TITLE:

A new species of Petrochromis (Perciformes: Cichlidae) from Lake Tanganyika

AUTHOR(S):

Takahashi, Tetsumi; Koblmüller, Stephan

CITATION:

Takahashi, Tetsumi ...[et al]. A new species of Petrochromis (Perciformes: Cichlidae) from Lake Tanganyika. Ichthyological Research 2014, 61(3): 252-264

ISSUE DATE:

2014-04-05

URL:

<http://hdl.handle.net/2433/198634>

RIGHT:

The final publication is available at Springer via <http://dx.doi.org/10.1007/s10228-014-0396-9>; この論文は出版社版ではありません。引用の際には出版社版をご確認ご利用ください。 ; This is not the published version. Please cite only the published version.

1

2

3 **A new species of *Petrochromis* (Perciformes: Cichlidae) from Lake Tanganyika**

4

5 Tetsumi Takahashi¹ and Stephan Koblmüller²

6

7 ¹ Department of Zoology, Graduate School of Science, Kyoto University,

8 Kitashirakawa-Oiwake, Sakyo, Kyoto 606-8502, Japan, e-mail:

9 tetsumi@terra.zool.kyoto-u.ac.jp

10

11 ² Department of Zoology, Karl Franzens University Graz, Universitätsplatz 2, 8010 Graz,

12 Austria

13 Based on morphological and molecular analyses of a *Petrochromis* fish (Cichlidae) from the
14 southern end of Lake Tanganyika, this fish is considered a taxonomic species distinct from
15 the six known congeners. A new scientific name is proposed for this fish. A key to the seven
16 *Petrochromis* species is included.

17

18 **Key words** Taxonomy · Morphology · mtDNA phylogeny · Description of a new species ·

19 Key to species

Introduction

Lake Tanganyika in the East African Rift Valley (Fig. 1) harbours morphologically, ecologically, and genetically exceptionally diverse cichlid species assemblage. About 200 cichlid species have been described so far for Lake Tanganyika (Koblmüller et al. 2008a), and new species are still being discovered (e.g., Takahashi and Hori 2006; Schelly et al. 2007; Verburg and Bills 2007; Takahashi 2008; Burgess 2012; Kullander et al. 2012), such that the total number of species may reach 250 (Snoeks 2000). Most of these species are endemic to the lake and this cichlid radiation most likely originated via intra-lacustrine speciation after the lake was established 9–12 million years ago (Cohen et al. 1993; Koblmüller et al. 2008a). Due to this high diversity and rapid cladogenesis, these fish are important model systems for studying the factors and processes underlying adaptive radiation (e.g., Fryer and Iles 1972; Kornfield and Smith 2000; Turner et al. 2001; Kocher 2004; Seehausen 2006; Turner 2007; Koblmüller et al. 2008a; Salzburger 2009; Sturmbauer et al. 2011; Takahashi and Koblmüller 2011; Gante and Salzburger 2012).

Tropheini Poll 1986 is one of the most species-rich cichlid tribes endemic to the lake. In this tribe, 23 mouth-brooding species are currently considered valid and belong to seven genera (genus allocation for two species is not resolved, Takahashi 2003). Molecular phylogenetic studies indicate that this tribe forms a monophyletic group within the so-called "modern haplochromines", sister to the extremely species-rich lineage that includes the species flocks of Lake Malawi and the Lake Victoria region as well as numerous riverine taxa (Salzburger et

al. 2005; Koblmüller et al. 2008b). *Petrochromis* Boulenger 1898 is a genus belonging to this tribe (Poll 1986; Takahashi 2003). This genus is morphologically defined by having a brush-like tooth plate on each jaw (Poll 1986), which allows the fish to comb unicellular algae from filamentous algae on rocks (Yamaoka 1983a). These tooth plates are composed of tricuspid teeth arranged in irregular rows, and the shape of the outer teeth does not differ from the inner teeth (e.g., Poll 1956: figs. 18, 20), whereas in the other species of the tribe Tropheini, the outer teeth are clearly different from the inner teeth. They are bicuspid in many species, are larger than the inner teeth, and are arranged in a single regular row (e.g., Poll 1956: figs. 10, 17). The fishes of the genus *Petrochromis* inhabit the rocky littoral zone where they represent one of the dominant cichlid genera (Sturmbauer et al. 2008; Takeuchi et al. 2010; van Steenberge et al. 2011); sandy bottom between rocky habitats restricts migration and gene flow in these fishes (Wagner and McCune 2009; Wagner et al. 2012). Thus, their habitat fragmentation and allopatric diversification resulted in numerous local colour variants (e.g., Kohda et al. 1996; Konings 1998). Six taxonomic species are currently considered valid in this genus (Yamaoka 1983b; Poll 1986; Maréchal and Poll 1991): *P. famula* Matthes and Trewavas 1960, *P. fasciolatus* Boulenger 1914, *P. macrognathus* Yamaoka 1983b, *P. orthognathus* Matthes 1959, *P. polyodon* Boulenger 1898, and *P. trewavasae* Poll 1948. Although molecular phylogenies based on mitochondrial DNA (mtDNA) sequences and amplified fragment length polymorphism (AFLP) of nuclear DNA question the monophyly of this genus (Sturmbauer et al. 2003; Koblmüller et al. 2010), this study uses this conventional taxonomic classification.

During his survey at the southern end of Lake Tanganyika, M. Hori of Kyoto University found an undescribed *Petrochromis* fish that was similar to *P. fasciolatus* in body coloration and stripe pattern (Fig. 2) but did not have a protruding lower jaw that characterises *P. fasciolatus* (Yamaoka 1983b). This fish was first recorded in 1996 and has been called *Petrochromis* sp. ("rotundus") (Takeuchi et al. 2010). The present study conducted morphological and molecular analyses and compared the undescribed fish with the six known *Petrochromis* species to infer whether this fish is indeed a distinct taxonomic species.

Materials and methods

Specimens of the undescribed fish. M. Hori collected twelve individuals of the undescribed fish at Kasenga, Zambia (Fig. 1) by chasing the fish into a screen net while SCUBA diving. For molecular analyses, the right pectoral fin was fixed in 100% ethyl alcohol in nine of the twelve individuals. The bodies of all the individuals were fixed in 10% formalin and thereafter preserved in 70–75% ethyl alcohol for morphological analyses.

Comparative materials for morphological analyses. For comparison, 130 specimens including name-bearing types (i.e., holotypes and syntypes) of the six described *Petrochromis* species were examined (Tables 1, S1).

Brichard (1989) divided *P. trewavasae* into two subspecies based on differences in body

86 colouration and caudal-fin shape and described one of the subspecies as *Petrochromis*
87 *trewavasae ephippium* Brichard 1989. No type specimens have been designated for *P. t.*
88 *ephippium*. Konings (1998) reported another *P. trewavasae*-like fish, *Petrochromis* sp.
89 "Moshi Yellow". These three fishes show different geographical distributions with overlaps
90 at a few localities; *Petrochromis trewavasae trewavasae* is restricted to the southern region of
91 the west coast of the lake, *Petrochromis* sp. "Moshi Yellow" is found at several localities on
92 the east coast, and *P. t. ephippium* is distributed over the other coastal regions (Konings
93 1998). As the taxonomic status of these fish is still unclear, the present study treats these fish
94 as a single operational taxonomic unit, *P. trewavasae*, though these fish probably includes
95 some distinct species [Koblmüller et al. 2010; J. Snoeks of MRAC (Royal Museum for
96 Central Africa, Tervuren, Belgium) personal communication; SK personal observation]. The
97 present sample for morphological analyses includes three individuals that are considered (as
98 judged from their sampling locations) *P. t. trewavasae*, 17 individuals that are considered *P. t.*
99 *ephippium*, and two individuals that are considered *Petrochromis* sp. "Moshi Yellow".
100
101 Some phenotypic variants are known in the *P. polyodon* species-complex (e.g., Koblmüller et
102 al. 2010; Wagner et al. 2012). Although paraphyletic in a mtDNA-phylogeny, this
103 species-complex forms a well-supported monophyletic group based on nuclear multi-locus
104 (AFLP) data (Koblmüller et al. 2010). As the taxonomic status of these fishes is still
105 unresolved, the present study treats this species-complex as a single operational taxonomic
106 unit, *P. polyodon*, though it clearly represents a complex of several distinct, partially
107 sympatric species (Koblmüller et al. 2010; Wagner et al. 2012).

108

109 Konings (1998) reported a local variant of *P. orthognathus* from the east coast between
110 Luagala Point and Cape Mpimbwe and called it *Petrochromis* sp. "orthognathus ikola".
111 Molecular phylogenies based on AFLP and mtDNA strongly support the monophyly of a
112 clade containing *P. orthognathus* and *Petrochromis* sp. "orthognathus ikola" (Koblmüller et
113 al. 2010). As the taxonomic status of *Petrochromis* sp. "orthognathus ikola" is still
114 unresolved, the present study treats these individuals as a single operational taxonomic unit,
115 *P. orthognathus*. The present morphological analysis includes 20 individuals that are
116 considered (as judged from their sampling locations) *P. orthognathus* and six individuals that
117 are considered *Petrochromis* sp. "orthognathus ikola".

118

119 *Interochromis loocki* (Poll 1949) is known among aquarists as *Petrochromis* sp.
120 "orthognathus tricolor", reflecting its similarities in general appearance to *P. orthognathus*
121 (Konings 1998). However, this species does not meet the morphological definition of
122 *Petrochromis*; for example, the outer teeth on jaws are bicuspid in *I. loocki*, whereas tricuspid
123 in *Petrochromis*. Therefore, this species is not a member of the morphologically defined
124 genus *Petrochromis*, and the present study did not include this species in morphological
125 analyses.

126

127 *Morphological data.* Sixteen morphometric characters [standard length (SL), body depth,
128 head length, length and depth of caudal peduncle, lengths of dorsal-fin and anal-fin bases,
129 lengths of pectoral, pelvic, and caudal fins, head width, snout length, eye length, interorbital

width, lower-jaw length, and upper-jaw protrusion] and 10 meristic characters (spines and soft rays in dorsal fin, spines and soft rays in anal fin, soft rays in pectoral fin, scales in longitudinal line, scales on upper and lower lateral lines, scale rows between lateral lines, and gill rakers on the first ceratobranchial) were examined in all individuals, and four morphometric characters on the lower pharyngeal jaw (length and width of lower pharyngeal jaw, and length and width of dentigerous area on the lower pharyngeal jaw) were measured in one individual of the undescribed fish (MRAC B3-03-P-05). The methods used to measure and count these characters correspond with those of Snoeks (2004) with the following exceptions. Lengths of the pectoral and pelvic fins were measured from the base to the tip of the longest ray in each fin. Length of the caudal fin was measured from the base to the tip of the longest soft ray in the upper lobe, which was the second, third or fourth branched soft ray from the upper. The base of the soft ray is on a skinfold resulting from lateral bending of the caudal fin. Protrusion of the upper jaw is the horizontal distance between the anterior tips of the upper and lower jaws when the mouth was closed completely, or closed to the hypothetical normal position in species that cannot close the mouth completely. The anterior tips of jaws are on the lip-tissues. When the lip-tissues have been fixed in unnatural shape, the upper-jaw protrusion was measured between hypothetical points if the lip-tissues would have been in natural shape. A positive value indicates that the upper jaw protrudes anterior to the lower jaw and a negative value indicates that the lower jaw protrudes anterior to the upper jaw. Scale rows between lateral lines were counted at the anterior end of the lower lateral line. Paired characters except for gill rakers were measured or counted on the left side of the body unless these were broken. Gill rakers were counted on the right side. Although counted

in many taxonomic studies of cichlid fish, the outer teeth on the upper jaw were not counted in the present study, as they are difficult to count correctly; these teeth were irregularly arranged and not distinguishable from the inner teeth in *Petrochromis*. The last two soft rays of the dorsal and anal fins were counted as two soft rays, although these are sometimes counted as one soft ray in non-cichlid fishes (e.g., Hubbs and Lagler 2004). The numbers of spines and soft rays in a fin were indicated by Roman and Arabic numerals, respectively.

Measurements were taken to the nearest 0.1 mm using dividers or digital callipers except for the lower pharyngeal jaw, of which measurements were taken to the nearest 0.01 mm using a digital microscope (KEYENCE VHX-100).

Statistical analyses of morphological data. Fifteen morphometric characters and eight meristic characters were used for statistical analyses. The SL was used as covariate. The four morphometric characters on the lower pharyngeal jaw, the number of spines on anal fin, and the number of scale rows between lateral lines were not used for statistic analyses, as these were measured only in one individual or were invariable.

Three analyses were conducted to test differences between the undescribed fish and each of the six known *Petrochromis* species and between sexes; those were a multivariate analysis of covariance (MANCOVA) with log₁₀-transformed SL as a covariate on 14 log₁₀-transformed morphometric characters except for upper jaw protrusion, an analysis of covariance (ANCOVA) with SL as a covariate on the upper jaw protrusion, of which the raw data were

analysed, as it can be zero or negative, and a multivariate analysis of variance (MANOVA) for the eight meristic characters. Critical significance levels were corrected following the Bonferroni procedure.

Phylogeny of mtDNA sequences. Koblmüller et al. (2010) inferred the phylogeny of the Tropheini based on mtDNA sequence data, including the NADH dehydrogenase subunit 2 gene (ND2, 1047 bp) and control region (CR, 962 bp; excluding the poly-T region). To infer the phylogenetic position of the undescribed *Petrochromis* fish, we added mtDNA sequence data of this fish to the data matrix of Koblmüller et al. (2010) [$N = 9$, MRAC B3-03-P-04 to B3-03-P-07 and BMNH (The Natural History Museum, London, UK) 2013.2.13.1 to 2013.2.13.5]. We also included mtDNA sequence data of *P. macrognathus*, which has not been included in the phylogenetic analysis of Koblmüller et al. (2010) [$N = 6$, Zm (private collection of M. Hori) 02170, 02573, 02574, 02578, 02579, 03532, collected at Kasenga, Zambia]. *Petrochromis polyodon*, *P. cf. polyodon*, *P. sp.* "macrognathus rainbow", and *P. sp.* "Texas Longola" of Koblmüller et al. (2010) were treated as *P. polyodon*, and *P. trewavasae*, *P. t. ephippium*, and *Petrochromis sp.* "Moshi yellow" were treated as *P. trewavasae* (see above). This phylogenetic analysis includes the undescribed fish of *Petrochromis*, all the six described congeners, and two unidentified fishes; namely, *Petrochromis sp.* "Katete" and *P. cf. macrognathus* (*sensu* Koblmüller et al. 2010). Details for the samples used in the phylogenetic analysis are in Table S2.

