only poorly, visible on preserved specimens. Additionally, members of the *P. humilis* group tend to have a more pointed snout and greater snout length than members of the *P. pulcher* group (25.3–43.0% SL, mean 33.7% vs. 19.9–38.8% SL, mean 27.3%). These observations together with the genetic results of Lamboj *et al.* (2014) and Schwarzer *et al.* (2014) provide justification for reassignment of the *P. humilis* group. As the type species of the genus *Pelvicachromis* is *P. pulcher* (Boulenger 1901), a new generic designation for the *P. humilis*-group, *Wallaceochromis*, is proposed.

Wallaceochromis gen. nov.

Differential Diagnosis. Lachrymal with four openings of laterosensory system; small chest scales; sixteen scales around caudal peduncle; upper lateral line clearly separated from dorsal fin base; teeth in both jaws unicuspid, a few teeth situated anterolaterally in the lower jaws with a curvature of the crown directed posteriorly and not buccally; no microbranchiospines; gill rakers on the outer row of the first ceratobranchial pachydermatous, transversely aligned, with a tuberculate and concave upper surface and a protracted distal tip; sexual dimorphism well developed: Males usually one third larger than females; in males first pelvic fin ray always longest, in females second (sometimes second and third) pelvic fin ray longer than first, giving the distal tip of the fin a rounded rather than pointed appearance. Snout pointed; dorsal head profile straight and sloping; low supraoccipital crest; ethmovomerine skull region slightly elongate and sloping at a low angle; it differs from *Pelvicachromis* in two contiguous tubular infraorbital bones (vs. three, with gap between 2nd and 3rd); 26–27 vertebrae with a tendency to

higher abdominal vertebral counts (14–15 vs. 13–14); a more narrow interorbital region in adult specimens (maximum of 21.7–25.6% HL vs. 26.8–36.7% HL); seven or eight vertical dark bars on body, visible in several behavioral situations (vs. no such bars).

Included species: *Wallaceochromis humilis* (Boulenger, 1916); type species (fig. 2, 3A,B)

Wallaceochromis rubrolabiatus (Lamboj, 2004) (fig. 3C,D)

Wallaceochromis signatus (Lamboj, 2004) (fig. 3E,F)

Etymology. In honor of Alfred R. Wallace, co-founder of the theory of evolution and founder of biogeography; chromis, a common ending for African cichlids.

Distribution. The genus is restricted to Guinea, Sierra Leone, and western parts of Liberia, where it occurs strictly in freshwater (Lamboj, 2004a). *Wallaceochromis rubrolabiatus* and *W. signatus* are only known from the Kolente River basin in Guinea, while *W. humilis* is found in the whole distribution area of the genus, including the Kolente River basin.

