

Kiunga ballochi, A New Genus and Species of Rainbowfish (Melanotaeniidae) from Papua New Guinea

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The rainbowfishes of the family Melanotaeniidae are represented by approximately 55 species belonging to nine genera that are confined to fresh and brackish waters of the Australia-New Guinea region. Allen and Cross (1982) provided a summary of the generic classification and a review of the known species. Since then a number of undescribed forms have been discovered, including at least three *Melanotaenia* and five *Pseudomugil*. The present paper describes a new species that was collected by the author during an expedition to New Guinea between September and November of 1982. It was initially thought to belong to the genus *Pseudomugil*, but closer examination revealed a number of distinctive external and internal features. Thus, it has been placed in a new genus that is also described herein.

Type specimens of *Kiunga ballochi* have been deposited at the following institutions: Australian Museum, Sydney (AM); Kanudi Fisheries Research Laboratory, Port Moresby, Papua New Guinea (PNG); Rijksmuseum van Natuurlijke Historie, Leiden (RMNH); United States National Museum of Natural History, Washington, D.C. (USNM); Western Australian Museum, Perth (WAM); and Zoologisch Museum, Amsterdam (ZMA).

METHODS

Standard length (SL) is taken from the most anterior point of the upper lip to the midbase of the caudal fin (end of hypural plate). Head length is measured from the front of the upper lip to the end of the opercular membrane. The depth of the body is a vertical measurement taken at the level of the pelvic fin origin. The width of the body is measured at the level of the gill opening. The diameter of the orbit is the horizontal fleshy diameter. The interorbital width is the bony width across the middle of the interorbital region. The length of the caudal peduncle is the horizontal measurement connecting two vertical lines, one passing through the base of the last dorsal ray and the other through the base of the middle caudal rays. The last dorsal and anal fin rays each consist of a double ray arising from a single pterygiophore and are counted as single rays. Predorsal scales are counted on the dorsal midline between the origin of the first dorsal fin and the interorbital. Preopercle scale counts refer to the total number of scales overlying the preopercle bone; opercular series scale counts refer to the total number of scales overlying the combined interopercle, subopercle, and opercle bones. Gill raker counts include rudiments; the

raker at the angle was incorporated into the lower limb count.

Kiunga gen. nov.

Type species: *Kiunga ballochi* Allen.

Diagnosis:

A genus of Melanotaeniidae allied to *Pseudomugil* but differing in scalation, skull features, dentition, fin shape, and counts. It is characterized by an unusual combination of characters that includes the presence of a keel-like structure between the pelvic and anal fins and scale modifications forming rigid sheaths at the bases of the dorsal and anal fins; a non-protrusible premaxilla; thorny teeth that form prominent symphyseal patches on the outside of the upper and lower jaws; body scales greatly elongated anteroventrally; pectoral fins not positioned above the horizontal axis of the body; spinous dorsal fin vestigial, with 2 or 3 elements; soft dorsal rays 13 to 16; total anal fin elements (including spine) 16 to 18; ray at beginning of second dorsal fin with a large, fan-shaped pterygiophore; and absence of obvious sexual dimorphism.

Description:

(See description of *K. ballochi* for additional details.) Body relatively deep and laterally compressed, greatest depth 2.9 to 3.5 in SL; pre-

maxillaries non-protrusible, with a distinct bend between the anterior horizontal portion and lateral part; jaw teeth conical, thorn-like, extending onto outer exposed portion of mouth; vomer and palatines toothless; a single inter-dorsal pterygiophore; first dorsal fin vestigial, inconspicuous, consisting of 2 or 3 slender, flexible spines; second dorsal fin composed of 13 to 16 segmented rays, all branched (except first ray usually unbranched in smaller specimens); large fan-shaped pterygiophore at beginning of second dorsal fin; anal fin with a slender, flexible spine and 15 to 17 segmented, branched rays; anal fin originating on anterior half of body; branched caudal rays usually 10, rarely 12; principal caudal rays usually 14; parhypural fused to lower hypural plate; pelvic girdle without anterior projections at ventral midline (Fig. 3B); lateral "wing" of pelvic girdle anchored to fourth (rarely third) pleural rib; dorsal head of cleithrum without posteriorly directed projections (Fig. 3D); scales cycloid with poorly developed radii; vertebrae 31 or 32 (5 specimens).

Remarks:

The genus *Kiunga* is most similar to *Pseudomugil* and *Popondetta*, which Allen (1980) considered as sister groups on the basis of certain apomorphic character expressions. The overall morphology of the new genus, including both osteological and external features, indicates a common ancestry with *Pseudomugil* and *Popondetta*. A study of the phylogenetic relationships of these fishes is currently under review by Allen and Ivantsoff and will be reported separately. One of the most noteworthy characters unique to *Kiunga* is the keel-like structure formed by the scales of the ventral midline between the pelvic fins and the anal fin origin. This structure is formed by a stout flange on the lower edge of the ventral scale row. Similar flange modifications of the scales at the bases of the dorsal and anal fins form low, rigid sheaths. The jaw structure of *Kiunga* is different