Total DNA was extracted from right pectoral fin using AquaPure Genomic DNA Kit

196 (Bio-Rad). Polymerase chain reaction was conducted using a GeneAmp PCR System 9700
197 (Applied Biosystems) with the following programme: one cycle of 94 °C for 2 min., and 32
198 cycles of 94 °C for 15 s, 55°C for 30 s, 72 °C for 2 min. The ND2 region was amplified with
199 the primers MET (Duftner et al. 2005) and TRP (Kocher et al. 1995), and sequenced using
200 these primers and the internal primers ND2.T-R and ND2.2A (Duftner et al. 2005). The CR
201 was amplified with the primers L-Pro-F_Tropheus (Koblmüller et al. 2011) and TDK-DHG
202 (primer G in Lee et al. 1995), and sequenced using these primers and the internal primers
203 TDK-D (primer E in Lee et al. 1995) and SC-DL (Salzburger et al. 2002). The PCR
204 fragments were purified using PEG and directly sequenced with the BigDye sequencing
205 chemistry (Applied Biosystems) using an ABI 3130xl sequencer (Applied Biosystems).
206 DNA sequences were aligned by eye using MEGA4 software (Tamura et al. 2007).
207 Sequences are available in the DNA Data Bank of Japan (DDBJ Accession no. AB850665–
208 AB850679 for ND2, AB850680–AB850694 for CR).

209
210 *Phylogenetic tree construction.* Phylogenetic inference based on maximum-likelihood (ML)
211 was done in Treefinder version October 2008 (Jobb et al. 2004). Shotgun search was repeated
212 until the likelihood value was not improved. Statistical support was assessed by
213 bootstrapping (100 pseudo-replicates). The best-fit model of molecular evolution for each
214 region was selected under the Akaike Information Criterion (AIC) by Kakusan4 (Tanabe
215 2011). The transition model (TIM) with gamma distribution (+ G) was selected for the first
216 and second codon positions of the ND2 region, and the J2 model + G for the third position.
217 The general time reversible model (GTR) + G was selected for the CR. Bayesian

phylogenetic analysis was conducted using MrBayes version 3.2 (Ronquist and Huelsenbeck 2003). Data were partitioned by gene, and additionally by codon position within ND2. Rate heterogeneity was set according to a gamma distribution with six rate categories (GTR model) for each data partition, which was selected under the AIC by Kakusan4. Posterior probabilities were obtained from MCMC simulations (5 million generations; trees sampled every 100 generations). The first 2000 trees were discarded as burn-in to obtain 50% majority consensus topology. Chain stationarity was checked using Tracer version 1.5 (Rambaut and Drummond 2009).

Results

Morphological analyses. Raw morphometric and meristic data for the undescribed fish and the six known *Petrochromis* species are available in Table S1. The ranges of some characters did not or little overlap between the undescribed fish and the known species (Table 2).

The MANCOVAs on 14 log₁₀-transformed morphometric characters showed significant differences between the undescribed fish and five known *Petrochromis* species except for *P. polyodon* (Table 3). *Petrochromis polyodon* was not significantly different from the undescribed fish in these characters after a Bonferroni correction, but the *P*-value was rather small (0.0096). The range of upper-jaw protrusion of the undescribed fish did not overlap with those of *P. fasciolatus*, *P. macrognathus*, *P. polyodon*, and *P. trewavasae* (Table 2), and

these differences were statistically significant (Table 3). The MANOVAs on eight meristic characters showed significant differences between the undescribed fish and five known species except for *P. fasciolatus* (Table 3). Sexual differences were not significant in these analyses.

Phylogenetic analysis of mtDNA sequences. Except for some nodes with bootstrap support (BS) lower than 70 of the ML tree, the ML and Bayesian tree topologies were identical (Fig. 3). Both analyses resolved the undescribed fish as a monophyletic group (BS of 100), sister to *Petrochromis* sp. "Katete" (BS of 100), which together represent a rather distinct clade of the genus *Petrochromis*. *Petrochromis macrognathus* resulted as monophyletic and was placed in a lineage containing the polyphyletic species *P. polyodon* and *P. trewavasae*. The other parts of the trees were identical with the mtDNA tree of Koblmüller et al. (2010) except for nodes with low bootstrap support; i.e. the monophyly of each species and *Tropheus* species complex was recovered with high bootstrap support with exception of *P. polyodon* and *P. trewavasae*. All polytypic genera (*Petrochromis*, *Simochromis* Boulenger 1898, and *Tropheus* Boulenger 1898) resulted as polyphyletic.

Discussion

Taxonomy. The undescribed fish was clearly distinct from the six described species of the genus *Petrochromis* in several morphological characters with no or less overlaps (Table 2).

These morphological differences were statistically significant (Table 3). The ML and Bayesian trees based on mtDNA sequences showed a clear separation of the undescribed fish from the six congeners (Fig. 3). Thus, both morphological and molecular data support the hypothesis that the undescribed fish represents a distinct taxonomic species rather than a variant of a described species of *Petrochromis*.

Habitat use. The undescribed fish occurs sympatrically with five known species of *Petrochromis* except for *P. orthognathus* at Kasenga (i.e., *P. famula*, *P. fasciolatus*, *P. macrognathus*, *P. polyodon*, and *P. trewavasae*). The undescribed fish is usually found on rocks at 13–15 m depth (main habitat of this fish may be deeper than this area). The five sympatric congeners mainly dwell in shallower areas, and their densities are much lower in the deep-water areas where the undescribed fish occurs [present study; appendix S2 of Takeuchi et al. (2010), which called the undescribed fish *Petrochromis* sp. ("rotundus")]. The undescribed fish may reduce congeneric competition for resources such as food by exploiting this deep habitat.

Phylogenetic considerations. Although phylogenetic inference of Lake Tanganyika's cichlids, including the Tropheini, based on mtDNA data has been repeatedly shown to be heavily impacted by (ancient) incomplete lineage sorting and (ancient) hybridisation/introgression (e.g., Rüber et al. 2001; Koblmüller et al. 2007ab, 2010; Sturmbauer et al. 2010), mtDNA data do provide important information on phylogenetic relationships between species. The close phylogenetic relationship of the undescribed

284 *Petrochromis* species with *P. sp. "Katete"* might indicate that these two taxa are conspecific.
285 Unfortunately, no voucher specimen is available for *P. sp. "Katete"*, but it resembles the
286 undescribed fish in its overall appearance (SK personal observation). Similarly,
287 *Petrochromis sp. "flame tail"*, another deep-water *Petrochromis* that recently entered the
288 aquarium trade resembles the undescribed fish. More samples and analyses are needed to
289 clarify whether these fish belong to the same taxonomic species as the undescribed fish and
290 what's the geographic distribution of this species.

291
292 The new mtDNA data, in particular those of *P. macrognathus*, indicate that the large-bodied
293 *P. polyodon*-, *P. macrognathus*- and *P. trewavasae*-like fishes are very closely related.
294 Paraphyly or polyphyly of nominal taxa may indicate that incomplete lineage sorting and/or
295 hybridization complicate phylogenetic inference and taxonomic assignment based on single
296 molecular markers in this cichlid lineage (also see Sturmbauer et al. 2003; Koblmüller et al.
297 2010). Nevertheless, the mtDNA data point to the urgent need for an extensive taxonomic
298 revision of the entire genus as morphologically and genetically distinct, yet taxonomically
299 undescribed, taxa of the *P. polyodon*-species complex appear to occur sympatrically at
300 various locations (Konings 1998; Koblmüller et al. 2010; Wagner et al. 2012). Thus, at
301 present the true species number and consequently diversification rate appears to be
302 dramatically underestimated in this clade, similar to the situation in the closely related genus
303 *Tropheus* (Konings 1998; Schupke 2003; Egger et al. 2007).

304

305

306 ***Petrochromis horii* n. sp.**

307

308 Here the undescribed fish is named *Petrochromis horii* n. sp.

309

310 **Holotype.** MRAC B3-03-P-01 (female, 137.6 mm SL), Kasenga, Zambia, rocky bottom at

311 13 m depth, screen net, M. Hori and T. Takahashi, 21 Nov. 2009.

312

313 **Paratypes.** *N* = 11. A fin-clip was taken from nine specimens for DNA analysis (indicated by

314 *). MRAC B3-03-P-02 (female, 85.0 mm SL), B3-03-P-03 (female, 105.7 mm SL),

315 B3-03-P-04* (male, 100.7 mm SL), collected with the holotype; MRAC B3-03-P-05*

316 (female, 128.3 mm SL), Kasenga, Zambia, rocky bottom at 15 m depth, screen net, M. Hori,

317 28 Nov. 2007; MRAC B3-03-P-06* (female, 116.6 mm SL), B3-03-P-07* (female, 100.4

318 mm SL), Kasenga, Zambia, rocky bottom at 14 m depth, screen net, M. Hori, 5 Nov. 2008;

319 BMNH 2013.2.13.1* (male, 104.4 mm SL), 2013.2.13.2* (male, 100.1 mm SL),

320 2013.2.13.3* (female, 130.3 mm SL), 2013.2.13.4* (male, 89.1 mm SL), 2013.2.13.5*

321 (female, 105.7 mm SL), Kasenga, Zambia, rocky bottom at 14 m depth, screen net, M. Hori,

322 9 Nov. 2008.

323

324 **Diagnosis.** This new taxonomic species differs from its congeners with no overlaps in

325 several morphological characters (Table 2). Its body is deeper than that of *P. macrognathus*,

326 the caudal peduncle is deeper than that of *P. orthognathus*, the pectoral fin is longer than that

327 of *P. macrognathus*, the pelvic fin is longer than that of *P. fasciolatus*, the caudal fin is longer

than that of *P. famula*, *P. fasciolatus*, and *P. orthognathus*, the interorbital region is wider than that of *P. macrognathus* and *P. orthognathus*, the upper jaw protrudes more than that of *P. fasciolatus* and less than that of *P. macrognathus*, *P. polyodon*, and *P. trewavasae*, the soft rays in the dorsal fin are fewer than in *P. macrognathus*, and the number of scales in longitudinal line is larger than in *P. famula* and *P. orthognathus*.

Morphological description. The morphological description, except for the lower pharyngeal jaw, is based on the holotype (Fig. 4a, b), and the ranges for paratypes are given in parentheses; the morphometric and meristic data are summarized in Table 4. The description of the lower pharyngeal jaw is based on a paratype (MRAC B3-03-P-05, Fig. 4c).

Body short, deepest at dorsal-fin origin, gradually becoming shallow to caudal peduncle; caudal peduncle short, depth of caudal peduncle 89.2% (82.2–101.6%) of its length. Dorsal profile of head sloping steeply; ventral profile slightly rounded. Eye small, rounded [percentage of eye length against head length decreased with increasing SL, non-parametric Spearman test: $N = 12$ (holotype and 11 paratypes), $\rho = -0.73$, $P = 0.007$]; eye length 62.4% (62.2–72.8%) of snout length. Interorbital region convex. Mouth lower than body axis; jaws almost equal anteriorly [percentage of upper jaw protrusion against head length decreased with increasing SL, non-parametric Spearman test: $N = 12$ (holotype and 11 paratypes), $\rho = -0.84$, $P < 0.001$]; posterior edge of mouth not reaching vertical line through anterior margin of eye.

350 Dorsal fin originating slightly anterior to vertical line through posterior margin of operculum;
351 each spine with a lappet near tip; all soft rays branched; posterior tip of the fin elongate,
352 extending beyond caudal-fin base when depressed. Anal fin originating slightly anterior to
353 vertical line through base of last dorsal-fin spine; three spines increasing in length
354 posteriorly; first and second spines with a lappet near tip; all soft rays branched; posterior tip
355 elongate, extending beyond caudal-fin base when depressed. Upper end of pectoral-fin base
356 slightly posterior to vertical line through posterior margin of operculum; distal tip acutely
357 pointed; fifth soft ray from upper longest, reaching vertical line through anus; soft rays
358 branched, except uppermost two and lowermost two (except uppermost two and lowermost
359 one or two). Pelvic fin originating posterior to vertical line through posterior margin of
360 operculum; all soft rays branched; outer soft rays longer than inner ones; outermost soft ray
361 filamentous, reaching anal-fin origin. Caudal fin lunate; distal tips of upper and lower lobes
362 acutely pointed.

363

364 Scales on flank cycloid or ctenoid with radially directed short ctenii; granulation extending
365 over almost entire exposed part of scale. Posterior half of cheek scaled; caudal fin with scales
366 on fin membrane between rays; other fins lack scales. Upper lateral line originating from
367 sensory canal of supracleithrum, running below dorsal margin of body, posteriorly not
368 reaching posterior end of dorsal-fin base. Lower lateral line running on body axis, anteriorly
369 not reaching vertical line through anal-fin origin, posteriorly extending beyond caudal-fin
370 base.

371

372 Oral teeth tricuspid, arranged in 9 to 11 irregular rows at anterior parts of upper and lower
373 jaws, making brush-like, broad tooth plate on each jaw; outer and inner teeth
374 indistinguishable in size, shape, or arrangement pattern. Gill rakers short.

375

376 Lower pharyngeal jaw of a paratype (MRAC B3-03-P-05, Fig. 4c) sub-triangular with
377 concave lateral margins and roundly convex caudal margins on both sides, length 14.83 mm,
378 width 12.63 mm; dentigerous area sub-triangular, length 6.80 mm, width 10.13 mm; teeth
379 villiform.