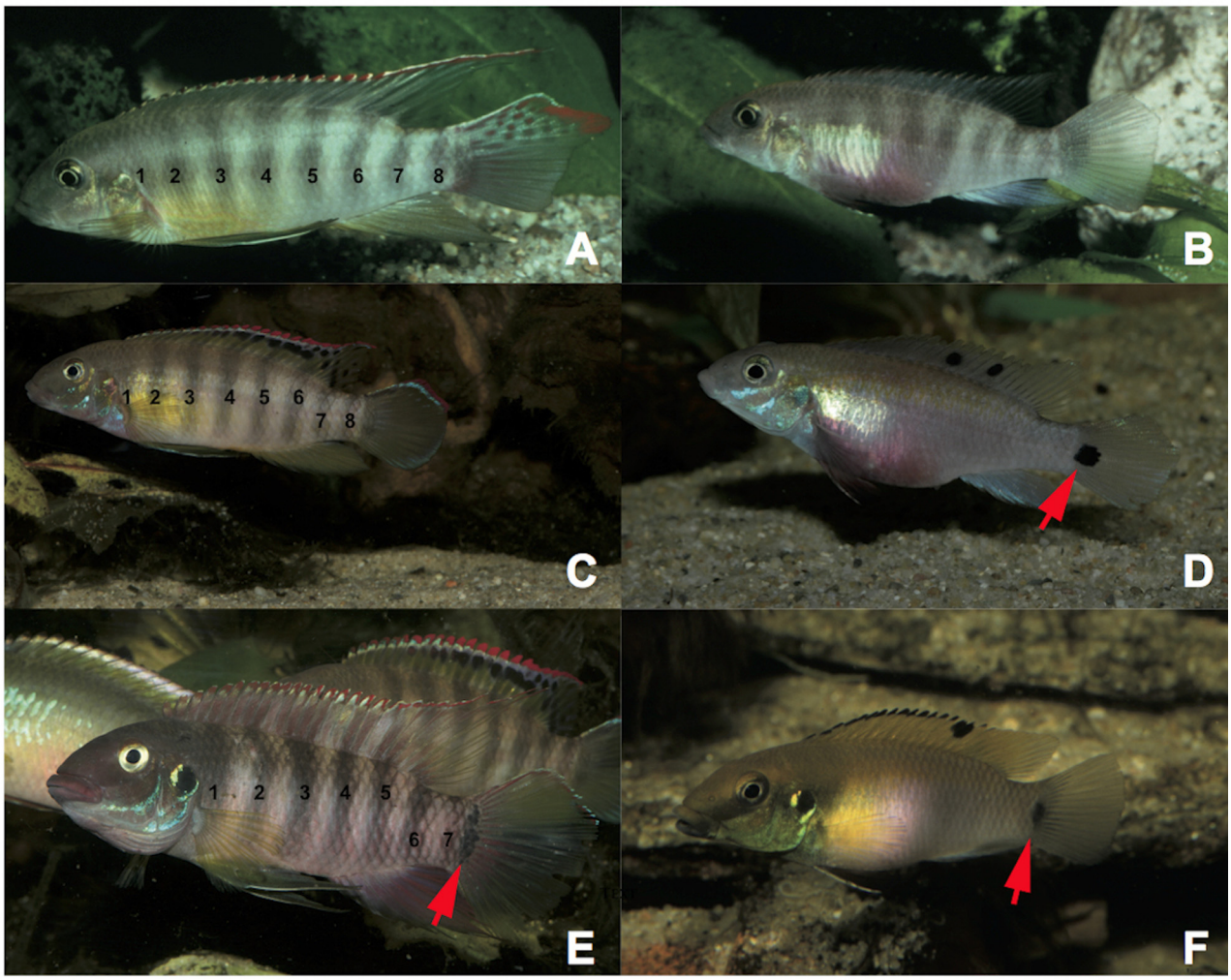

FIGURE 3. Species included in *Wallaceochromis*, all aquarium specimens, not measured, not preserved: A—*W. humilis,* male, B—female; C—*W. signatus* male, D—female; E—*W. rubrolabiatus* male, F—female. Figs. A,C,D: Numbers indicate counts for vertical black bars; red arrows indicate black spots on caudal fin (D) and on base of caudal peduncle (E,F).

Key to the species

1. Seven dark bars on body, visible in most behavioral situations, a dark ovoid spot at base of caudal peduncle . . . . . *W. rubrolabiatus*
- Eight dark bars on body, visible in most behavioral situations, dark spot at base of caudal peduncle absent 2
2. Males with dark markings in dorsal and caudal fin, females with dark spot on anteriormost portion of caudal fin . . *W. signatus*
- No black markings in fins in either sexes . . . . . *W. humilis*

