

A Revision of the Cichlid Fish Genus *Petrochromis* from Lake Tanganyika, with Description of a New Species

Kosaku Yamaoka

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Abstract The cichlid fish genus *Petrochromis* is endemic to Lake Tanganyika. The genus consists of six species: 5 previously known and the present new species, *P. macrognathus*. This new species is easily distinguished from the other species of *Petrochromis* by the following characters: more projecting upper jaw, posterior margins of lips just reaching to vertical from anterior orbital rim, shorter pectoral fins (26.0~28.2% in standard length (SL) instead of 30.5~36.0%), strongly pronounced premaxillary ascending process, pronounced concavity of chin region, greater number of vertebrae (33~34 instead of 30~32), many small scales present on bases of dorsal and anal fins, and specimens smaller than about 160 mm SL show distinct 11 to 12 vertical stripes (in larger ones those stripes become obscure and the whole body becomes dark-green or dull yellowish-green). A key is given to the species of *Petrochromis*.

Fishes of the genus *Petrochromis* are algal feeders and attain a large size for cichlids. They inhabit the shallow rocky shore of Lake Tanganyika, and are endemic to the lake.

Until recently five species of the genus *Petrochromis* have been recognized, i.e., *P. polyodon*, *P. fasciolatus*, *P. trewavasae*, *P. orthognathus* and *P. famula*. A key to these species was given by Brichard (1978) on the basis of Poll (1956), Matthes (1959) and Matthes and Trewavas (1960).

During an ecological survey of the north-western part of Lake Tanganyika from July through December, 1981 I caught some specimens of an undescribed species belonging to the genus *Petrochromis* from shallow waters along the rocky shore. In addition to the description of the new species, a revised key to *Petrochromis* is offered, mainly based on external characters, not on coloration or internal characters.

Standard measurements and counts follow Hubbs and Lagler (1958) except for the following items: length of head (from the tip of the snout to the posterior bony margin of the gill cover), width of snout (the widest part of the snout not including the labial region), length of lower jaw (from the anterior tip to the posterior end of the lower jaw), depth of labial (the deepest part of the upper lip) and width of lower jaw (the distance between the points on the left and right lower jaws just anterior to the rim marking their articulation with the suspensorium, as defined by Barel et al. (1977)). Least bony

interorbital width of Hubbs and Lagler (1958) is adopted as interorbital width. Distance between anterior tips of the upper and lower jaws is measured from the anteriormost tip of upper jaw to the corresponding tip of the lower one with the mouth closed on a projection chart. Proportional measurements of five species excepting the new one are shown in Table 1. Number of vertebrae is counted from radiographs.

Feeding behavior of the new species was observed on two individuals of about 160 mm in standard length (SL) at Luhanga on August 12 and 13, and September 11, 1981. One hundred and twenty-two observations were made.

Genus *Petrochromis* Boulenger, 1898

Petrochromis Boulenger, 1898: 20 (type species, *Petrochromis polyodon* Boulenger, by monotypy); Pellegrin, 1904: 350; Regan, 1920: 42; Poll, 1946: 277; Poll, 1956: 596; Poll, 1957: 143; Matthes and Trewavas, 1960: 350; Brichard, 1978: 334.

Diagnosis. This genus is distinguished from other cichlids by the following character combination: 1) dental pads with many tricuspid teeth with slender shafts, 2) gill-rakers on lower limb of first arch 10~13, 3) pharyngeal apophysis of *Tilapia* type and 4) unpaired gonad.

Description. *Petrochromis* is a genus endemic to Lake Tanganyika. D. XVII~XIX, 7~10; A. III, 6~8; number of lateral-line scales, 32~36; vertebrae, 30~34; gill-rakers on lower limb of first arch, 10~13; branchiostegal rays, 5.

Table 1. Proportional measurements as the percent of standard length in five species of *Petrochromis*. Data show ranges, and means are in parentheses.

	<i>P. fasciolatus</i>	<i>P. polyodon</i>	<i>P. trewavasae</i>	<i>P. famula</i>	<i>P. orthognathus</i>
Number of specimens	6	5	5	6	5
Standard length (mm)	85.4~111.4	118.7~147.9	121.2~147.1	84.2~118.1	97.1~136.3
Depth of body	37.8~39.5 (38.8)	38.7~41.6 (40.1)	40.0~41.4 (40.8)	41.5~42.8 (42.0)	36.3~40.7 (39.0)
Head length	31.7~32.2 (31.9)	33.3~35.6 (34.4)	33.8~35.2 (34.5)	34.3~36.8 (35.3)	31.9~34.4 (33.0)
Snout length	13.5~14.6 (14.0)	17.0~18.3 (17.7)	17.3~17.9 (17.5)	16.6~18.8 (17.5)	15.3~15.7 (15.5)
Snout width	16.7~18.3 (17.8)	19.5~22.4 (20.8)	19.4~20.0 (19.7)	18.2~21.2 (19.5)	16.3~17.1 (16.6)**
Eye diameter	7.0~ 8.3 (7.6)	6.5~ 7.4 (7.0)	6.1~ 7.0 (6.6)	6.3~ 7.0 (6.7)	6.5~ 8.0 (7.4)
Interorbital width	9.4~11.5 (10.3)	10.8~12.1 (11.6)	11.2~11.8 (11.5)	11.2~11.9 (11.5)	9.3~10.8 (10.1)
Length of upper jaw	11.8~13.9 (12.8)	13.8~15.3 (14.5)	13.1~14.1 (13.7)	13.5~15.4 (14.6)	11.9~12.9 (12.3)
Length of lower jaw	9.8~11.8 (11.1)	7.8~ 9.7 (9.0)	8.3~ 8.7 (8.5)	9.2~11.9 (10.2)	8.6~10.2 (9.4)
Width of lower jaw	14.2~16.0 (15.0)	18.4~20.8 (19.4)	17.7~18.4 (18.0)	15.7~19.2 (17.6)	14.0~15.2 (14.6)**
Distance between tips of upper and lower jaws	negative	1.9~ 3.4 (2.4)	1.7~ 3.2 (2.6)	0.4~ 0.9 (0.6)*	0.1~ 0.8 (0.4)
Length of caudal peduncle	16.0~18.0 (16.6)	16.6~18.0 (17.2)	14.7~16.7 (15.8)	14.7~15.6 (15.1)	15.1~17.4 (15.8)
Depth of caudal peduncle	11.0~11.8 (11.4)	11.7~12.2 (12.0)	11.6~12.6 (12.0)	10.8~12.2 (11.5)	11.0~11.8 (11.3)
Length of pectoral fin	31.0~33.3 (32.3)	31.7~34.6 (32.8)	30.5~33.7 (32.5)	32.0~36.0 (34.5)	32.2~35.0 (33.3)
Depth of labial	2.9~ 3.6 (3.2)	4.2~ 4.5 (4.3)	4.4~ 4.8 (4.6)	4.4~ 5.4 (4.8)	3.5~ 3.9 (3.7)