380

381 **Body colour pattern.** The colour of live fish is described based on two photographs; one is
382 of the holotype that was taken under water when it was caught (Fig. 4b, female), and the other
383 is of individuals that were not collected (Fig. 2b, sex unknown). A part of head anterior to the
384 posterior margin of eye moss green; pale ventrally. Body with eleven moss green vertical
385 bands from nape to caudal-fin base (the most anterior one combines with the moss-green blot
386 on the head in Fig. 4b), and a moss green or dark green horizontal broad band on body axis
387 (pale above anus, breaking the band into two parts in Fig. 2b); spaces between the bands and
388 ventral part of body pale green. Fins moss green; anterior margin of pelvic fin pale green.

389

390 The vertical and horizontal bands are unclear in fixed specimens (Fig. 4a).

391

392 **Sexual dimorphism.** Apparent differences between sexes were not found in morphometric
393 and meristic characters. The largest female was 1.3 times larger than the largest male in SL,

but small sample size precludes a definite conclusion (note: males grow larger than females in all other species of *Petrochromis*). Given the relatively small size of the males examined, no sexual dimorphism of body shape and coloration was observed. Whether *P. horii* n. sp. indeed exhibits no (or even reversed) sexual dimorphism in body shape, coloration, or body size clearly requires the examination of a larger sample size of adult specimens.

Distribution. At present, this new species is only known from Kasenga.

Etymology. Named in honour of M. Hori of Kyoto University, Japan; he suggested that this fish might represent an undescribed species.

Key to the seven *Petrochromis* species.

This key was constructed based on specimens larger than ~80 mm SL (Table 2). Therefore, the key morphometric characters are not applicable to smaller individuals. Known maximum SL of each species was drawn from Poll (1956), Yamaoka (1983b), and the present study.

- 1a. Lower jaw protruding anterior to upper jaw (protrusion of upper jaw -1.0 to -6.6% of head length, Fig. 5a) ----- *P. fasciolatus* (maximum SL, 131.0 mm)
- 1b. Upper jaw a little protruding anterior to lower jaw (protrusion of upper jaw 0.6–4.6% of head length, Fig. 5b) ----- 2

- 416 1c. Upper jaw greatly protruding anterior to lower jaw (protrusion of upper jaw 4.8–15.4% of
417 head length, Fig. 5c) -----4
- 418 2a. 34 or 35 scales in longitudinal line; caudal fin long (length 27.2–32.3% of SL) ----- *P.*
419 *horii* n. sp. (maximum SL, 137.6 mm)
- 420 2b. 31–33 scales in longitudinal line; caudal fin short (length 22.2–26.3% of SL) ----- 3
- 421 3a. Body shallow (depth 36.5–41.5% of SL); head small (length 30.5–33.7% of SL); caudal
422 peduncle narrow (depth 71.4–88.9% of the length); 7 soft rays in anal fin ----- *P.*
423 *orthognathus* (maximum SL, 150.5 mm)
- 424 3b. Body deep (depth 40.5–45.0% of SL); head large (length 31.9–36.3% of SL); caudal
425 peduncle deep (depth 79.4–108.2% of the length); usually 8 soft rays in anal fin -----
426 *P. famula* (maximum SL, 133.0 mm)
- 427 4a. 11 or 12 soft rays in dorsal fin; interorbital region narrow (width 28.8–33.9% of head
428 length); upper jaw protrusion 6.4–15.4% of head length; pectoral fin short (length 24.1–
429 30.1% of SL) ----- *P. macrognathus* (maximum SL, 178.7 mm)
- 430 4b. Usually 10 or less soft rays in dorsal fin; interorbital region wide (width 31.2–40.9% of
431 head length); upper jaw protrusion 4.8–11.9% of head length; pectoral fin long (length
432 29.9–37.1% of SL) ----- 5
- 433 5a. Usually 17 or 18 spines in dorsal fin; usually 8 soft rays in anal fin; caudal fin short
434 (length 24.8–30.6% of SL); dorsal profile of head gently rounded ----- *P. polyodon*
435 (maximum SL, 179.8 mm)
- 436 5b. Usually 19 spines in dorsal fin; usually 7 soft rays in anal fin; caudal fin long (length
437 28.3–35.8% of SL); dorsal profile of head nearly straight ----- *P. trewavasae*

438 (maximum SL, 153.3 mm)

439

440

441 **Acknowledgements** We thank M. Hori for providing specimens; P. Ngalande, H. Phiri, D.
442 Sinyinza and other staff of Department of Fisheries, the Ministry of Livestock and Fisheries,
443 Zambia and B. Ngatunga, A. Chande and other staff of Tanzania Fisheries Research Institute
444 for their support in the field; J. Snoeks, R. Britz, M. Yabe, Y. Kai, G. Shinohara, Y. Terai, and
445 H. Hata for their assistance during the examination of comparative specimens; J. Snoeks and
446 R. Britz for depositing type specimens of *P. horii* n. sp. in MRAC and BMNH, respectively;
447 J. Snoeks for comments on the taxonomic status of *P. t. ephippium*; and Y. Kai for measuring
448 the upper-jaw protrusion in some specimens. This study was supported by Grants-in-Aid for
449 Special Purposes (No. 18779002), Young Scientists (B) (No. 20770065), and Scientific
450 Research (B) (No. 23370043) from the Ministry of Education, Culture, Sports, Science and
451 Technology, Japan.

452

453

454 **References**

455

456 Boulenger GA (1898) Report on the fishes recently obtained by Mr. J. E. S. Moore in Lake
457 Tanganyika. Proc Zool Soc Lond :494–497

458 Boulenger GA (1914) Diagnoses des poissons nouveaux: I. Acanthoptérygiens, Opisthomes,
459 Cyprinodontes (Mission Stappers au Tanganyika-Moero). Rev Zool Afr 3:442–447

- 460 Brichard P (1989) Cichlids and all the other fishes of Lake Tanganyika. T.F.H. Publications,
461 Neptune City
- 462 Burgess WE (2012) A new species of goby cichlid of the genus *Eretmodus*, *E. marksmithi*,
463 (Pisces: Cichlidae) from the northern part of Lake Tanganyika. *Tanganika Mag* 12:23–
464 31
- 465 Cohen AS, Soreghan MJ, Scholz CA (1993) Estimating the age of formation of lakes: an
466 example from Lake Tanganyika, East African Rift system. *Geology* 21:511–514
- 467 Coulter GW (1994) Lake Tanganyika. *Adv Limnol* 44:13–18
- 468 Duftner N, Koblmüller S, Sturmbauer C (2005) Evolutionary relationships of the
469 Limnochromini, a Tribe of benthic deepwater cichlid fish endemic to Lake Tanganyika,
470 East Africa. *J Mol Evol* 60:277–289
- 471 Egger B, Koblmüller S, Sturmbauer C, Sefc KM (2007) Nuclear and mitochondrial data
472 reveal different evolutionary processes in the Lake Tanganyika cichlid genus *Tropheus*.
473 *BMC Evol Biol* 7:137
- 474 Fryer G, Iles TD (1972) The cichlid fishes of the great lakes of Africa. T.F.H. Publications,
475 Neptune City
- 476 Gante HF, Salzburger W (2012) Evolution: Cichlid models on the runaway to speciation.
477 *Current Biol* 22:R956–958
- 478 Günther A (1893) Descriptions of the reptiles and fishes collected by Mr. E. Coode-Hore on
479 Lake Tanganyika. *Proc Zool Soc Lond* 628-632.
- 480 Hubbs CL, Lagler KF (2004) Fishes of the great lakes region, revised edition, revised by
481 Smith GR. University of Michigan Press, Ann Arbor

- 482 Iles RB (1960) A group of zooplankton feeders of the genus *Haplochromis* (Cichlidae) in
483 Lake Nyasa. *Ann Mag Nat Hist* (13) 2:257–280
- 484 Jobb G, von Haeseler A, Strimmer K (2004) TREEFINDER: a powerful graphical analysis
485 environment for molecular phylogenetics. *BMC Evol Biol* 4:18
- 486 Koblmüller S, Duftner N, Sefc KM, Aibara M, Stipacek M, Blanc M, Egger B, Sturmbauer C
487 (2007a) Reticulate phylogeny of gastropod-shell-breeding cichlids from Lake
488 Tanganyika – the result of repeated introgressive hybridization. *BMC Evol Biol* 7:7
- 489 Koblmüller S, Egger B, Sefc KM, Sturmbauer C (2007b) Evolutionary history of Lake
490 Tanganyika's scale-eating cichlid fishes. *Mol Phylogenet Evol* 44:1295–1305
- 491 Koblmüller S, Sefc KM, Sturmbauer C (2008a) The Lake Tanganyika cichlid species
492 assemblage: recent advances in molecular phylogenetics. *Hydrobiologia* 615:5–20
- 493 Koblmüller S, Schliewen UK, Duftner N, Sefc KM, Katango C, Sturmbauer C (2008b) Age
494 and spread of the haplochromine cichlid fishes in Africa. *Mol Phylogenet Evol* 49:153–
495 169
- 496 Koblmüller S, Egger B, Sturmbauer C, Sefc KM (2010) Rapid radiation, ancient incomplete
497 lineage sorting and ancient hybridization in the endemic Lake Tanganyika cichlid tribe
498 Tropheini. *Mol Phylogenet Evol* 55:318–334
- 499 Koblmüller S, Salzburger W, Obermüller B, Eigner E, Sturmbauer C, Sefc K (2011)
500 Separated by sand, fused by dropping water: habitat barriers and fluctuating water levels
501 steer the evolution of rock-dwelling cichlid populations in Lake Tanganyika. *Mol Ecol*
502 20:2272–2290
- 503 Kocher TD (2004) Adaptive evolution and explosive speciation: the cichlid fish model.

- 504 Nature Rev Gen 5:288–298
- 505 Kocher TD, Conroy JA, McKaye KR, Stauffer JR, Lockwood SF (1995) Evolution of NADH
506 dehydrogenase subunit 2 in east African cichlid fish. Mol Phylogenet Evol 4:420–432
- 507 Kohda M, Yanagisawa Y, Sato T, Nakaya K, Niimura Y, Matsumoto K, Ochi H (1996)
508 Geographical colour variation in cichlid fishes at the southern end of Lake Tanganyika.
509 Environ Biol Fish 45:237–248
- 510 Konings A (1998) Tanganyika cichlids in their natural habitat. Cichlid Press, El Paso
- 511 Kornfield I, Smith PF (2000) African cichlid fishes: model systems for evolutionary biology.
512 Ann Rev Ecol Syst 31:163–196
- 513 Kullander SO, Karlsson M, Karlsson M (2012) *Lepidiolamprologus kamambae*, a new
514 species of cichlid fish (Teleostei: Cichlidae) from Lake Tanganyika. Zootaxa 3492:30–
515 48
- 516 Lee W-J, Conroy J, Howell WH, Kocher TD (1995) Structure and evolution of teleost
517 mitochondrial control regions. J Mol Evol 41:54–66
- 518 Maréchal C, Poll M (1991) *Petrochromis*. In: Daget J, Gosse J-P, Teugels GG, Thys van den
519 Audenaerde DFE (eds) Check-list of the freshwater fishes of Africa CLOFFA 4. ISBNB,
520 Bruxelles, MRAC, Tervuren, ORSTOM, Paris, pp. 369–373
- 521 Matthes H (1959) Un Cichlidae nouveau du lac Tanganika: *Petrochromis orthognathus* n. sp.
522 Rev Zool Botanique Afr 60:335–341
- 523 Matthes H, Trewavas E (1960) *Petrochromis famula* n. sp. a cichlid fish of Lake Tanganyika.
524 Rev Zool Botanique Afr 61:349–357
- 525 Poll M (1948) Description de Cichlidae nouveaux recueillis par la mission hydrobiologique

- 526 belge au lac Tanganika (1946–1947). Bull Mus R Hist Nat Belg 24:1–31
- 527 Poll M (1949) Deuxième série de Cichlidae nouveaux recueillis par la mission
- 528 hydrobiologique belge au lac Tanganika. Bull Inst R Sci Nat Belg 33:1–55
- 529 Poll M (1956) Poissons Cichlidae. Rés Sci Explor Hydrobiol Lac Tanganika Inst R Sci Nat
- 530 Belg 3(5B):1–619
- 531 Poll M (1986) Classification des Cichlidae du lac Tanganika. Tribus, genres et espèces. Acad
- 532 R Belg Mém Cl Sci 45:1–163
- 533 Rambaut A, Drummond AJ (2009) Tracer version 1.5. Available at
- 534 <http://tree.bio.ed.ac.uk/software/tracer/>
- 535 Ronquist F, Huelsenbeck JP (2003) MrBayes 3: Bayesian phylogenetic inference under
- 536 mixed models. Bioinformatics 19:1572–1574
- 537 Rüber L, Meyer A, Sturmbauer C, Verheyen E (2001) Population structure in two sympatric
- 538 species of the Lake Tanganyika cichlid tribe Eretmodini: evidence for introgression.
- 539 Mol Ecol 10:1207–1225
- 540 Salzburger W (2009) The interaction of sexually and naturally selected traits in the adaptive
- 541 radiations of cichlid fishes. Mol Ecol 18:169–185
- 542 Salzburger W, Meyer A, Baric S, Verheyen E, Sturmbauer C (2002) Phylogeny of the Lake
- 543 Tanganyika cichlid species flock and its relationship to the Central and East African
- 544 haplochromine cichlid fish faunas. Syst Biol 51:113–135
- 545 Salzburger W, Mack T, Verheyen E, Meyer A (2005) Out of Tanganyika: genesis, explosive
- 546 speciation, key-innovations and phylogeography of the haplochromine cichlid fishes.
- 547 BMC Evol Biol 5:17