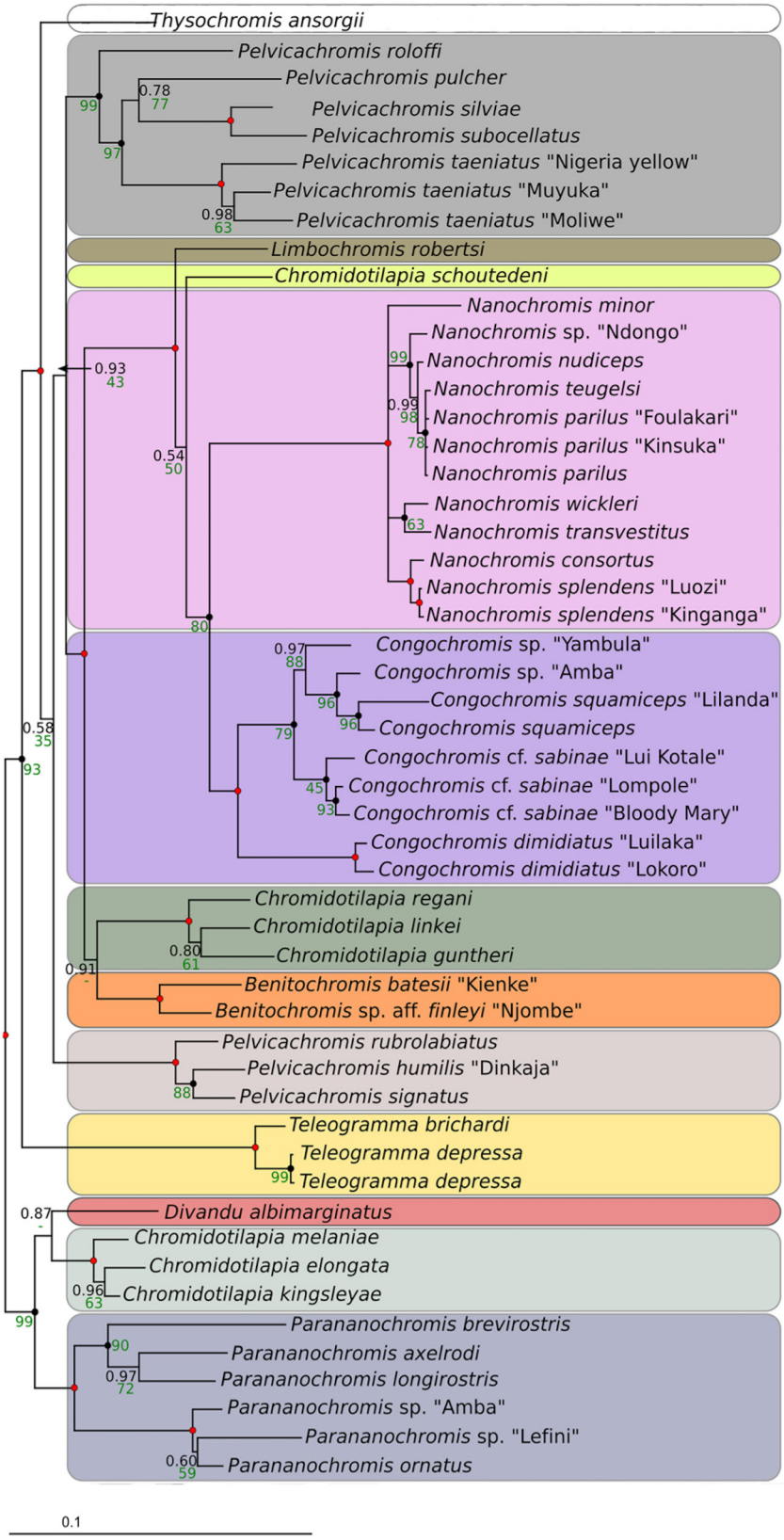

FIGURE 4. Consensus BI tree (50% majority rule) of chromidotilapiines, based on six genes, taken from Schwarzer *et al.* (2014), modified. The dataset comprises mitochondrial and nuclear sequences of six independent markers. Green numbers at nodes refer to bootstrap values (BS, 1,000 replicates) of the ML run and black numbers to Bayesian posterior probabilities (BPP). Red circles represent a 100% BS support and 1.00 BPP and black circles 1.00 BPP and lower BS values. The leaf stability index exceeded 0.93 for all specimens. For more details, see Schwarzer *et al.*, (2014, fig.4).

FIGURE 5. Distribution map of *Pelvicachromis* (+) and *Wallaceochromis* **gen. nov.** (●).

Conclusion

In the phylogeny of Schwarzer *et al.* (2014), a monophyletic *P. humilis*-group (*Wallaceochromis)* is placed outside of a large clade that includes *Pelvicachromis* sensu stricto (Fig. 4) and was noted as being in need of formal taxonomic recognition. According to Schwarzer *et al.*, (2014), *Pelvicachromis* is notably older, with an estimated origin between 12.8 and 29.5 mya, versus 3.9–14.8 mya for *Wallaceochromis*, depending on the calibration of molecular clock (for details, see Schwarzer *et al.* 2014, fig.4). Perhaps in reflection of a longer time for dispersal, *Pelvicachromis* has a wider distribution than the radiation of *Wallaceochromis*, which is restricted to a small area from Guinea via Sierra Leone to Liberia (Fig. 5). Overlap in distribution of the two genera occurs only with *P. roloffi*, which is also known from Guinea, Sierra Leone and Liberia.