* 5 specimens measured.

** 4 specimens measured.

Table 2. Frequency distributions of 5 meristic characters in species of *Petrochromis*.

Species	Dorsal spines			Dorsal soft rays				Anal soft rays			Vertebrae					Number of lateral-line scales				
	XVII	XVIII	XIX	7	8	9	10	6	7	8	30	31	32	33	34	32	33	34	35	36
<i>P. macrognathus</i>		6					6	5	1					4*	1				5	1
<i>P. fasciolatus</i>	2	4		2	4			5	1			5	1			3	3			
<i>P. famula</i>		3	3	3	2	1		6			1	5				6				
<i>P. orthognathus</i>			5	1	4			5			1	4				5				
<i>P. trewavasae</i>		5				5		4	1				5				1	4		
<i>P. polyodon</i>	1	4		4	1			4	1				5				1	4		

* One specimen excluded because of abnormality.

A comparison of some diagnostic characters of the six species of *Petrochromis* is presented in Table 2.

Body stocky and compressed. Snout wide. Mouth large and protrusible. Lips thickened. Crowded tricuspid teeth with slender shafts on jaws. Caudal peduncle longer than deep. One nostril on each side.

Upper and lower lateral lines on body, both incomplete. Scales slightly ctenoid. Some scales on head, tending to be imbedded. Scales present on cheek and opercle.

Dorsal fin continuous. Origin of dorsal anterior to insertion of pectorals. Pectoral fins pointed; fourth ray longest. Pelvic fins pointed; first soft ray longest; insertion of pelvic behind posterior end of pectoral base. Caudal fin emarginate, subtruncate or lunate.

Only a right gonad present.

Remarks. *Petrochromis* of Lake Tanganyika is very similar to the genus *Petrotilapia* of Lake Malawi, but their similarities have been regarded as a remarkable convergence because these two genera are different from each other in the structure of the pharyngeal apophysis: the former shows *Tilapia* type and the latter *Haplochromis* type (Trewavas, 1935; Matthes and Trewavas, 1960; Greenwood, 1978). However, on the basis of close reexamination of this feature, Greenwood (1978) rejected the dichotomy of the cichlids into *Tilapia* and *Haplochromis* lineages by Regan (1920). Brichard (1978) stated that *Petrochromis* is very close to *Tilapia* (*Sarotherodon*). The intestinal coiling pattern, which has been suggested to be a phylogenetically useful feature (Kafuku, 1958, 1975; Mok, 1977; Mok and Shen, 1982), of these three genera are basi-

cally the same (Yamaoka, 1982, in prep.; Zihler, 1982). Their feeding behavior is also very similar (Fryer, 1959; Yamaoka, 1982, pers. obs.). The relationships among *Petrochromis*, *Petrotilapia* and *Tilapia* (*Sarotherodon*) must be reviewed more closely and at present I consider that they were derived from a common ancestor.

Key to the species of *Petrochromis*

- 1a. Lower jaw projecting (Fig. 2).....*P. fasciolatus*
- 1b. Jaws equal anteriorly, or upper jaw projecting2
- 2a. When mouth is closed completely, teeth almost invisible from outside3
- 2b. When mouth is closed completely, teeth visible from outside.....4
- 3a. Body not so deep (36.3~40.7% SL); caudal fin almost non-maculated...*P. orthognathus*
- 3b. Body deep (41.5~42.8% SL); caudal fin

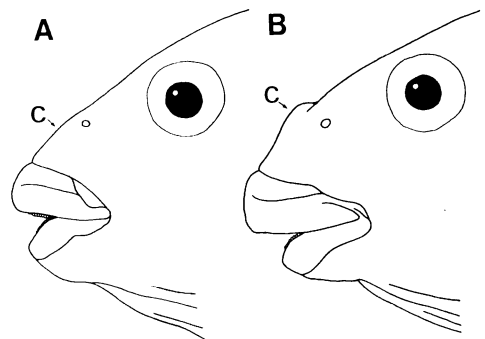


Fig. 1. Lateral view of head. A, *P. polyodon*, FAKU 51093, 118.7 mm SL. B, *P. macrognathus*, sp. nov., paratype, FAKU 50675, 135.4 mm SL. C, convexity of premaxillary ascending processes.