- 548 Schelly R, Takahashi T, Bills R, Hori M (2007) The first case of aggressive mimicry among
549 lamprologines in a new species of *Lepidolamprologus* (Perciformes: Cichlidae) from
550 Lake Tanganyika. *Zootaxa* 1638:39–49
- 551 Schupke P (2003) *Aqualog: African cichlids II, Tanganyika I, Tropheus*. Verlag A.C.S.
552 Gmbh, Rodgau
- 553 Seehausen O (2006) African cichlid fish: a model system in adaptive radiation research. *Proc*
554 *R Soc B* 273:1987–1998
- 555 Snoeks J (2000) How well known is the ichthyodiversity of the large East African lakes? *Adv*
556 *Ecol Res* 31:17–38
- 557 Snoeks J (2004) Material and methods. In: Snoeks J (ed) *The cichlid diversity of Lake*
558 *Malawi/Nyasa/Niassa: Identification, distribution and taxonomy*. Cichlid Press, El
559 Paso, pp. 12–19
- 560 Sturmbauer C, Hainz U, Baric S, Verheyen E, Salzburger W (2003) Evolution of the tribe
561 Tropheini from Lake Tanganyika: synchronized explosive speciation producing
562 multiple evolutionary parallelism. *Hydrobiologia* 500:51–64
- 563 Sturmbauer C, Fuchs C, Harb G, Damm E, Duftner N, Maderbacher M, Koch M, Koblmüller
564 S (2008) Abundance, distribution, and territory areas of rock-dwelling Lake Tanganyika
565 cichlid fish species. *Hydrobiologia* 615:57–68
- 566 Sturmbauer C, Salzburger W, Duftner N, Schelly R, Koblmüller S (2010) Evolutionary
567 history of the Lake Tanganyika cichlid tribe Lamprologini (Teleostei: Perciformes)
568 derived from mitochondrial and nuclear DNA data. *Mol Phylogenet Evol* 57:266–284
- 569 Sturmbauer C, Husemann M, Danley PD (2011) Explosive speciation and adaptive radiation

- 570 of East African cichlid fishes. *Biodiversity Hotspots* 2011:333–362
- 571 Takahashi T (2003) Systematics of Tanganyikan cichlid fishes (Teleostei: Perciformes).
572 *Ichthyol Res* 50:367–382
- 573 Takahashi T (2008) Description of a new cichlid fish species of the genus *Benthochromis*
574 (Perciformes: Cichlidae) from Lake Tanganyika. *J Fish Biol* 72:603–613
- 575 Takahashi T, Hori M (2006) Description of a new Lake Tanganyikan cichlid fish of the genus
576 *Cyprichromis* (Perciformes: Cichlidae) with a note on sexual dimorphism. *J Fish Biol*
577 68(B):174–192
- 578 Takahashi T, Koblmüller S (2011) The adaptive radiation of cichlid fish in Lake Tanganyika:
579 a morphological perspective. *Int J Evol Biol* 2011:Article ID 620754
- 580 Takeuchi Y, Ochi H, Kohda M, Sinyinza D, Hori M (2010) A 20-year census of a rocky
581 littoral fish community in Lake Tanganyika. *Ecol Freshwater Fish* 2010:239–248
- 582 Tamura K, Dudley J, Nei M, Kumar S (2007) MEGA4: molecular evolutionary genetics
583 analysis (MEGA) software version 4.0. *Mol Biol Evol* 24:1596–1599
- 584 Tanabe AS (2011) Kakusan4 and Aminosan: two programs for comparing nonpartitioned,
585 proportional and separate models for combined molecular phylogenetic analyses of
586 multilocus sequence data. *Mol Ecol Res* 11:914–921
- 587 Turner GF (2007) Adaptive radiation of cichlid fish. *Current Biol* 17:R827–R831
- 588 Turner GF, Seehausen O, Knight ME, Allender CJ, Robinson RL (2001) How many species
589 of cichlid fishes are there in African lakes? *Mol Ecol* 10:793–806
- 590 Van Steenberge M, Vanhove MPM, Muzumani RD, Mulimbwa NT, Muterezi BF, Pariselle
591 A, Gillardin C, Vreven E, Raeymakers JAM, Huyse T, Volckaert FAM, Nshombo MV,

- 592 Snoeks J (2011) A recent inventory of the fishes of the north-western and central
593 western coast of Lake Tanganyika (Democratic Republic Congo). *Acta Ichthyol Piscat*
594 41:201–214
- 595 Verburg P, Bills R (2007) Two new sympatric species of *Neolamprologus* (Teleostei:
596 Cichlidae) from Lake Tanganyika, East Africa. *Zootaxa* 1612:25–44
- 597 Wagner CE, McCune AR (2009) Contrasting patterns of spatial genetic structure in
598 sympatric rock-dwelling cichlid fishes. *Evolution* 63:1312–1326
- 599 Wagner CE, McCune AR, Lovette IJ (2012) Recent speciation between sympatric
600 Tanganyikan cichlid colour morphs. *Mol Ecol* 21:3283–3292
- 601 Yamaoka K (1983a) Feeding behavior and dental morphology of algae scraping cichlids
602 (Pisces: Teleostei) in Lake Tanganyika. *Afr Stud Monogr* 4:77–89
- 603 Yamaoka K (1983b) A revision of the cichlid fish genus *Petrochromis* from Lake
604 Tanganyika, with description of a new species. *Jpn J Ichthyol* 30:129–141.
605

Figure legends

Fig. 1 Map of Lake Tanganyika (29°05'–31°15'E, 3°30'–8°50'S, 650 km in length, Coulter 1994), showing the sampling localities of the specimens examined in morphological analyses.

Fig. 2 Underwater photographs taken at Kasenga (14–16 m depth) in November 2010 by M. Hori. Colour was corrected using Adobe Photoshop CS3 (Adobe Systems, Inc.). **a** The head of the group is *Petrochromis fasciolatus*, followed by two individuals of the undescribed fish (sex is unknown). The smallest individual could not be identified to species level. **b** An expanded image showing the two individuals of the undescribed fish. **c** Another photograph of *P. fasciolatus*; this individual appears to be a mouth-brooding female.

Fig. 3 The best ML tree of the Tropheini based on the complete ND2 gene and the mitochondrial control region (excluding the poly-T region). Only ML-bootstrap percentages >50 and posterior probabilities >0.50 resulting from Bayesian inference are shown at the nodes. *Astatotilapia burtoni* (Günther 1893), *Aulonocara* sp. and *Copadichromis borleyi* (Iles 1960) were used as outgroup taxa. The coloured bars depict the assignment to different genera of Tropheini. The catalogue numbers of specimens correspond to those in Table S1 and those of Koblmüller et al. (2010). Generic allocation has not been resolved for *Chromis horei* and *Paratilapia pfefferi*, so the genus in original description is tentatively used.

Fig. 4 *Petrochromis horii* n. sp. **a** Holotype (MRAC B3-03-P-01, female, 137.6 mm SL) after

629 fixation. **b** Holotype when caught; colour was corrected using Photoshop; white mesh on the
630 fish is a screen net. **c** Lower pharyngeal jaw (14.83 mm in length) of a paratype (MRAC
631 B3-03-P-05, female, 128.3 mm SL) in dorsal view; the background was trimmed using
632 Photoshop.

633

634 **Fig. 5** Different mouth shapes of *Petrochromis*. **a** Lower jaw protruding (*P. fasciolatus*, Zm
635 401-b, female, 113.1 mm SL). **b** Upper jaw a little protruding (*P. famula*, Zm 869-b, female
636 108.2 mm SL). **c** Upper jaw greatly protruding (*P. trewavasae*, TT 1215, male, 113.0 mm
637 SL).

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Table 1. Summary of specimens used for morphological analyses. See Table S1 for details of the sampling.

	No. and SL (mm) of females	No. and SL (mm) of males	Sampling localities
Undescribed fish	$N = 8$ 85.0–137.6	$N = 4$ 89.1–104.4	Kasenga
<i>P. famula</i>	$N = 8$ 84.7–108.2	$N = 12$ 97.6–133.0	Pemba, Cape Muzimu, Kabimba, Kasenga
<i>P. fasciolatus</i>	$N = 11$ 77.6–113.1	$N = 10$ 82.2–128.6	Pemba, Cape Muzimu, Kalemie, Kapamba (= Kapampa?), baie de Kilewa (= Kileba?), Kasenga
<i>P. macrognathus</i>	$N = 10$ 87.1–132.2	$N = 11$ 93.2–178.7	Luhanga, Pemba, Sumbu, Kasenga
<i>P. orthognathus</i>	$N = 11$ 88.4–129.9	$N = 15$ 84.2–150.5	Pemba, Cape Muzimu, near Kalemie, Cape Mpibmwe, Karema, Mkangasi, near Bulu Point, Kiti Point, Kigoma, near Nyanza, Gitaza
<i>P. polyodon</i>	$N = 8$ 101.6–149.6	$N = 12$ 77.3–179.8	Pemba, Cape Muzimu, Kalemie, Mpulungu, Kasenga, Masaka Point, Kigoma, near Nyanza

<i>P. trewavasae</i>	$N = 10$	$N = 12$	Pemba, Ubwari Peninsula, Cape
	77.3–145.3	77.1–153.3	Muzimu, Moliro, Chipimbi, Kasenga, Kigoma

Table 2 Summary of characters that differ between the undescribed fish and the six known *Petrochromis* species with no or little overlaps

	<i>N</i>	SL (mm) of specimens examined	Body depth % of SL	Caudal- peduncle depth % of SL	Dorsal- fin base length % of SL	Pectoral- fin length % of SL	Pelvic- fin length % of SL	Caudal- fin length % of SL	Snout length % of head length	Eye length % of head length
Undescribed fish	12	85.0–137.6	41.0–45.5	12.7–14.9	60.5–64.8	30.7–37.1	33.9–42.3	27.2–32.3	40.3–44.3	26.9–30.1
<i>P. famula</i>	20	84.7–133.0	40.5–45.0	11.5–13.7	60.4–64.8	30.1–39.3	28.9–41.8	22.7–26.3 ^a	40.3–46.3	22.2–28.1
<i>P. fasciolatus</i>	21	77.6–128.6	33.6–41.9	10.4–13.0	57.2–63.4	27.9–34.0	25.5–31.5 ^b	21.2–26.3 ^b	35.1–41.9	24.8–31.8
<i>P. macrognathus</i>	21	87.1–178.7	35.6–40.2	12.2–14.3	56.5–61.6	24.1–30.1	24.7–42.9	25.5–30.7	42.1–49.5	21.3–27.5
<i>P. orthognathus</i>	26	84.2–150.5	36.5–41.5	10.8–12.4	58.4–65.5	30.3–38.5	28.2–42.9	22.2–25.9 ^c	36.4–45.2	25.4–32.5
<i>P. polyodon</i>	20	77.3–179.8	36.5–43.1	11.8–14.2	56.3–62.9	29.9–37.1	27.9–48.8	24.8–30.6 ^e	36.4–48.9	22.2–28.6
<i>P. trewavasae</i>	22	77.1–153.3	38.4–43.9	11.8–13.3	59.5–66.6	30.1–36.6	32.3–51.4 ^b	28.3–35.8 ^b	40.2–48.9	22.9–30.0

Shading indicates characters in which the values of all individuals (heavy shading) or >90% individuals (light shading) are excluded from the ranges of the undescribed fish. ^a *N* = 19; ^b *N* = 20; ^c *N* = 24; ^d *N* = 25; ^e *N* = 18.

Table 2 Continued (this is the right part of Table 2)

Interorbital	Upper-jaw	Soft	Scales in
width %	protrusion	rays in	longitudinal
of head	% of head	dorsal	line
length	length	fin	
37.0–40.4	0.6–4.6	9–10	34–35
33.3–38.2	0.9–3.3	8–10	31–33
32.3–40.1	-6.6 to -1.0	8–11	33–34
28.8–33.9	6.4–15.4	11–12	35–37
29.9–36.7	0.6–4.0 ^d	8–10	31–33
31.2–40.5	4.8–11.9	9–11	34–36
33.7–40.9	5.2–9.3	8–10	34–35

Table 3 Results of 1) MANCOVA on 14 log₁₀-transformed morphometric characters, 2) ANCOVA on the upper jaw protrusion, and 3) MANOVA on eight meristic characters to test morphological differences between the undescribed fish and each of the six known *Petrochromis* species

	Fish	Sex	y	Fish × sex	Fish × y	Sex × y
vs. <i>P. famula</i>						
1) 14 morphometrics, y: log ₁₀ (SL)	$F_{(14, 11)} = 11.6^{**}$	$F_{(14, 11)} = 1.80^{NS}$	$F_{(14, 11)} = 95.8^{**}$	$F_{(14, 11)} = 0.70^{NS}$	$F_{(14, 11)} = 1.76^{NS}$	$F_{(14, 11)} = 2.70^{NS}$
2) Upper-jaw protrusion, y: SL	$F_{(1, 25)} = 2.26^{NS}$	$F_{(1, 25)} = 0.47^{NS}$	$F_{(1, 25)} = 0.14^{NS}$	$F_{(1, 25)} = 0.94^{NS}$	$F_{(1, 25)} = 2.03^{NS}$	$F_{(1, 25)} = 0.15^{NS}$
3) 8 meristics	$F_{(8, 21)} = 14.6^{**}$	$F_{(8, 21)} = 1.51^{NS}$	—	$F_{(8, 21)} = 0.67^{NS}$	—	—
vs. <i>P. fasciolatus</i>						
1) 14 morphometrics, y: log ₁₀ (SL)	$F_{(14, 11)} = 52.1^{**}$	$F_{(14, 11)} = 0.86^{NS}$	$F_{(14, 11)} = 259^{**}$	$F_{(14, 11)} = 1.51^{NS}$	$F_{(14, 11)} = 1.39^{NS}$	$F_{(14, 11)} = 2.30^{NS}$
2) Upper-jaw protrusion, y: SL	$F_{(1, 26)} = 148^{**}$	$F_{(1, 26)} = 0.33^{NS}$	$F_{(1, 26)} = 7.18^{NS}$	$F_{(1, 26)} = 0.27^{NS}$	$F_{(1, 26)} = 0.10^{NS}$	$F_{(1, 26)} = 0.22^{NS}$
3) 8 meristics	$F_{(8, 21)} = 3.45^{NS}$	$F_{(8, 21)} = 0.37^{NS}$	—	$F_{(8, 21)} = 1.05^{NS}$	—	—
vs. <i>P. macrognathus</i>						
1) 14 morphometrics, y:	$F_{(14, 12)} = 26.0^{**}$	$F_{(14, 12)} = 1.69^{NS}$	$F_{(14, 12)} = 173^{**}$	$F_{(14, 12)} = 0.40^{NS}$	$F_{(14, 12)} = 0.88^{NS}$	$F_{(14, 12)} = 1.20^{NS}$

log₁₀(SL)