Material examined. *Wallaceochromis humilis.* BMNH 1915.4.13:44, holotype,—MRAC 154802,—MRAC 164505,—MRAC 183575-576,—MRAC 183577-578,—MRAC 73-10-P-663-685,—MRAC 73-10-P-6427-482,—MRAC 73-10-P-6483-528,—MRAC 73-10-P-6600-620,—MRAC 73-10-P-6529-568,—MRAC 73-10-P- 6569-599,—MRAC 73-10-6636-643,—MRAC 73-10-P-7802-861,—MRAC 92-59- P-2644-2652,—AMNH 12317,—AMNH 97493,—AMNH 97494,—AMNH 97495,—AMNH 97496,—AMNH 97497,—AMNH 97498,—AMNH 97499,—AMNH 97500,—AMNH 97501,—AMNH 97502,—AMNH 97503,—AMNH 97405,—AMNH 97505,—ZCUV-2015/6.

Wallaceochromis rubrolabiatus. NMW 94835, holotype,—NMW 94836,—MRAC A2-011-P-19-20,—ZCUV-2015/8.

Wallaceochromis signatus. ZMA 109.959, holotype,—ZMA 109.960,—ZMA 114.995,—ZMA 114.996,—MRAC 77-10-P-2-5,—ZCUV-2015/7.

Pelvicachromis kribensis. BMNH 1902.11.12.164-165 and BMNH 1912.6.29.19-28, syntypes,—NMW 95240,—NMW 95241,—NMW 95242,—ZCUV-2015/1,— ZCUV-2015/2.

Pelvicachromis pulcher. BMNH 1901.1.28.13-20, syntypes,—BMNH 1902.11.10.221–228,—BMNH 1902.11.10.229–230,—BMNH 1912.2.2.9,—BMNH 1984.7.27.1048–1053,—MRAC 154804–807,—MRAC 154809-810,—MRAC P 154821, f—MRAC 84-20-P-262,—MRAC 84-51-P-17,—MRAC 84-51-P-68–69,

MRAC 86-08-P33,—MRAC 86-08-P-34,—MRAC 86-10-P-101,—MRAC 88-35-P 434–435,—MRAC 88-35-P-436–438,—MRAC 88-43-P-439–442,—MRAC 90-019-P-0463–0489,—MRAC 91-01-P-411–414,—MRAC 91-067-P-0549,—MRAC 91-055-P-0602–0603,—MRAC 91-010-P- 0653,—MRAC 92-014-P- 0125,— MRAC 93-039-P0147–0148,—ZCUV-2015/3,—ZCUV-2015/4.

Pelvicachromis roloffi. MRAC 73399, holotype,—MRAC 733400,—MRAC 73401-402,—ZCUV 2015/5.

Pelvicachromis sacrimontis. MRAC 86-10-P-102, neotype,—MRAC 138748–138755,—MRAC 154410-154412,—MRAC 154513–154514,—MRAC 154520–154530,—MRAC 86-08-P-33,—MRAC 86-08-P-34,—MRAC 86-10-P-101,—MRAC 86-10-P-103,—MRAC 88-37-P-138-142, –. MRAC 93-039-P-0149–0150.

Pelvicachromis silviae. NMW 95243, holotype,— NMW 95244,— MRAC 91-067-P-0549,— MRAC B2-22-P-1-2.

Pelvicachromis subocellatus. BMNH 1872.1.27.14-15, syntypes,—MRAC 144619-144630.

Pelvicachromis drachenfelsi. NMW 95237, holotype,—NMW 95238,—NMW 95239,—MRAC B2-19-P-1-4,—AMNH 255627,—ZSM 41742.

Pelvicachromis taeniatus. BMNH 1901.1.28.21, holotype,—AMNH 97565.

Archiving of 3D image data. The reconstructed images shown in Figs. 1 have been deposited to figshare.com as stacks of TIFF images, along with their relevant metadata. These are freely available for unstained heads of *Wallaceochromis humilis,* female, ZCUV-2015/6, SL 56,3 mm, and *Wallaceochromis pulcher* male, ZCUV-2015/4, SL 54.01 mm at https://dx.doi.org/10.6084/m9.figshare.3405961.

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