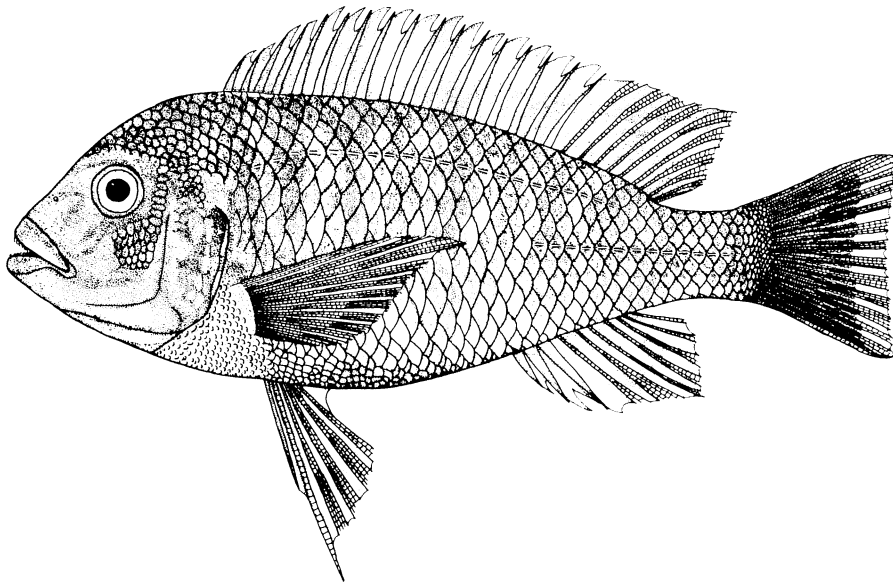


Fig. 2. *Petrochromis fasciolatus* Boulenger. Lateral view of a male, 100.4 mm in SL, FAKU 51118.

- notably maculated.....*P. famula*
 4a. Caudal fin lunate; body deep brown to golden.....*P. trewavasae*
 4b. Caudal fin emarginate5
 5a. No scales on bases of dorsal and anal fins; convexity of premaxillary ascending processes on snout less pronounced (Fig. 1A)*P. polyodon*
 5b. Many small scales on bases of dorsal and anal fins; convexity of premaxillary ascending processes on snout much pronounced (Fig. 1B).....*P. macrognaathus* sp. nov.

***Petrochromis fasciolatus* Boulenger, 1914**
 (Fig. 2)

Petrochromis fasciolatus Boulenger, 1914: 446; Boulenger, 1915: 273; Poll, 1946: 277; Poll, 1956: 105, fig. 19; Poll, 1957: 143; Brichard, 1978: 338.

Petrochromis polyodon Poll, 1946: 277.

Materials examined. FAKU (Department of Fisheries, Faculty of Agriculture, Kyoto University) 51115~51117, two males and one female, 96.6~111.4 mm SL, Luhanga, 3°31'S, 29°09'E, 2~6 m deep, October 17, 1981. FAKU 51118~51120, two males and one female, 85.4~100.4 mm SL, Kashombe, 3°31'S, 29°09'E, 1~6 m deep, August 14, 1981.

Description. D. XVII~XVIII, 8~9; A. III, 6~7; gill-rakers on lower limb of first arch 11~13; number of lateral-line scales 32~33; verte-

brae 31~32 (mainly 31).

Body not so deep. Snout profile gentle, ascending processes of premaxillae not prominent at all. Lower jaw extending in front of upper jaw (prognathous lower jaw). Posterior margins of lips not reaching to vertical from anterior orbital rim, but going beyond vertical from nostril. Tricuspid teeth on jaws in low density, not showing regular series.

Cheek with four to five rows of scales. Small scales absent on bases of dorsal and anal fins.

Posterior tips of dorsal and anal soft rays not filamentous. Pectoral almost same as head in length. Pelvic fin short, not reaching anal spine. Caudal fin emarginate.

Color in life. In large males, whole body except dorsum and ventral part of head and chest grayish blue. Two gray interorbital stripes on forehead. More than 10 gray vertical stripes on dorsum. Eight yellow egg dummies on anal fin. In smaller specimens, probably immature males, and females, ground color of body whitish brown to whitish green with 9 to 10 brownish vertical stripes on each side. Many small orange spots on body and fins.

Color in formalin. In large males, whole body dark chocolate-brown. In smaller specimens, probably immature males, and females, ground color of body brownish with dark brown stripes.

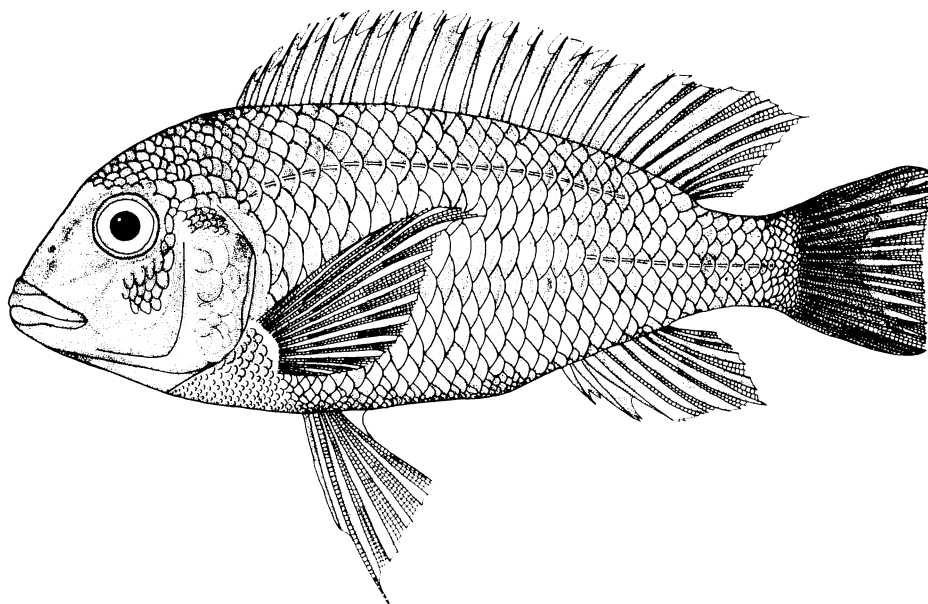


Fig. 3. *Petrochromis orthognathus* Matthes. Lateral view of a female, 105.5 mm in SL, FAKU 51111.