2) Upper-jaw protrusion, y: SL	$F_{(1, 26)} = 58.0^{**}$	$F_{(1, 26)} = 3.97^{\text{NS}}$	$F_{(1, 26)} = 2.49^{\text{NS}}$	$F_{(1, 26)} < 0.01^{\text{NS}}$	$F_{(1, 26)} = 1.24^{\text{NS}}$	$F_{(1, 26)} = 1.89^{\text{NS}}$
3) 8 meristics	$F_{(8, 22)} = 14.7^{**}$	$F_{(8, 22)} = 0.56^{\text{NS}}$	—	$F_{(8, 22)} = 0.31^{\text{NS}}$	—	—

vs. *P. orthognathus*

1) 14 morphometrics, y:	$F_{(14, 16)} = 19.9^{**}$	$F_{(14, 16)} = 2.92^{\text{NS}}$	$F_{(14, 16)} = 355^{**}$	$F_{(14, 16)} = 1.11^{\text{NS}}$	$F_{(14, 16)} = 1.10^{\text{NS}}$	$F_{(14, 16)} = 1.53^{\text{NS}}$
-------------------------	----------------------------	-----------------------------------	---------------------------	-----------------------------------	-----------------------------------	-----------------------------------

log₁₀(SL)

2) Upper-jaw protrusion, y: SL	$F_{(1, 30)} = 3.03^{\text{NS}}$	$F_{(1, 30)} = 2.12^{\text{NS}}$	$F_{(1, 30)} = 3.53^{\text{NS}}$	$F_{(1, 30)} = 0.07^{\text{NS}}$	$F_{(1, 30)} = 0.41^{\text{NS}}$	$F_{(1, 30)} = 0.06^{\text{NS}}$
3) 8 meristics	$F_{(8, 27)} = 37.1^{**}$	$F_{(8, 27)} = 0.92^{\text{NS}}$	—	$F_{(8, 27)} = 0.88^{\text{NS}}$	—	—

vs. *P. polyodon*

1) 14 morphometrics, y:	$F_{(14, 10)} = 4.65^{\text{NS}}$	$F_{(14, 10)} = 1.30^{\text{NS}}$	$F_{(14, 10)} = 164^{**}$	$F_{(14, 10)} = 0.83^{\text{NS}}$	$F_{(14, 10)} = 0.71^{\text{NS}}$	$F_{(14, 10)} = 1.12^{\text{NS}}$
-------------------------	-----------------------------------	-----------------------------------	---------------------------	-----------------------------------	-----------------------------------	-----------------------------------

log₁₀(SL)

2) Upper-jaw protrusion, y: SL	$F_{(1, 25)} = 34.0^{**}$	$F_{(1, 25)} = 2.54^{\text{NS}}$	$F_{(1, 25)} = 0.01^{\text{NS}}$	$F_{(1, 25)} = 0.02^{\text{NS}}$	$F_{(1, 25)} = 0.47^{\text{NS}}$	$F_{(1, 25)} = 1.00^{\text{NS}}$
3) 8 meristics	$F_{(8, 21)} = 7.14^{**}$	$F_{(8, 21)} = 0.31^{\text{NS}}$	—	$F_{(8, 21)} = 0.81^{\text{NS}}$	—	—

vs. *P. trewavasae*

1) 14 morphometrics, y:	$F_{(14, 12)} = 12.2^{**}$	$F_{(14, 12)} = 1.08^{\text{NS}}$	$F_{(14, 12)} = 127^{**}$	$F_{(14, 12)} = 1.01^{\text{NS}}$	$F_{(14, 12)} = 2.26^{\text{NS}}$	$F_{(14, 12)} = 1.07^{\text{NS}}$
-------------------------	----------------------------	-----------------------------------	---------------------------	-----------------------------------	-----------------------------------	-----------------------------------

log₁₀(SL)

2) Upper-jaw protrusion, y: SL	$F_{(1, 27)} = 82.8^{**}$	$F_{(1, 27)} = 0.74^{\text{NS}}$	$F_{(1, 27)} = 0.84^{\text{NS}}$	$F_{(1, 27)} = 0.10^{\text{NS}}$	$F_{(1, 27)} = 8.77^{\text{NS}}$	$F_{(1, 27)} < 0.01^{\text{NS}}$
3) 8 meristics	$F_{(8, 23)} = 7.40^{**}$	$F_{(8, 23)} = 1.53^{\text{NS}}$	—	$F_{(8, 23)} = 0.86^{\text{NS}}$	—	—

^{**} $\alpha < 0.01$ ($P < 0.000556$), ^{*} $\alpha < 0.05$ ($P < 0.00267$), ^{NS} $\alpha \geq 0.05$ ($P \geq 0.00267$) after a Bonferroni correction.

Table 4 Morphometric and meristic characters of *Petrochromis horii* n. sp.

	Holotype	Paratypes
	Female	Seven females and four males
SL (mm, female)	137.6	85.0–130.3
SL (mm, male)	—	89.1–104.4
Percentage of SL		
Body depth	43.2	41.0–45.5 (43.4 ± 1.4)
Head length	34.4	31.6–33.7 (32.5 ± 0.8)
Caudal-peduncle length	14.8	14.4–15.7 (15.1 ± 0.5)
Caudal-peduncle depth	13.2	12.7–14.9 (13.5 ± 0.6)
Dorsal-fin base length	60.5	61.7–64.8 (63.1 ± 0.9)
Anal-fin base length	16.6	17.5–19.9 (18.5 ± 0.7)
Pectoral-fin length	33.6	30.7–37.1 (34.2 ± 1.9)
Pelvic-fin length	33.9	34.5–42.3 (38.9 ± 2.4)
Caudal-fin length	29.7	27.2–32.3 (29.8 ± 1.4)
Percentage of head length		
Head width	52.5	54.4–60.9 (57.5 ± 2.1)
Snout length	44.3	40.3–43.3 (41.5 ± 0.9)
Eye length	27.6	26.9–30.1 (28.6 ± 1.0)
Interorbital width	38.2	37.0–40.4 (38.5 ± 1.0)
Lower-jaw length	31.0	25.9–33.2 (28.6 ± 2.1)

Upper-jaw protrusion	0.6	1.0–4.6 (3.2 ± 1.1)
----------------------	-----	---------------------

Meristic characters

Dorsal fin	XIX,9	XVIII,10 (5), XIX,9 (4), XIX,10 (2)
Anal fin	III,7	III,7 (2), III,8 (9)
Pectoral fin	16	15 (2), 16 (9)
Scales in longitudinal line	34	34 (8), 35 (3)
Scales on upper lateral line	24	23 (2), 24 (6), 25 (2), 26 (1)
Scales on lower lateral line	14	10 (1), 13 (2), 14 (6), 15 (1), 16 (1)
Scale rows between lateral lines	2	2 (11)
Gill rakers	11	11 (4), 12 (6), 13 (1)

Morphometric characters of paratypes are indicated as follows: minimum value–maximum value (mean ± standard deviation). Meristic characters of paratypes are indicated as follows: observed value (number of paratypes).