Remarks. Though Boulenger (1914) did not point it out in the original description of *Petrochromis fasciolatus*, the prognathous lower jaw is the most remarkable diagnostic character of this species.

P. fasciolatus is relatively close to *P. orthognathus* in having fewer jaw teeth (Yamaoka, 1982) and smaller number of vertebrae (31), but differs in the following characters: 1) lower jaw projecting (jaws equal anteriorly in the latter); 2) generally 18 dorsal spines (19 spines); 3) generally 9 vertical stripes on the body (no vertical stripes).

Birchard (1978) stated that all species of *Petrochromis* are highly solitary and are never found in schools or even the ephemeral groupings of *Tropheus*. I observed and recorded on 8 mm film, however, a school of many adult individuals swimming slowly around rocks on sandy bottom at the depth of 4 m at Kashombe.

***Petrochromis orthognathus* Matthes, 1959**
(Fig. 3)

Petrochromis orthognathus Matthes, 1959: 335; Birchard, 1978: 338.

Materials examined. FAKU 51110~51114, 2 males and 3 females, 97.1~136.3 mm SL, Luhanga, 2~10 m deep, from August to October, 1981.

Description. D. XIX, 7~8; A. III, 6; gill-

rakers on lower limb of first arch 10~13; number of lateral-line scales 32; vertebrae 30~31 (mainly 31).

Body not so deep. Snout profile of ascending processes of premaxillae not prominent. Upper jaw meeting the lower almost evenly in front (isognathous) or upper jaw only slightly projecting. Posterior margins of lips not reaching to vertical from anterior orbital rim. Tricuspid teeth on jaws in low density, tending to show regular series.

Cheek with four rows of scales. Only a few small scales present on bases of dorsal and anal fins.

Posterior tips of dorsal and anal soft rays not filamentous. Pectoral fin almost same as head in length. In large male posterior tip of pelvic fin filamentous, reaching anal spine. Caudal fin emarginate.

Color in life. Head and dorsum brown. Vertical stripes not conspicuous. Two pearl white interorbital stripes on forehead. One whitish stripe behind orbit on nape. Seven to eight yellow egg dummies present on anal fin in larger specimens. Flank pearly olive white.

Color in formalin. Head and dorsum dark brown. Flank whitish brown.

Remarks. Matthes (1959) stated that *Petrochromis orthognathus* is closely related to *P.*

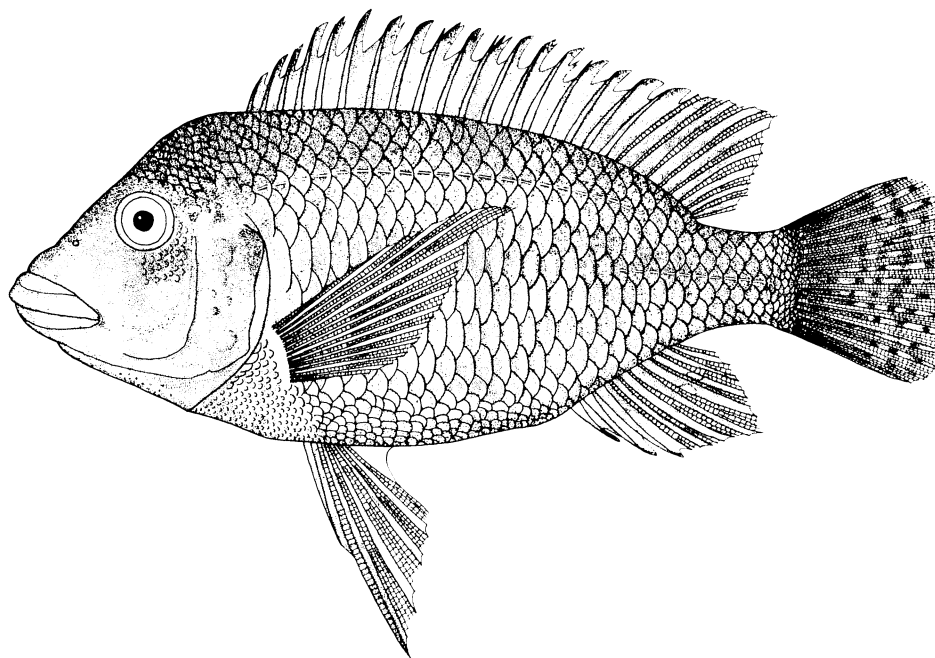


Fig. 4. *Petrochromis famula* Matthes et Trewavas. Lateral view of a female, 93.3 mm in SL, FAKU 51107.

famula and pointed out seven characters for distinguishing the two species. The results of the present study agree with those characters. He included the morphology of the lower pharyngeal bone, an internal character, as one of the distinguishing characters. However, I think that such internal characters are not always necessary for distinction. The diagnostic character of *P. orthognathus* is the isognathous jaws. As shown in Yamaoka (1982), this species seems to represent the most primitive form because of the primitive arrangement of the jaw dentition.

In juveniles, the whole body color in life is brownish.

Though the mean depth of the habitat of *P. orthognathus* has been reported to be 3m by Matthes (1959), large specimens, probably mature males, mainly inhabit deeper water of 8~10 m.

Petrochromis famula Matthes et
Trewavas, 1960
(Fig. 4)

Petrochromis famula Matthes and Trewavas, 1960:
349, fig. 1; Brichard, 1978: 338.

Materials examined. FAKU 51104~51109, 4 males and 2 females, 84.2~118.1 mm SL, Luhanga, 1~6 m deep, from August to December, 1981.

Description. D. XVIII~XIX, 7~9; III, 7; gill-rakers on lower limb of first arch 10~13; number of lateral-line scales 32; vertebrae 30~31 (mainly 31).

Body deep. Snout profile of ascending processes of premaxillae moderately prominent. Upper jaw extending in front of lower jaw slightly. Posterior margins of lips not reaching to vertical from anterior orbital rim. Tricuspid teeth on jaws in higher density, not showing regular series.

Cheek with two to three rows of small scales, its inferior half naked. Fewer small scales present on bases of dorsal and anal fins.

Posterior tips of dorsal and anal soft rays not filamentous. Pectoral fin almost same as head in length. Pelvic fin in males reaching anal spine, but not in females. Caudal fin subtruncate.

Color in life. Generally almost whole body deep purple. Occasionally 9 whitish narrow vertical stripes on each side. Distal tips of two membranes between three anal spines yellowish.

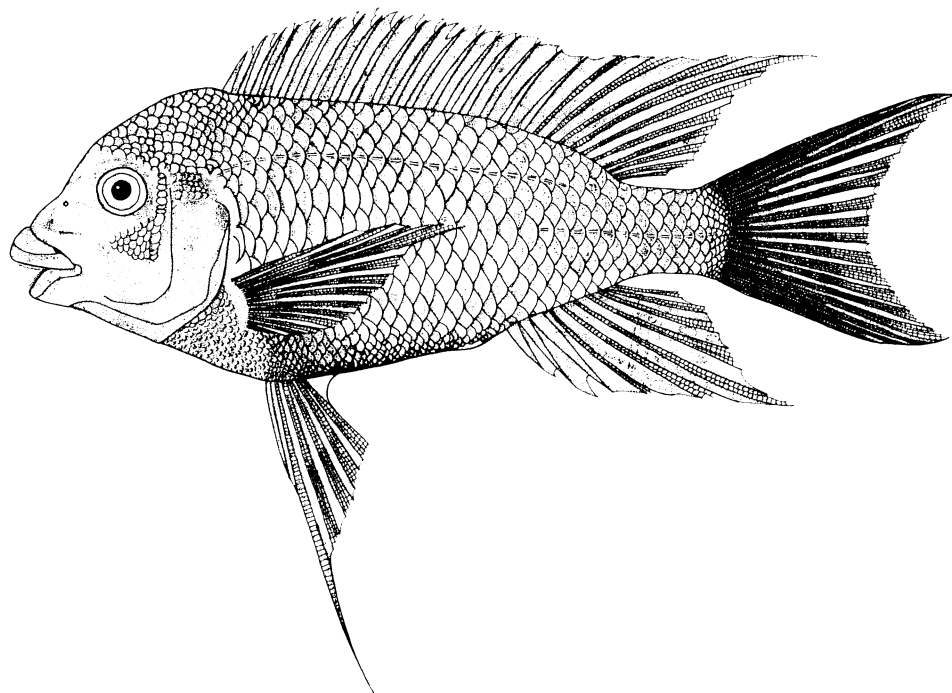


Fig. 5. *Petrochromis trewavasae* Poll. Lateral view of a male, 147.1 mm in SL, FAKU 51098.

Caudal fin maculated. Outer ring of eye whitish in underwater.

Color in formalin. Body deep purplish brown. Caudal fin maculated.

Remarks. Matthes (1959) and Matthes and Trewavas (1960) stated that *P. famula* is very close to *P. orthognathus* and *P. polyodon*, respectively. Matthes and Trewavas (1960) pointed out eight characters distinguishing *P. famula* from *P. polyodon*. My data agree with their statements. The number of the vertebrae is generally 31 in the former and generally 32 in the latter (Table 2). Thus, on the basis of the number of vertebrae *P. famula* is probably closer to *P. orthognathus* than *P. polyodon*.

Brichard (1978: 257) showed two photographs of two specimens of *Petrochromis*. The upper specimen was designated as an unidentified species and the lower one as *P. fasciolatus*. I am almost certain that both specimens are *P. famula* because of their common features of upper and lower jaws and maculated caudal fin. The upper specimen seems to be a younger one. In juveniles and young, 9 whitish delicate vertical stripes on each body side are conspicuous.

***Petrochromis trewavasae* Poll, 1948
(Fig. 5)**

Petrochromis trewavasae Poll, 1948: 10, fig. 5; Poll, 1956: 109; Poll, 1957: 134, Brichard, 1978: 338.

Materials examined. FAKU 51098~51102, 2 males and 3 females, 121.2~147.1 mm SL, Luhanga, 4~10 m deep, from July to October, 1981.

Description. D. XVIII, 9; A. III, 6~7; gill-rakers on lower limb of first arch 10~11; number of lateral-line scales 33~34; vertebrae 32.

Body deep. Snout profile of ascending processes of premaxillae moderately prominent. Upper jaw extending in front of lower jaw notably. Posterior margins of lips not reaching to vertical from anterior orbital rim. Tricuspid teeth on jaws in higher density than in *P. fasciolatus* and *P. orthognathus*, and not in regular rows.

Cheek with five to six rows of scales. Fewer small scales present on bases of dorsal and anal fins.

Posterior tips of dorsal and anal soft rays slightly filamentous. Pectoral fin shorter than head. Pelvic fin long, reaching anal spine. Caudal fin lunate.