Species	Catalogue no.	Locality	Depth (m)	Type	Sex	Standard length (mm)	Body depth (mm)	Head length (mm)	Caudal-peduncle length (mm)	Caudal-peduncle depth (mm)	Dorsal-fin-base length (mm)	Anal-fin-base length (mm)	Pectoral-fin length (mm)	Pelvic-fin length (mm)	Shortest caudal-fin-ray length (mm)	Longest caudal-fin-ray length (mm)	Head width (mm)	Snout length (mm)	Eye length (mm)	Interorbital width (mm)	Lower-jaw length (mm)	Upper-jaw protrusion (mm)	Length of LPJ (mm)	Width of LPJ (mm)	Length of dentigerous area on LPJ (mm)	Width of dentigerous area on LPJ (mm)	Dorsal-fin spines	Dorsal-fin soft rays	Anal-fin spines	Anal-fin soft rays	Pectoral-fin soft rays	Scales in longitudinal line	Scales on upper lateral line	Scales on lower lateral line	Scale rows between lateral lines	Gill rakers on first ceratobranchial
<i>Petrochromis horii</i> n. sp.	MRAC B3-03-P-01	Kasenga, Zambia	13	Holotype	Female	137.6	59.5	47.4	20.3	18.1	83.2	22.8	46.2	46.7	29.8	40.9	24.9	21.0	13.1	18.1	14.7	0.3	—	—	—	—	19	9	3	7	16	34	24	14	2	11
<i>Petrochromis horii</i> n. sp.	MRAC B3-03-P-02	Kasenga, Zambia	13	Paratype	Female	85.0	37.1	28.3	12.5	12.7	53.3	16.2	30.2	31.3	19.9	24.4	15.4	11.4	8.3	10.7	8.0	1.1	—	—	—	—	18	10	3	8	16	34	25	14	2	12
<i>Petrochromis horii</i> n. sp.	MRAC B3-03-P-03	Kasenga, Zambia	13	Paratype	Female	105.7	47.7	35.6	16.0	14.8	67.1	19.3	39.2	43.8	26.1	34.1	20.4	15.0	10.2	13.9	10.5	0.7	—	—	—	—	18	10	3	8	16	34	23	10	2	12
<i>Petrochromis horii</i> n. sp.	MRAC B3-03-P-04	Kasenga, Zambia	13	Paratype	Male	100.7	44.7	33.8	14.7	14.0	62.6	17.8	36.3	42.6	24.0	29.8	18.6	13.8	9.9	13.6	8.8	1.4	—	—	—	—	18	10	3	8	16	34	23	14	2	12
<i>Petrochromis horii</i> n. sp.	MRAC B3-03-P-05	Kasenga, Zambia	15	Paratype	Female	128.3	53.5	42.2	19.9	16.6	80.3	23.4	45.0	51.5	29.6	40.6	23.0	17.2	11.7	15.6	14.0	1.1	14.83	12.63	6.80	10.13	18	10	3	7	15	35	25	15	2	11
<i>Petrochromis horii</i> n. sp.	MRAC B3-03-P-06	Kasenga, Zambia	14	Paratype	Female	116.6	51.7	39.0	17.2	16.0	75.5	22.2	38.9	42.7	26.0	34.4	22.2	16.2	10.5	15.0	12.0	1.2	—	—	—	—	19	9	3	8	16	34	24	16	2	13
<i>Petrochromis horii</i> n. sp.	MRAC B3-03-P-07	Kasenga, Zambia	14	Paratype	Female	100.4	45.7	31.7	15.5	13.5	64.1	20.0	33.9	39.5	23.6	30.7	19.3	12.8	9.1	12.2	9.1	1.3	—	—	—	—	19	9	3	8	15	34	24	14	2	12
<i>Petrochromis horii</i> n. sp.	BMNH 2013.2.13.1	Kasenga, Zambia	14	Paratype	Male	104.4	44.5	33.6	15.0	14.1	66.5	19.4	35.5	43.0	24.6	32.1	20.1	13.8	9.6	12.7	9.4	1.3	—	—	—	—	19	9	3	8	16	34	24	13	2	12
<i>Petrochromis horii</i> n. sp.	BMNH 2013.2.13.2	Kasenga, Zambia	14	Paratype	Male	100.1	42.3	31.6	14.6	13.0	62.4	18.7	34.6	39.7	24.4	30.2	18.5	13.3	9.0	12.2	8.2	1.1	—	—	—	—	19	10	3	8	16	34	24	14	2	11
<i>Petrochromis horii</i> n. sp.	BMNH 2013.2.13.3	Kasenga, Zambia	14	Paratype	Female	130.3	53.4	41.6	20.2	16.6	81.6	24.4	40.0	47.8	27.4	35.5	24.0	18.0	11.2	16.8	12.0	0.4	—	—	—	—	18	10	3	8	16	34	24	14	2	11
<i>Petrochromis horii</i> n. sp.	BMNH 2013.2.13.4	Kasenga, Zambia	14	Paratype	Male	89.1	38.1	28.2	14.0	12.1	56.8	16.1	31.2	30.7	21.5	26.0	16.6	11.7	8.5	10.7	8.1	1.3	—	—	—	—	19	9	3	8	16	35	26	14	2	11
<i>Petrochromis horii</i> n. sp.	BMNH 2013.2.13.5	Kasenga, Zambia	14	Paratype	Female	105.7	46.0	34.0	16.6	14.0	65.2	18.5	33.2	41.2	24.6	30.2	19.8	14.4	10.0	12.9	9.0	0.8	—	—	—	—	19	10	3	7	16	35	24	13	2	12
<i>Petrochromis famula</i>	BMNH 1950.4.1:7636	Lake Tanganyika	—	Holotype	Male	122.2	50.8	40.6	16.3	14.3	78.4	23.5	42.8	42.2	25.7	27.7	21.7	17.5	10.5	15.3	12.5	0.5	—	—	—	—	18	10	3	8	14	32	22	10	2	12
<i>Petrochromis famula</i>	BMNH 1950.4.1:7640	Lake Tanganyika	—	Paratype	Male	115.7	47.8	39.6	15.3	14.9	74.0	22.5	44.3	39.3	25.0	27.2	19.3	17.8	9.9	14.3	11.6	1.0	—	—	—	—	18	9	3	8	16	33	22	13	2	12
<i>Petrochromis famula</i>	BMNH 1950.4.1:7641	Lake Tanganyika	—	Paratype	Male	121.1	49.2	42.3	16.3	15.1	76.2	24.5	42.8	35.0	26.7	29.0	20.7	18.4	9.4	14.1	13.3	1.3	—	—	—	—	18	10	3	9	15	33	23	12	2	11
<i>Petrochromis famula</i>	MRAC 131113	Kabimba, D. R. Congo	—	Non-type	Male	115.7	50.1	38.9	17.7	14.7	70.2	20.1	41.6	48.4	25.8	27.5	22.1	18.0	9.5	14.2	11.1	0.6	—	—	—	—	18	9	3	8	16	32	22	11	2	11
<i>Petrochromis famula</i>	MRAC 131114	Kabimba, D. R. Congo	—	Non-type	Male	111.6	48.2	38.2	16.5	13.1	69.5	22.1	41.3	38.0	25.0	26.3	21.4	16.9	9.8	13.6	12.3	1.1	—	—	—	—	18	9	3	8	15	31	22	9	2	12
<i>Petrochromis famula</i>	MRAC 131115	Kabimba, D. R. Congo	—	Non-type	Male	102.0	41.9	32.5	14.1	12.1	62.9	18.8	35.5	35.6	22.0	23.5	18.8	13.7	8.0	11.7	9.5	0.3	—	—	—	—	18	10	3	8	15	32	23	12	2	11
<i>Petrochromis famula</i>	HUMZ 116502	Pemba, D. R. Congo	—	Non-type	Female	90.8	40.9	33.0	11.0	11.5	55.2	16.9	33.5	30.3	21.4	22.6	17.4	14.1	8.9	11.6	9.7	0.8	—	—	—	—	18	9	3	8	15	31	22	9	2	12
<i>Petrochromis famula</i>	HUMZ 118085	Pemba, D. R. Congo	—	Non-type	Female	95.7	39.9	33.0	11.0	11.0	57.8	16.6	32.9	29.5	21.5	22.7	17.5	13.3	8.8	11.9	10.3	0.3	—	—	—	—	18	9	3	8	15	32	23	10	2	12
<i>Petrochromis famula</i>	HUMZ 127712	Muzimu, D. R. Congo	5	Non-type	Male	97.6	39.5	32.3	12.5	11.5	59.7	18.3	33.7	38.5	22.8	24.5	17.4	14.1	8.4	11.3	8.3	0.8	—	—	—	—	19	9	3	8	16	32	23	11	2	12
<i>Petrochromis famula</i>	HUMZ 127713	Muzimu, D. R. Congo	5	Non-type	Female	84.7	37.7	30.2	9.7	10.5	52.1	14.8	33.3	26.6	20.8	21.5	16.2	13.3	8.5	10.3	8.1	1.0	—	—	—	—	18	9	3	8	15	32	23	10	2	12
<i>Petrochromis famula</i>	Zm 465-a	Kasenga, Zambia	1.5-2	Non-type	Female	94.6	41.3	32.9	13.3	12.3	59.7	16.7	32.5	31.4	21.5	22.6	16.9	14.0	8.2	11.1	9.3	0.6	—	—	—	—	19	8	3	7	15	33	24	12	2	14
<i>Petrochromis famula</i>	Zm 465-b	Kasenga, Zambia	1.5-2	Non-type	Female	90.1	40.0	31.5	12.2	12.2	55.1	15.9	31.7	28.1	20.5	22.0	16.7	13.0	8.5	10.6	9.6	0.3	—	—	—	—	18	8	3	7	15	32	24	11	2	12
<i>Petrochromis famula</i>	Zm 483-a	Kasenga, Zambia	1.5	Non-type	Male	101.1	45.2	34.6	13.7	13.5	65.1	19.8	34.4	37.5	23.8	26.3	18.0	15.6	8.2	12.1	9.5	1.0	—	—	—	—	18	9	3	8	15	32	22	12	2	11
<i>Petrochromis famula</i>	Zm 483-b	Kasenga, Zambia	1.5	Non-type	Male	99.0	41.8	33.7	14.8	13.3	61.6	18.2	29.8	29.3	21.5	23.4	17.4	14.5	8.1	11.5	9.6	0.5	—	—	—	—	18	9	3	8	15	32	23	12	2	12
<i>Petrochromis famula</i>	Zm 483-c	Kasenga, Zambia	1.5	Non-type	Female	95.1	40.6	33.3	12.7	12.2	58.1	16.9	32.3	31.1	21.9	25.0	17.3	14.3	8.5	11.6	9.4	0.8	—	—	—	—	18	9	3	8	15	32	22	12	2	12
<i>Petrochromis famula</i>	Zm 483-d	Kasenga, Zambia	1.5	Non-type	Female	92.9	41.1	32.6	13.0	12.2	57.8	16.8	33.1	29.3	19.9	21.8	17.3	14.5	8.2	11.3	9.2	0.4	—	—	—	—	18	9	3	8	15	32	22	12	2	13
<i>Petrochromis famula</i>	Zm 869-a	Kasenga, Zambia	3-4	Non-type	Male	121.1	53.7	41.5	17.1	16.6	78.5	23.0	44.6	46.6	27.2	30.8	21.6	18.7	9.5	15.6	12.5	1.1	—	—	—	—	18	10	3	8	15	33	22	12	2	12
<i>Petrochromis famula</i>	Zm 869-b	Kasenga, Zambia	3-4	Non-type	Female	108.2	48.1	37.7	16.5	14.1	68.3	20.5	36.3	32.7	—	—	19.7	16.7	10.0	13.2	11.8	1.1	—	—	—	—	18	9	3	8	15	32	22	10	2	11
<i>Petrochromis famula</i>	Zm 93792-d	Kasenga, Zambia	1-3	Non-type	Male	126.3	53.7	45.8	17.1	16.1	79.0	22.4	44.8	47.6	30.0	32.0	23.6	21.1	10.5	16.0	14.0	1.5	—	—	—	—	18	9	3	8	15	32	22	13	2	12
<i>Petrochromis famula</i>	Zm 93792-e	Kasenga, Zambia	1-3	Non-type	Male	133.0	55.6	43.2	16.3	16.1	84.6	24.8	46.6	47.0	28.6	32.7	24.0	19.2	10.0	16.5	13.1	1.0	—	—	—	—	18	10	3	8	15	33	24	10	2	12
<i>Petrochromis fasciolatus</i>	MRAC 10.749	devant Kapamba, D. R. Congo	—	Syntype	Female	85.3	30.3	26.7	14.2	9.6	51.4	14.6	27.7	24.0	18.3	—	14.9	9.7	8.5	9.6	10.0	-0.8	—	—	—	—	19	8	3	7	16	33	23	10	2	13
<i>Petrochromis fasciolatus</i>	MRAC 10.750	devant Kapamba, D. R. Congo	—	Syntype	Female	77.6	29.6	25.3	12.0	9.2	46.1	14.2	25.8	22.5	16.8	19.0	13.7	8.9	8.0	8.7	8.7	-0.8	—	—	—	—	19	9	3	8	15	33	24	13	2	—
<i>Petrochromis fasciolatus</i>	MRAC 11.695	baie de Kilewa, devant la Sambala, D. R. Congo	—	Syntype	Female	92.0	31.8	29.4	14.5	10.4	52.6	16.7	28.8	23.5	18.5	20.7	15.6	10.7	8.6	9.5	9.6	-0.9	—	—	—	—	19	9	3	8	16	34	24	14	2	13
<i>Petrochromis fasciolatus</i>	MRAC 11.696	baie de Kilewa, devant la Sambala, D. R. Congo	—	Syntype	Female	95.2	34.1	30.2	14.9	11.1	55.1	16.9	29.5	25.5	18.5	21.0	16.1	11.5	9.2	10.4	10.0	-1.7	—	—	—	—	18	10	3	8	16	34	23	12	2	11
<i>Petrochromis fasciolatus</i>	MRAC 106550	Albertville, D. R. Congo	—	Non-type	Female	99.1	38.5	32.1	15.8	11.5	59.8	17.5	32.4	27.4	20.3	23.2	18.2	12.1	9.3	11.2	11.6	-0.6	—	—	—	—	18	10	3	8	16	34	24	13	2	13
<i>Petrochromis fasciolatus</i>	MRAC 106551	Albertville, D. R. Congo	—	Non-type	Female	85.5	33.1	28.1	12.8	9.8	51.8	15.3	28.7	24.9	19.3	22.5	15.6	10.5	8.5	9.1	9.2	-0.6	—	—	—	—	18	10	3	8	16	34	25	15	2	11
<i>Petrochromis fasciolatus</i>	MRAC 106552	Albertville, D. R. Congo	—	Non-type	Male	101.3	39.3	32.2	15.9	11.2	60																									