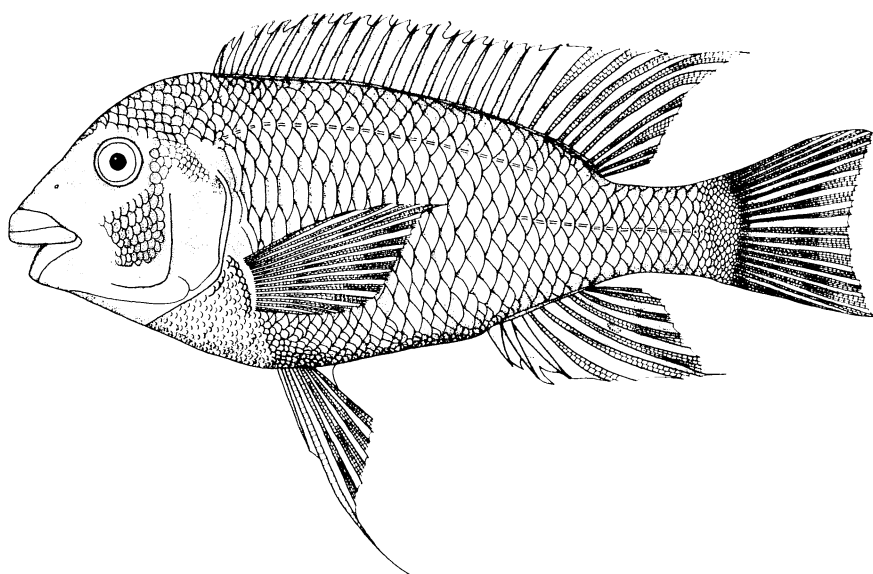


Fig. 6. *Petrochromis polyodon* Boulenger, Lateral view of a male, 145.8 mm in SL, FAKU 51094.

Color in life. Whole body except basal part of dorsal fin dark brown. Basal part of dorsal fin golden yellow. Occasionally 9 vertical delicate stripes of whitish dots on each flank.

Color in formalin. Upper half of body dark chocolate brown. Lower half whitish brown.

Remarks. Poll (1948) described this species on the basis of a single specimen measuring 120 mm in total length. As this species grows to almost 150 mm SL the type specimen can be regarded as a younger one. Description by Poll (1948) and a key given by Poll (1956) should be read with this view. A key given by Brichard (1978) is only concerned with the coloration and inappropriate for the following reasons: vertical stripes on flanks are not always present in specimens even in life. Besides, these stripes tend to fade away in formalin. Though the number of dorsal spines was 19 in the original description by Poll (1948), it is commonly 18. He also stated that *P. trewavasae* is very similar to *P. polyodon*. The same number of the vertebrae (Table 2) also indicates that these two species are closely related to each other. The most diagnostic character of this species is its lunate caudal fin.

Larger specimens (probably mature males) mainly inhabit deeper water of 8~12 m deep. Whole body of juveniles and young are coal-

black and they inhabit crevices among rocks. Specimens measuring 28 mm in standard length were found to be brooded in the oro-pharyngeal cavity of a female.

Petrochromis polyodon Boulenger, 1898
(Fig. 6)

Petrochromis polyodon Boulenger, 1898: 20, fig. 1: Pellegrin, 1904: 352; Boulenger, 1906: 573; Boulenger, 1915: 270; Regan, 1920: 42; Poll, 1946: Poll, 1956: 101; Poll, 1957: 143; Brichard, 1978: 338.

Materials examined. FAKU 51093~51097, 2 males and 3 females, 118.7~147.9 mm SL, Luhanga, 1~5 m deep, from August to October, 1981.

Description. D. XVII~XVIII, 8~9; A. III, 6~7; gill rakers on lower limb of first arch 10~12; number of lateral-line scales 33~34; vertebrae 32.

Body deep. Snout profile of ascending processes of premaxillae moderately prominent. Upper jaw extending in front of lower jaw notably. Posterior margins of lips not reaching to vertical from anterior orbital rim. Tricuspid teeth on jaws in higher density, not showing regular series.

Cheek with six rows of scales. Small scales absent on bases of dorsal and anal fins.

Posterior tips of dorsal and anal soft rays not

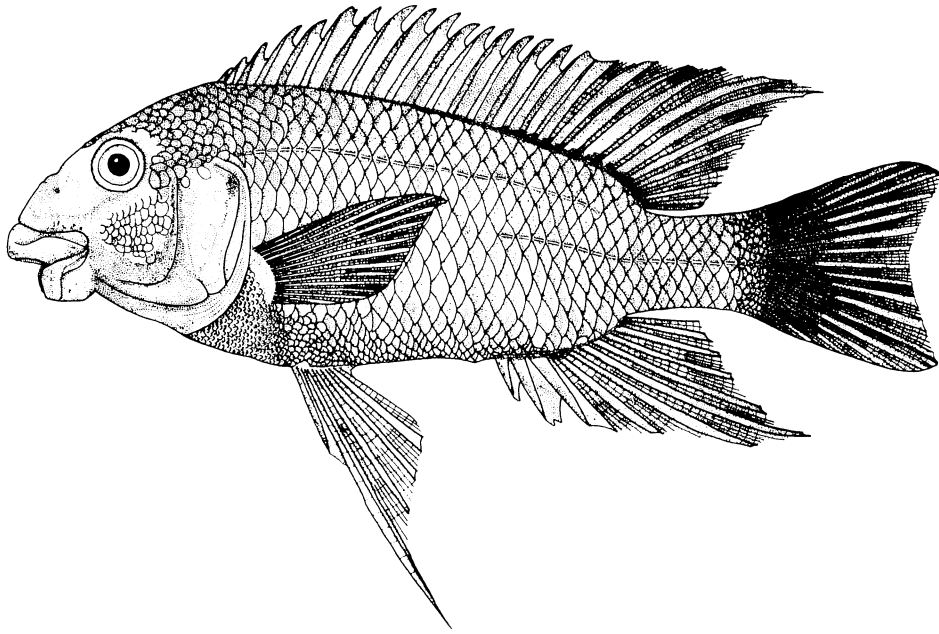


Fig. 7. Holotype of *Petrochromis macrognathus* sp. nov., FAKU 50673, 161.3 mm in SL, collected from Luhanga, northwestern part of Lake Tanganyika.

filamentous. Pectoral shorter than head and almost transparent. In large males posterior tip of pelvic filamentous, reaching anal spine. Caudal fin emarginate in large specimens and rather truncate in smaller ones.

Color in life. In larger mature males whole body grayish light blue. In smaller specimens, probably immature males, and females, body yellowish green with 9 dark green vertical stripes.

Color in formalin. In large mature males head and dorsum dull chocolate-brown. Flank whitish brown. In smaller specimens, body whitish brown with dull brown vertical stripes.

Remarks. Excepting the number of dorsal and anal soft rays, and length and depth of caudal peduncle, the external characters obtained from the present study agree with those of the original description by Boulenger (1898). The discrepancy may be due to differences in methods of counting and measuring. The number of the vertebrae in the descriptions of the genus *Petrochromis* by Boulenger (1898) and Regan (1920) agrees with the present study. *P. polyodon* seems to be situated morphologically between *P. trewavasae* and *P. macrognathus*. On the basis of the number of vertebrae, six species of

Petrochromis can be divided into three groups, i.e., those with 31-, 32-, and 33-vertebrae. The direction of the diversification seems to be from fewer to greater in number, which agrees with Cichocki's (1976) suggestion that the major trend is toward increased vertebral number rather than reduced number in cichlids.

Brichard (1978: 339) shows a photograph of a specimen identified as *Petrochromis fasciolatus*. I am confident that the specimen is *P. polyodon*, because of its projecting upper jaw, body form and pattern of stripes on the body side.

P. polyodon inhabits from the surface (juveniles) to a depth of about 7 m on rocky bottoms, and shallow water is its main habitat.

Petrochromis macrognathus sp. nov.
(Fig. 7)

Holotype. FAKU (Department of Fisheries, Faculty of Agriculture, Kyoto University) 50673, a male, 161.3 mm SL, Luhanga, 3°31'S, 29°09'E, rocky bottom at a depth of 0.5 m, hand net, July 27, 1981, caught by Ngera Ngera Lombola.

Paratypes. FAKU 50674, a female, 130.3 mm SL, Luhanga, at a depth of 0.5 m, hand net, July 30, 1981. FAKU 50675, a female, 135.4 mm SL, Luhanga, at a depth of 0.5 m, hand net, July 30, 1981.

FAKU 51090, a female, 114.3 mm SL, Luhanga, at a depth of 0.5 m, hand net, August 13, 1981. NSMT-P (Department of Zoology, National Science Museum, Tokyo) 21791, a female, 120.2 mm SL, Luhanga, at a depth of 0.5 m, hand net, August 10, 1981. NSMT-P 21792, a male, 164.1 mm SL, Pemba, 3°40'S, 29°09'E, at a depth of 1.0 m, spear, October 17, 1981.

Diagnosis. This species is easily distinguished from other species of *Petrochromis* by the following characters: 1) more projecting upper jaw, 2) posterior margins of lips just reaching to vertical from anterior orbital rim, 3) shorter pectoral fins (26.0~28.2% of SL instead of 30.5~36.0%), 4) strongly pronounced premaxillary ascending processes, 5) pronounced concavity of chin region, 6) greater number of vertebrae (33~34 instead of 30~32), 7) presence of many small scales on bases of dorsal and anal fins, and 8) specimens smaller than about 160 mm SL show distinct 11 to 12 vertical stripes, but in larger ones these stripes become obscure and whole body becomes dark-green or dull yellowish-green.

lowish-green.

Description. Counts and proportional measurements are shown in Table 3.

Body stocky and compressed. Head stout and long. Skin of body thick. Snout very broad, width broader than length. Snout profiles strongly humped by ascending processes of premaxillae. Eye diameter short. Interorbital space narrower. Mouth very large. Upper jaw extending much in advance of lower jaw (retrognathous). Posterior margins of lips just reaching to vertical from anterior orbital rim. Upper lip much thickened. Tricuspid teeth on jaws in higher density, not in regular rows. Posterior teeth small. Scales slightly ctenoid. Scales of nape and thorax small. Cheek with five to six rows of scales. Scales present on the opercle. Caudal fin lobes scaled except for posterior region. Many small scales present on bases of dorsal and anal fins.

Last dorsal spine longest: 5th soft ray longest, when depressed extending to the posterior tip of anal soft ray: not so filamentous. Anal origin

Table 3. Proportional measurements and counts of *Petrochromis macrognathus* sp. nov. Data show ranges; the means and sample sizes in parentheses.