Species	Catalogue no.	Locality	Depth (m)	Type	Sex	Standard length (mm)	Body depth (mm)	Head length (mm)	Caudal-peduncle length (mm)	Caudal-peduncle depth (mm)	Dorsal-fin-base length (mm)	Anal-fin-base length (mm)	Pectoral-fin length (mm)	Pelvic-fin length (mm)	Shortest caudal-fin-ray length (mm)	Longest caudal-fin-ray length (mm)	Head width (mm)	Snout length (mm)	Eye length (mm)	Interorbital width (mm)	Lower-jaw length (mm)	Upper-jaw protrusion (mm)	Length of LPJ (mm)	Width of LPJ (mm)	Length of dentigerous area on LPJ (mm)	Width of dentigerous area on LPJ (mm)	Dorsal-fin spines	Dorsal-fin soft rays	Anal-fin spines	Anal-fin soft rays	Pectoral-fin soft rays	Scales in longitudinal line	Scales on upper lateral line	Scales on lower lateral line	Scale rows between lateral lines	Gill rakers on first ceratobranchial
<i>Petrochromis macrognathus</i>	Zm 284-c	Kasenga, Zambia	2	Non-type	Female	87.1	31.2	30.2	14.0	11.8	50.3	17.1	21.2	22.6	20.1	23.0	14.3	12.7	8.0	8.7	6.5	4.0	—	—	—	—	18	12	3	8	17	36	26	15	2	11
<i>Petrochromis macrognathus</i>	Zm 02170	Kasenga, Zambia	—	Non-type	Male	95.1	34.0	32.7	14.0	12.5	56.1	18.3	22.9	25.8	21.7	25.3	16.0	14.2	8.0	9.5	7.4	4.0	—	—	—	—	18	11	3	9	17	36	25	15	2	11
<i>Petrochromis macrognathus</i>	Zm 02573	Kasenga, Zambia	—	Non-type	Male	118.9	45.1	38.0	17.5	16.7	70.9	22.8	30.5	35.7	27.4	32.7	22.4	16.2	9.5	12.9	10.7	3.7	—	—	—	—	18	11	3	8	17	35	25	14	2	11
<i>Petrochromis macrognathus</i>	Zm 02574	Kasenga, Zambia	—	Non-type	Male	96.7	35.1	32.7	14.1	13.4	57.6	20.9	23.8	27.2	22.9	25.5	17.2	15.1	7.8	10.9	7.6	3.9	—	—	—	—	18	12	3	9	16	35	24	14	2	12
<i>Petrochromis macrognathus</i>	Zm 02578	Kasenga, Zambia	—	Non-type	Female	110.9	40.5	37.1	17.1	14.7	65.7	23.1	28.2	27.4	25.7	29.6	19.2	16.7	8.8	12.4	9.9	3.5	—	—	—	—	18	11	3	8	16	35	26	14	2	12
<i>Petrochromis macrognathus</i>	Zm 02579	Kasenga, Zambia	—	Non-type	Female	120.1	43.6	39.0	19.0	16.5	72.4	24.0	31.7	34.9	27.5	31.3	21.2	17.4	9.7	13.2	10.4	2.5	—	—	—	—	18	11	3	8	16	36	25	15	2	11
<i>Petrochromis macrognathus</i>	Zm 03532	Kasenga, Zambia	—	Non-type	Male	110.2	39.2	36.3	17.3	14.6	62.8	21.5	29.7	31.8	25.1	28.5	19.1	15.8	8.8	11.3	8.6	4.7	—	—	—	—	18	11	3	9	16	36	25	13	2	11
<i>Petrochromis macrognathus</i>	Zm 0127	Kasenga, Zambia	—	Non-type	Male	93.2	35.8	31.0	13.9	13.3	54.8	17.2	25.6	30.2	22.8	25.7	16.4	13.3	8.1	10.2	8.5	2.9	—	—	—	—	17	12	3	8	17	36	25	16	2	11
<i>Petrochromis macrognathus</i>	Zm 0323	Kasenga, Zambia	—	Non-type	Female	117.5	47.0	39.6	19.0	16.0	70.7	22.7	34.0	37.1	29.9	34.9	21.2	19.0	9.2	12.5	10.2	3.9	—	—	—	—	18	12	3	9	17	36	25	17	2	12
<i>Petrochromis macrognathus</i>	HUMZ 122890	Cape Kanchese, Sumbu, Zambia	—	Non-type	Female	127.8	45.8	42.8	18.7	16.5	73.4	23.8	36.0	44.0	31.5	35.7	21.1	20.5	11.1	13.4	11.6	3.5	—	—	—	—	18	11	3	9	16	36	25	15	2	12
<i>Petrochromis macrognathus</i>	HUMZ 122901	Cape Kanchese, Sumbu, Zambia	—	Non-type	Male	178.7	65.7	61.9	26.9	22.5	103.5	35.7	50.6	63.1	41.1	49.8	30.2	30.0	13.2	18.0	14.5	6.1	—	—	—	—	18	11	3	10	17	36	24	17	2	12
<i>Petrochromis macrognathus</i>	HUMZ 138694	Kahoma (?), D. R. Congo	—	Non-type	Male	147.7	52.9	49.5	26.6	18.0	83.4	25.5	39.2	49.7	31.3	39.5	25.1	22.0	11.5	16.2	12.2	5.4	—	—	—	—	18	11	3	8	16	36	25	17	2	14
<i>Petrochromis orthognathus</i>	MRAC 125.150	Bemba, km 155 route Uvira-Baraka, D. R. Congo	2-5	Holotype	Male	131.7	52.2	41.4	19.7	14.8	82.5	23.0	44.7	45.6	27.3	32.1	23.9	18.7	10.5	14.1	11.4	0.7	—	—	—	—	19	9	3	7	16	32	23	12	2	14
<i>Petrochromis orthognathus</i>	MRAC 125180	Entre Albertville et le camp Jacques, D. R. Congo	—	Non-type	Male	150.5	54.9	46.6	22.9	17.3	90.2	25.6	49.6	55.7	31.5	35.1	25.5	20.0	13.1	15.8	14.0	0.3	—	—	—	—	18	10	3	7	15	31	22	11	2	14
<i>Petrochromis orthognathus</i>	HUMZ 116553	Pemba, D. R. Congo	—	Non-type	Male	99.3	40.6	32.6	13.5	12.0	63.3	16.8	38.2	36.2	24.3	25.6	18.6	13.1	9.5	11.1	9.5	0.5	—	—	—	—	19	9	3	7	16	32	23	9	2	12
<i>Petrochromis orthognathus</i>	HUMZ 116674	Pemba, D. R. Congo	—	Non-type	Female	129.9	51.2	41.7	18.0	14.7	77.0	20.6	39.4	39.5	26.7	30.5	22.5	18.0	11.9	15.3	12.8	0.7	—	—	—	—	18	9	3	7	14	33	23	11	2	13
<i>Petrochromis orthognathus</i>	HUMZ 118079	Pemba, D. R. Congo	—	Non-type	Female	92.7	37.7	29.2	13.6	10.7	59.4	15.0	32.7	29.9	21.0	23.0	16.5	11.9	8.2	9.8	8.4	0.4	—	—	—	—	19	10	3	7	15	33	24	11	2	13
<i>Petrochromis orthognathus</i>	HUMZ 118086	Pemba, D. R. Congo	—	Non-type	Female	107.1	42.1	34.5	15.8	12.2	66.0	18.5	36.9	34.4	22.5	25.1	18.6	14.8	9.6	11.6	9.8	0.7	—	—	—	—	19	9	3	7	15	33	23	11	2	13
<i>Petrochromis orthognathus</i>	HUMZ 127387	Gitaza, Burundi	12	Non-type	Female	108.5	44.2	35.2	15.5	12.3	64.9	17.2	35.9	32.9	23.8	25.9	19.3	15.7	10.0	12.5	10.0	0.4	—	—	—	—	19	8	3	7	15	32	24	10	2	13
<i>Petrochromis orthognathus</i>	HUMZ 127388	Gitaza, Burundi	12	Non-type	Male	123.9	49.8	39.4	19.3	14.6	77.9	21.4	42.3	46.6	26.0	29.5	23.1	16.3	11.0	14.3	11.8	0.8	—	—	—	—	18	9	3	7	15	31	21	10	2	14
<i>Petrochromis orthognathus</i>	HUMZ 127390	Gitaza, Burundi	12	Non-type	Female	101.1	42.0	32.6	14.7	12.5	60.8	16.9	32.6	30.0	22.2	23.4	17.5	13.1	9.4	11.1	8.7	0.7	—	—	—	—	19	8	3	7	14	32	22	11	2	11
<i>Petrochromis orthognathus</i>	HUMZ 127423	Moguruka near Nyanza, Burundi	—	Non-type	Female	99.8	38.0	32.9	14.4	11.4	60.5	17.6	35.6	29.2	21.6	23.5	17.7	13.0	10.0	10.6	10.2	0.5	—	—	—	—	18	10	3	7	16	32	23	11	2	13
<i>Petrochromis orthognathus</i>	HUMZ 127426	Moguruka near Nyanza, Burundi	—	Non-type	Male	109.9	41.5	33.6	15.0	12.9	69.2	19.8	38.1	35.1	27.1	28.3	19.2	14.5	10.1	11.5	9.1	0.9	—	—	—	—	19	9	3	7	16	33	23	11	2	14
<i>Petrochromis orthognathus</i>	HUMZ 127427	Moguruka near Nyanza, Burundi	—	Non-type	Male	130.4	49.2	39.8	19.3	15.0	81.8	24.1	42.6	39.5	28.6	31.4	22.8	16.7	11.6	14.3	12.1	0.4	—	—	—	—	18	9	3	7	15	32	23	11	2	13
<i>Petrochromis orthognathus</i>	HUMZ 127510	Moguruka near Nyanza, Burundi	—	Non-type	Male	134.9	50.5	41.4	19.6	15.3	83.3	22.6	44.7	57.9	29.0	32.4	23.0	17.2	12.2	14.5	11.8	1.0	—	—	—	—	18	9	3	7	16	32	23	11	2	11
<i>Petrochromis orthognathus</i>	HUMZ 127511	Moguruka near Nyanza, Burundi	—	Non-type	Male	97.2	36.9	30.2	14.1	11.8	61.6	17.3	30.2	33.9	21.5	23.4	17.0	12.1	9.3	10.4	8.7	0.6	—	—	—	—	19	9	3	7	15	32	24	10	2	12
<i>Petrochromis orthognathus</i>	HUMZ 127697	Muzimu, D. R. Congo	4-5	Non-type	Female	116.0	43.0	39.1	18.0	12.9	67.8	18.6	40.5	36.4	24.9	—	19.7	14.8	11.5	12.0	9.8	—	—	—	—	18	9	3	7	15	32	23	9	2	11	
<i>Petrochromis orthognathus</i>	HUMZ 127699	Muzimu, D. R. Congo	4-5	Non-type	Female	92.6	37.5	29.5	13.1	11.4	59.1	15.4	34.0	30.0	21.1	23.5	17.5	11.7	9.6	10.3	9.4	0.5	—	—	—	—	19	9	3	7	16	32	25	11	2	13
<i>Petrochromis orthognathus</i>	HUMZ 127714	Muzimu, D. R. Congo	4-5	Non-type	Male	105.9	43.6	33.7	14.6	12.9	68.6	17.4	38.8	42.6	24.3	27.4	19.0	13.9	9.7	12.0	10.5	0.8	—	—	—	—	19	8	3	7	15	32	23	11	2	12
<i>Petrochromis orthognathus</i>	HUMZ 127719	Muzimu, D. R. Congo	4-5	Non-type	Male	124.0	48.2	38.2	19.1	14.3	81.2	19.9	42.4	44.9	27.9	30.5	22.6	16.2	10.7	13.5	11.1	0.5	—	—	—	—	20	8	3	7	15	33	24	11	2	14
<i>Petrochromis orthognathus</i>	HUMZ 127720	Muzimu, D. R. Congo	4-5	Non-type	Male	134.8	50.6	41.1	19.3	15.0	83.3	22.5	45.2	49.7	28.5	32.7	23.6	17.5	11.3	14.6	10.7	1.2	—	—	—	—	19	9	3	7	15	33	23	12	2	12
<i>Petrochromis orthognathus</i>	TT 1213	purchased in Katonga Marchet, Kigoma, Tanzania	—	Non-type	Female	106.8	41.5	33.4	15.5	13.2	66.1	19.9	35.8	30.1	22.9	25.0	19.2	13.2	9.9	11.7	10.4	1.0	—	—	—	—	19	9	3	7	16	32	23	10	2	14
<i>Petrochromis orthognathus</i> "ikola"	MRAC 92081.0592	Mpimbwe Hills, southern part of Shashete Bay, Tanzania	—	Non-type	Male	127.1	51.7	41.4	19.2	13.7	81.7	22.6	42.5	45.0	26.6	29.2	22.1	17.6	12.0	14.8	12.0	1.5	—	—	—	—	19	9	3	7	16	33	23	12	2	13
<i>Petrochromis orthognathus</i> "ikola"	MRAC 92081.0743	Just south of Karema, Tanzania	—	Non-type	Female	91.8	36.4	30.8	14.1	10.3	57.0	15.6	33.2	31.0	—	—	15.4	11.6	9.5	9.7	8.6	1.2	—	—	—	—	19	8	3	7	15	32	24	12	2	12
<i>Petrochromis orthognathus</i> "ikola"	MRAC 92081.0865	Just south of Mkangasi, Tanzania	—	Non-type	Female	88.4	35.5	29.3	13.1	9.6	55.6	16.9	29.9	29.6	18.0	20.1	15.1	11.4	9.1	9.0	8.2	1.1	—	—	—	—	19	9	3	7	15	32	24	12	2	12
<i>Petrochromis orthognathus</i> "ikola"	MRAC 92081.1023	Just south of Bulu Point, Tanzania	—	Non-type	Male	95.9	37.1	30.0	13.6	11.4	60.3	16.4	32.1	31.2	19.5	22.0	16.5	12.0	9.3	9.2	8.5	1.2	—	—	—	—	19	9	3	7	15	33	23	12	2	13
<i>Petrochromis orthognathus</i> "ikola"	MRAC 92081.1242	? ± 3km north of Kabwe, Tanzania	—	Non-type	Male	108.0	43.3	35.7	14.3	12.7	66.4	17.8	38.0	39.0	23.0	24.0	19.1	14.2	10.7	11.8	10.4	1.3	—	—	—	—	18	9	3	7	16	32	23	10	2	13
<i>Petrochromis orthognathus</i> "ikola"	MRAC 92081.1433	Kiti Point, southern shore, Tanzania	—	Non-type	Male	84.2	33.6	26.4	12.1	9.8	53.6	14.1	30.2	30.0	19.2	21.6	13.6	9.6	8.2	7.9	7.2	0.9	—	—	—	—	18	10	3	7	15	32	24	11	2	12
<i>Petrochromis polyodon</i>	BMNH 1898.9.9:59	Kinyamkol, Mpulungu, Zambia	—	Syntype	Male	79.6	32.9	28.3

Species	Catalogue no.	Locality	Depth (m)	Type	Sex	Standard length (mm)	Body depth (mm)	Head length (mm)	Caudal-peduncle length (mm)	Caudal-peduncle depth (mm)	Dorsal-fin-base length (mm)	Anal-fin-base length (mm)	Pectoral-fin length (mm)	Pelvic-fin length (mm)	Shortest caudal-fin-ray length (mm)	Longest caudal-fin-ray length (mm)	Head width (mm)	Snout length (mm)	Eye length (mm)	Interorbital width (mm)	Lower-jaw length (mm)	Upper-jaw protrusion (mm)	Length of LPJ (mm)	Width of LPJ (mm)	Length of dentigerous area on LPJ (mm)	Width of dentigerous area on LPJ (mm)	Dorsal-fin spines	Dorsal-fin soft rays	Anal-fin spines	Anal-fin soft rays	Pectoral-fin soft rays	Scales in longitudinal line	Scales on upper lateral line	Scales on lower lateral line	Scale rows between lateral lines	Gill rakers on first ceratobranchial
<i>Petrochromis trewavasae ephippium</i>	HUMZ 116592	Pemba, D. R. Congo	—	Non-type	Male	77.1	32.2	25.4	10.8	9.6	47.1	14.5	25.5	32.5	18.9	23.3	13.9	11.1	7.5	8.7	5.6	1.7	—	—	—	—	19	9	3	7	16	34	24	12	2	12
<i>Petrochromis trewavasae ephippium</i>	HUMZ 116661	Pemba, D. R. Congo	—	Non-type	Female	77.3	32.9	26.1	11.5	10.0	48.2	14.6	28.3	31.0	19.6	25.8	14.3	10.5	7.7	9.0	6.6	1.6	—	—	—	—	19	9	3	7	15	34	23	13	2	10
<i>Petrochromis trewavasae ephippium</i>	HUMZ 127700	Cape Muzimu, D. R. Congo	4-5	Non-type	Male	100.4	41.9	32.4	13.9	12.5	64.0	17.9	32.9	40.3	23.5	30.1	18.1	13.5	8.7	12.1	9.8	1.9	—	—	—	—	19	9	3	7	16	34	25	14	2	10
<i>Petrochromis trewavasae ephippium</i>	HUMZ 127921	Cape Muzimu, D. R. Congo	4-5	Non-type	Male	153.3	59.3	49.5	24.3	19.1	92.7	26.2	53.8	78.8	33.9	45.5	29.1	23.0	12.2	18.7	13.4	2.9	—	—	—	—	18	9	3	7	16	35	22	13	2	11
<i>Petrochromis trewavasae ephippium</i>	HUMZ 127922	Cape Muzimu, D. R. Congo	4-5	Non-type	Male	112.7	45.3	36.4	18.6	13.8	69.2	18.7	37.6	46.0	25.8	34.0	20.2	16.5	9.9	14.5	9.3	2.8	—	—	—	—	19	9	3	8	15	34	24	15	2	11
<i>Petrochromis trewavasae ephippium</i>	HUMZ 136368	Pemba, D. R. Congo	0.5	Non-type	Female	145.3	58.2	47.2	23.0	17.1	86.5	24.7	46.0	57.3	33.4	48.4	25.4	21.4	11.9	16.8	11.9	3.3	—	—	—	—	19	10	3	7	16	35	24	11	2	10
<i>Petrochromis trewavasae ephippium</i>	HUMZ 138051	Pemba, D. R. Congo	—	Non-type	Female	84.0	35.4	27.3	11.4	10.5	51.3	15.0	27.6	30.7	20.7	27.0	15.7	11.2	8.2	10.0	6.9	2.3	—	—	—	—	18	10	3	7	16	34	22	14	2	9
<i>Petrochromis trewavasae ephippium</i>	HUMZ 138053	Pemba, D. R. Congo	—	Non-type	Female	125.1	51.2	40.6	19.0	15.8	78.5	21.6	39.5	57.3	28.9	37.7	21.9	17.9	10.0	14.5	10.1	2.1	—	—	—	—	19	9	3	7	15	34	22	13	2	11
<i>Petrochromis trewavasae ephippium</i>	Zm 93793-a	Kasenga, Zambia	1-3	Non-type	Female	141.0	57.4	50.2	21.5	17.6	87.0	24.8	44.8	54.0	31.0	41.7	23.4	22.7	11.5	17.9	12.7	4.6	—	—	—	—	19	9	3	7	16	35	24	16	2	10
<i>Petrochromis trewavasae ephippium</i>	Zm 93793-b	Kasenga, Zambia	1-3	Non-type	Female	128.9	56.2	44.2	20.5	16.2	83.1	22.5	43.0	50.1	29.3	38.1	23.0	19.9	10.8	16.8	11.2	2.4	—	—	—	—	18	9	3	7	15	34	24	15	2	10
<i>Petrochromis trewavasae ephippium</i>	Zm 93793-c	Kasenga, Zambia	1-3	Non-type	Female	132.5	54.3	47.3	21.5	17.4	84.0	24.6	41.8	54.8	29.5	38.0	24.6	21.2	11.4	17.2	13.2	3.3	—	—	—	—	19	8	3	7	15	35	25	14	2	12
<i>Petrochromis trewavasae ephippium</i>	Zm 93793-d	Kasenga, Zambia	1-3	Non-type	Male	127.1	52.8	42.4	15.6	16.1	82.0	23.4	42.0	53.7	28.0	36.6	22.2	20.4	10.0	14.9	11.3	3.7	—	—	—	—	19	9	3	8	15	34	25	13	2	11
<i>Petrochromis trewavasae ephippium</i>	Zm 93793-e	Kasenga, Zambia	1-3	Non-type	Female	125.0	48.0	40.6	18.3	14.8	79.7	22.8	39.7	44.4	27.1	35.5	21.7	18.6	10.5	14.7	9.8	2.9	—	—	—	—	19	9	3	7	15	35	24	13	2	10
<i>Petrochromis trewavasae ephippium</i>	Zm 93793-f	Kasenga, Zambia	1-3	Non-type	Male	98.9	42.9	32.9	15.0	12.4	65.0	17.5	30.7	31.9	22.9	28.0	17.4	13.8	9.0	12.2	8.7	2.6	—	—	—	—	19	9	3	7	15	35	23	15	2	14
<i>Petrochromis trewavasae ephippium</i>	Zm 93793-g	Kasenga, Zambia	1-3	Non-type	Male	94.4	41.4	32.8	12.4	12.0	62.9	17.2	31.9	36.3	22.7	27.3	17.2	14.0	9.0	11.5	7.6	2.3	—	—	—	—	19	9	3	7	15	34	23	13	2	12
<i>Petrochromis trewavasae ephippium</i>	Zm 93793-h	Kasenga, Zambia	1-3	Non-type	Female	86.6	37.0	29.1	13.4	10.9	53.7	15.0	28.5	33.7	20.2	24.5	15.0	12.1	8.0	10.0	7.0	2.7	—	—	—	—	18	9	3	7	15	34	23	13	2	10
<i>Petrochromis trewavasae "Moshi Yellow"</i>	TT 1214	purchased in Katonga Marchet, Kigoma, Tanzania	—	Non-type	Male	130.8	52.6	42.4	19.7	15.9	78.9	23.6	43.4	50.7	30.3	37.8	22.4	20.5	10.5	15.5	11.0	3.3	—	—	—	—	19	8	3	7	15	34	26	14	2	12
<i>Petrochromis trewavasae "Moshi Yellow"</i>	TT 1215	purchased in Katonga Marchet, Kigoma, Tanzania	—	Non-type	Male	113.0	44.2	37.1	16.5	14.1	70.5	23.5	37.6	43.9	25.4	33.3	20.3	16.2	9.6	13.4	9.9	3.0	—	—	—	—	19	9	3	8	15	34	23	14	2	13