	<i>P. macrognathus</i> sp. nov.	
	Holotype	Paratypes
Number of fish	1	5
Standard length (mm)	161.3	114.3~164.1
Dorsal fin rays	XVIII, 10	XVIII, 10
Anal fin rays	III, 7	III, 7~8
Pored lateral-line scales	35	35~36
Pored upper lateral-line scales	24	23~25
Pored lower lateral-line scales	16	14~15
Gill-rakers on lower part of first arch	13	11~12
Vertebrae	33	33~34
Depth of body	38.6	36.1~38.5 (37.6, 5)
Head length	36.1	34.5~36.4 (35.5, 5)
Snout length	18.6	17.9~19.0 (18.5, 5)
Snout width	21.3	20.3~21.0 (20.6, 5)
Eye diameter	6.4	6.0~7.2 (6.8, 5)
Interorbital width	10.0	9.3~10.6 (9.8, 5)
Length of upper jaw	15.9	14.6~15.4 (15.1, 5)
Length of lower jaw	8.0	7.3~8.7 (8.1, 5)
Width of lower jaw	19.0	18.8~20.3 (19.4, 5)
Length between upper and lower jaw	4.8	4.0~4.7 (4.3, 4)
Length of caudal peduncle	17.0	17.0~18.2 (17.5, 5)
Depth of caudal peduncle	12.5	12.3~12.8 (12.5, 5)
Length of pectoral fin	26.7	26.0~28.2 (27.1, 5)
Depth of labial	4.8	4.8~5.4 (5.2, 5)

below 17th dorsal spine. Third anal spine longest: 3rd soft ray longest, posterior tip not so filamentous. Anal fin with base ending a little anterior to end of dorsal fin base. Pelvic fin long, reaching beyond the posterior tip of 2nd anal spine in larger specimens (male). Caudal fin emarginate with slightly pointed corner (males) or with round corner (young and females).

Color in life. In specimens larger than 160 mm SL (males), whole body dark-green or dull yellowish-green. In smaller specimens (young and females), head dark-green, body dull yellowish-green, with distinct 11 to 12 dark-green vertical stripes; the first stripe beginning dorsally at the origin of dorsal fin, passing semiobliquely just posterior to pectoral base; second, beginning at fourth through fifth dorsal spines; tenth lying between posterior dorsal and anal fins; eleventh and twelfth stripes on caudal peduncle; dorsal, anal, caudal and pelvic fins dark-green, pectoral fin not so dark.

Color in formalin. Whole body dark chocolate-brown in larger males. In young and females, dark-green area in life becomes dark chocolate-brown, and dull yellowish-green becomes grayish brown.

Remarks. *Petrochromis macrognathus* is closely related to *P. polyodon* in having a projecting upper jaw and emarginate caudal fin, but differs from it in the following characters: 1) shallower depth of body; 2) posterior margins of lips just reaching to vertical from anterior orbital rim; 3) more projecting upper jaw; 4) thicker lip of upper jaw; 5) much pronounced convexity of premaxillary ascending processes; 6) pronounced concavity of chin region; 7) shorter pectoral fins; 8) narrower interorbital width; 9) greater number of vertebrae; 10) greater number of dorsal soft rays; 11) small scales present on bases of dorsal and anal fins; 12) 11 to 12 dark-green vertical stripes on the body. Poll (1956) described the modal fin formula of dorsal for *P. polyodon* as follows; D. XVIII, 10, though modal counts of dorsal soft rays in my material were eight. This discrepancy may be due to difference of counting method. He probably counted the posterior-most two rays as two.

The largest specimen collected measures 172.2 mm SL.

Habitat and feeding behavior. This species is not so rare along rocky shores where many *P.*

polyodon also occur. Since its mode of life is somewhat cryptic between rocks near shore, it is apt to be out of sight. They are found in depths ranging from the water surface to 2 m, and hover in waves to feed on algae usually attached on a nearly vertical plane of rocks between the water surface and a depth of 0.5 m. Whereas *P. polyodon* is found at depths ranging from the surface to 7 m.

Feeding behavior of this species is somewhat different from that of *P. polyodon*. Speed of grazing (frequency of mouth-opening and mouth-closing cycles per second) is faster. Because of its speed, brief duration and indistinctness caused by foam from the waves, it was impossible to measure. The mean and the standard deviation of the figure of SRT (successional repeated times: frequency of mouth-opening and mouth-closing cycles per each pressing of the mouth against rock surface) is 1.56 ± 0.61 . According to Yamaoka (1982), the mean of SRT of *P. polyodon*, *P. trewavasae*, *P. famula*, *P. orthognathus* and *P. fasciolatus* were 4.63, 3.61, 1.66, 2.74 and 6.29, respectively.

Yamaoka (1982) stated that species possessing a more projecting upper jaw grazes slowly and is regarded to be more specialized for combing off algae from the rock surface. The projecting upper jaw and faster speed of grazing in *P. macrognathus* contradict the above-mentioned suggestion. Since *P. macrognathus* feeds in the surface zone, if speed of grazing is slower or the figure of SRT is higher, it may become stranded out of water.

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(Department of Fisheries, Faculty of Agriculture, Kyoto University, Sakyo-ku, Kyoto 606, Japan)

タンガニーカ湖産カワスズメ科 *Petrochromis* 属魚類の分類および1新種の記載

山岡耕作

タンガニーカ湖に固有な *Petrochromis* 属魚類の1新種 *P. macrognaathus* を記載した。同属の他の5種に

ついても、比較のために主要な形質の記載を行なった。本種は同所的に生息し形態的に最も近縁だと思われる *P. polyodon* と次の点で容易に区別できる：体高が低いこと；口唇後縁が眼の前端部から体軸におろした垂線にほぼ達すること；突出した上顎；厚い上顎唇；前上顎骨上方突起が吻部へ顕著に突出すること；下顎の頭部にくぼみがみられること；短い胸鰭；脊椎骨が多いこと；背鰭軟条が多いこと；背鰭および臀鰭基底

部に多数の小鱗の存在すること；全身濃緑色の成熟雄を除くと、体側に 11~12 本の暗緑色横帯の存在すること。生態的にも両種間には、摂食行動、微生息場所に差がみられる。外部形態にもとづき、*Petrochromis* 属 6 種の検索表を作製した。

(606 京都市左京区北白川追分町 京都大学農学部水産学教室)