BMNH: The Natural History Museum, London, UK
FAKU: Fish collection of Kyoto University, Kyoto and Maizuru, Japan
HUMZ: Laboratory of Marine Biodiversity, Graduate School of Fisheries Science, Hokkaido University, Hakodate, Japan
LPJ: Lower pharyngeal jaw
MRAC: Royal Museum for Central Africa, Tervuren, Belgium
NSMT-P: Department of Zoology, National Science Museum, Tokyo, Japan
TT: private collection of T. Takahashi, Kyoto University, Kyoto, Japan
Z, Zm: private collection of M. Hori, Kyoto University, Kyoto, Japan

Table S2 Samples used for the phylogenetic analysis

	Names in the present study	Names in Koblmüller et al. (2010)	Catalogue no.	Locality	Accession no. of DDBJ or GenBank	
					ND2	CR
Ingroup (Tropheini)	<i>Chromis horei</i> *	<i>Ctenochromis horei</i>	6621	Katete	GQ995716**	GQ995825**
			6636	Mbita Island W	GQ995717**	GQ995826**
			6637	Mbita Island W	GQ995718**	GQ995827**
	<i>Interochromis loocki</i>	<i>Interochromis loockii</i>	6650	Kalambo Lodge	GQ995742**	GQ995851**
			6653	Wonzye	GQ995743**	GQ995852**
			6654	Wonzye	GQ995744**	GQ995853**
			6658	Wonzye	GQ995745**	GQ995854**
			8037	Wonzye	GQ995746**	GQ995855**
			8258	Mtosi	GQ995747**	GQ995856**
	<i>Limnotilapia dardennii</i>	<i>Limnotilapia dardennii</i>	6645	Kalambo Lodge	GQ995722**	GQ995831**
			7190	Mpulungu	GQ995723**	GQ995832**
			7191	Mpulungu	GQ995724**	GQ995833**
	<i>Lobochilotes labiatus</i>	<i>Lobochilotes labiatus</i>	6619	Chimba	GQ995725**	GQ995834**
			6625	Chimba	GQ995726**	GQ995835**
			6628	Mbita Island E	GQ995727**	GQ995836**
			6655	Wonzye	GQ995728**	GQ995837**
	<i>Paratilapia pfefferi</i> *	<i>Gnathochromis pfefferi</i>	6614	Kalambo Lodge	GQ995719**	GQ995828**
			6615	Kalambo Lodge	GQ995720**	GQ995829**
			6618	Chimba	GQ995721**	GQ995830**
	<i>Petrochromis famula</i>	<i>Petrochromis famula</i>	6613	Kalambo Lodge	GQ995729**	GQ995838**
			6620	Chimba	GQ995730**	GQ995839**
			6627	Chimba	GQ995731**	GQ995840**
			7376	Mpimbwe	GQ995732**	GQ995841**
			8241	S of Isonga	GQ995733**	GQ995842**
			8252	Mahale N	GQ995734**	GQ995843**
	<i>Petrochromis fasciolatus</i>	<i>Petrochromis fasciolatus</i>	6626	Chimba	GQ995799**	GQ995908**
			6638	Mbita Island W	GQ995793**	GQ995902**
			6657	Wonzye	GQ995800**	GQ995909**
			7058	Kalambo	GQ995801**	GQ995910**
			7061	Wonzye	GQ995794**	GQ995903**
			7062	Kalambo Lodge	GQ995795**	GQ995904**
			8031	Kalambo Lodge	GQ995796**	GQ995905**
			8032	Kalambo Lodge	GQ995797**	GQ995906**
			8033	Kalambo Lodge	GQ995798**	GQ995907**
			8035	Kalambo Lodge	GQ995802**	GQ995911**
	<i>Petrochromis horii</i> n. sp.	Not used in Koblmüller et al. (2010)	MRAC B3-03-P-04	Kasenga	AB850665	AB850680
			MRAC B3-03-P-05	Kasenga	AB850666	AB850681
			MRAC B3-03-P-06	Kasenga	AB850667	AB850682
			MRAC B3-03-P-07	Kasenga	AB850668	AB850683
			BMNH 2013.2.13.1	Kasenga	AB850669	AB850684
			BMNH 2013.2.13.2	Kasenga	AB850670	AB850685
			BMNH 2013.2.13.3	Kasenga	AB850671	AB850686
			BMNH 2013.2.13.4	Kasenga	AB850672	AB850687
			BMNH 2013.2.13.5	Kasenga	AB850673	AB850688
	<i>Petrochromis macrognathus</i>	Not used in Koblmüller et al. (2010)	Zm 02170	Kasenga	AB850674	AB850689
			Zm 02573	Kasenga	AB850675	AB850690
			Zm 02574	Kasenga	AB850676	AB850691
			Zm 02578	Kasenga	AB850677	AB850692
			Zm 02579	Kasenga	AB850678	AB850693
			Zm 03532	Kasenga	AB850679	AB850694
	<i>Petrochromis cf. macrognathus</i>	<i>Petrochromis cf. macrognathus</i>	8248	Mahale N	GQ995770**	GQ995879**
	<i>Petrochromis orthognathus</i>	<i>Petrochromis orthognathus</i>	61	Kavalla	GQ995737**	GQ995846**
			149	Ikola	GQ995738**	GQ995847**
			8239	Mpimbwe	GQ995739**	GQ995848**
			8242	S of Isonga	GQ995740**	GQ995849**
			8247	N of Mabilibili	GQ995741**	GQ995850**
	<i>Petrochromis polyodon</i>	<i>Petrochromis polyodon</i>	6612	Kalambo Lodge	GQ995749**	GQ995858**
			6622	Katete	GQ995750**	GQ995859**
			6629	Nakaku	GQ995751**	GQ995860**
			6630	Nakaku	GQ995752**	GQ995861**
			6631	Nakaku	GQ995753**	GQ995862**
			6632	Nakaku	GQ995754**	GQ995863**
			6633	Nakaku	GQ995755**	GQ995864**
	<i>Petrochromis cf. polyodon</i>		7374	Nkondwe Island	GQ995756**	GQ995865**
			7375	N of Mpimbwe	GQ995757**	GQ995866**
			8236	Mpimbwe	GQ995774**	GQ995883**
			8238	Mpimbwe	GQ995775**	GQ995884**
			8243	S of Isonga	GQ995767**	GQ995876**
			8249	Mahale N	GQ995768**	GQ995877**
			8261	Mtosi	GQ995769**	GQ995878**
	<i>Petrochromis</i> sp. "macrognathus rainbow"		8257	Mtosi	GQ995771**	GQ995880**
			8259	Mtosi	GQ995772**	GQ995881**
			8260	Mtosi	GQ995773**	GQ995882**
	<i>Petrochromis</i> sp. "Texas Longola"		8234	Longola	GQ995766**	GQ995875**
	<i>Petrochromis ephippium</i>		6656	Isanga	GQ995735**	GQ995844**
			7063	Kalambo Lodge	GQ995736**	GQ995845**
	<i>Petrochromis trewavasae</i>		69***	Location unknown	GQ995759**	GQ995868**
			143***	Zaire	GQ995760**	GQ995869**
			6617	Chimba	GQ995761**	GQ995870**
	<i>Petrochromis</i> sp. "Moshi yellow"		7377	S of Karema	GQ995758**	GQ995867**
			8235	Mpimbwe	GQ995764**	GQ995873**
			8245	N of Mabilibili	GQ995762**	GQ995871**
			8246	N of Mabilibili	GQ995763**	GQ995872**
			8250	Mahale N	GQ995765**	GQ995874**
	<i>Petrochromis</i> sp. "Katete"	<i>Petrochromis</i> sp. "Katete"	6623	Katete	GQ995748**	GQ995857**
	<i>Pseudosimochromis curvifrons</i>	<i>Pseudosimochromis curvifrons</i>	6624	Katete	GQ995776**	GQ995885**
			6646	Kalambo Lodge	GQ995777**	GQ995886**
			7059	Kasenga Rocks	GQ995778**	GQ995887**
			7060	Location unknown	GQ995779**	GQ995888**
	<i>Simochromis babaulti</i>	<i>Simochromis babaulti</i>	8240	Kekese	GQ995784**	GQ995893**
			8255	Mahale N	GQ995786**	GQ995895**
			8256	Mahale N	GQ995785**	GQ995894**

Table S2 (continued)

	Names in the present study	Names in Koblmüller et al. (2010)	Catalogue no.	Locality	Accession no. of DDBJ or GenBank	
					ND2	CR
	<i>Simochromis diagramma</i>	<i>Simochromis diagramma</i>	6649	Kalambo Lodge	GQ995790**	GQ995899**
			8038	Wonzye	GQ995791**	GQ995900**
			8244	S of Isonga	GQ995792**	GQ995901**
	<i>Simochromis marginatus</i>	<i>Simochromis marginatus</i>	64	Ubwari	GQ995789**	GQ995898**
			8253	Mahale N	GQ995787**	GQ995896**
			8254	Mahale N	GQ995788**	GQ995897**
	<i>Simochromis pleurospilus</i>	<i>Simochromis pleurospilus</i>	6611	Kalambo Lodge	GQ995780**	GQ995889**
			6616	Kalambo Lodge	GQ995781**	GQ995890**
			6639	Mbita Island W	GQ995782**	GQ995891**
			8039	Mbita Island W	GQ995783**	GQ995892**
	<i>Tropheus duboisi</i>	<i>Tropheus duboisi</i>	76	Bemba	GQ995804**	GQ995913**
			85***	Maswa	GQ995806**	GQ995915**
			91***	Maswa	GQ995807**	GQ995916**
			101	Bemba	GQ995805**	GQ995914**
			3441	Location unknown	GQ995803**	GQ995912**
			4518	Halembé	GQ995808**	GQ995917**
			4519	Halembé	GQ995809**	GQ995918**
	<i>Tropheus</i> species complex	<i>Tropheus brichardi</i>	Tr10	Bulombora	GQ995817**	GQ995926**
		<i>Tropheus moorii</i>	4300	Mbita Island W	GQ995810**	GQ995919**
		<i>Tropheus polli</i>	5447	Kekese	GQ995818**	GQ995927**
			5448	Kekese	GQ995819**	GQ995928**
		<i>Tropheus</i> sp.	Tr8	Kapampa	GQ995816**	GQ995925**
			4370***	Kachese	GQ995811**	GQ995920**
			4374***	Mpimbwe	GQ995812**	GQ995921**
			4376***	Bemba	GQ995813**	GQ995922**
			4385	Nakaku	GQ995814**	GQ995923**
		<i>Tropheus</i> sp. "Kirschfleck"	4520***	Mabilibili	GQ995815**	GQ995924**
Outgroup	<i>Astatotilapia burtoni</i>	<i>Astatotilapia burtoni</i>	7054		GQ995713**	GQ995822**
			7055		GQ995714**	GQ995823**
			7056		GQ995715**	GQ995824**
	<i>Aulonocara</i> sp.	<i>Aulonocara</i> sp.	6662***		GQ995712**	GQ995821**
	<i>Copadichromis borleyi</i>	<i>Copadichromis borleyi</i>	6661***		GQ995711**	GQ995820**

* Generic allocation has not been resolved, so the combination shown in the original description of the species is tentatively used.

** Koblmüller et al. (2010)

*** Samples obtained through ornamental fish trade.