from most melanotaeniids in that the premaxilla is firmly attached and cannot be protruded. In all other genera except *Chilatherina* and *Iriatherina* the upper jaw is slightly to highly protrusible. The thorny, conical dentition of the jaws is similar to that of *Popondetta*, but a unique feature is the presence of discrete symphyseal tooth patches. The body scales of *Kiunga*, particularly those of the midlateral row (Fig. 3C), are much more elongate than in other melanotaeniids. Although *Kiunga* is similar to *Pseudomugil* and *Popondetta* in many respects, one important difference involves the position of the pectoral fins. In *Kiunga* they are positioned near the horizontal axis, in contrast to the more dorsal position in the other two genera. In addition, these fins do not extend above the dorsal profile during the "upstroke," a feature unique to *Pseudomugil* and *Popondetta* among the melanotaeniids. The spinous dorsal fin is weakly developed in at least two *Pseudomugil*, *P. paludicola* Allen and Moore and *P. cyanodorsalis* Allen and Sarti, but not to the extent found in *Kiunga*, whose first dorsal fin requires considerable magnification for detection. The high number of soft dorsal rays (13 to 16) further distinguishes *Kiunga* from *Pseudomugil* (4 to 9) and *Popondetta* (7 to 12). The soft anal ray count of 15 to 17 overlaps with *Popondetta* (15 to 20) but is generally higher than for *Pseudomugil* (6 to 14). In addition, the large, fan-shaped pterygiophore at the base of the first ray of the second dorsal fin of *Kiunga* appears to be distinctive. Also, there are fewer expanded neural spines on the anteriormost vertebrae compared with most melanotaeniids. *Kiunga* usually has only the first 2 vertebrae with greatly expanded neural spines compared with 2 to 3 in *Popondetta*, 1 to 4 (rarely 5 or 6) in *Pseudomugil*, 3 to 4 in *Cairnsichthys*, and 4 to 9 in the remaining genera. Finally, there is no obvious sexual dimorphism exhibited in *Kiunga*, in contrast with many melanotaeniids including *Popon-*

detta and at least half of the species of *Pseudomugil*.

The genus is named after the village of Kiunga, the largest settlement in the area where the type species occurs.

Kiunga ballochi sp. nov.

Yellow-finned Blue-eye
(Figs. 1A, 1B)

Holotype:

WAM P27797-001, male; 24.5 mm SL, small creek, a tributary of the Upper Fly River, about 40 km north of Kiunga on Tabubil Road, Papua New Guinea (approximately 5°52'S, 141°12'E), seine net, G. Allen and J. Paska, 16 September 1982.

Paratypes:

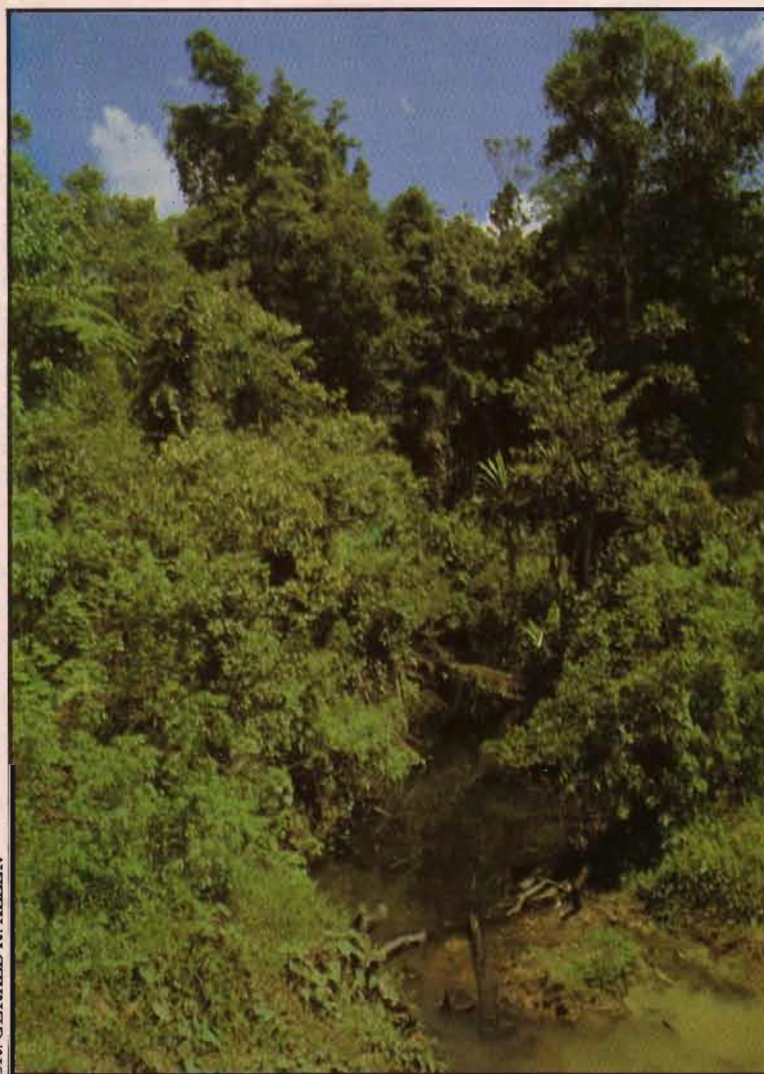
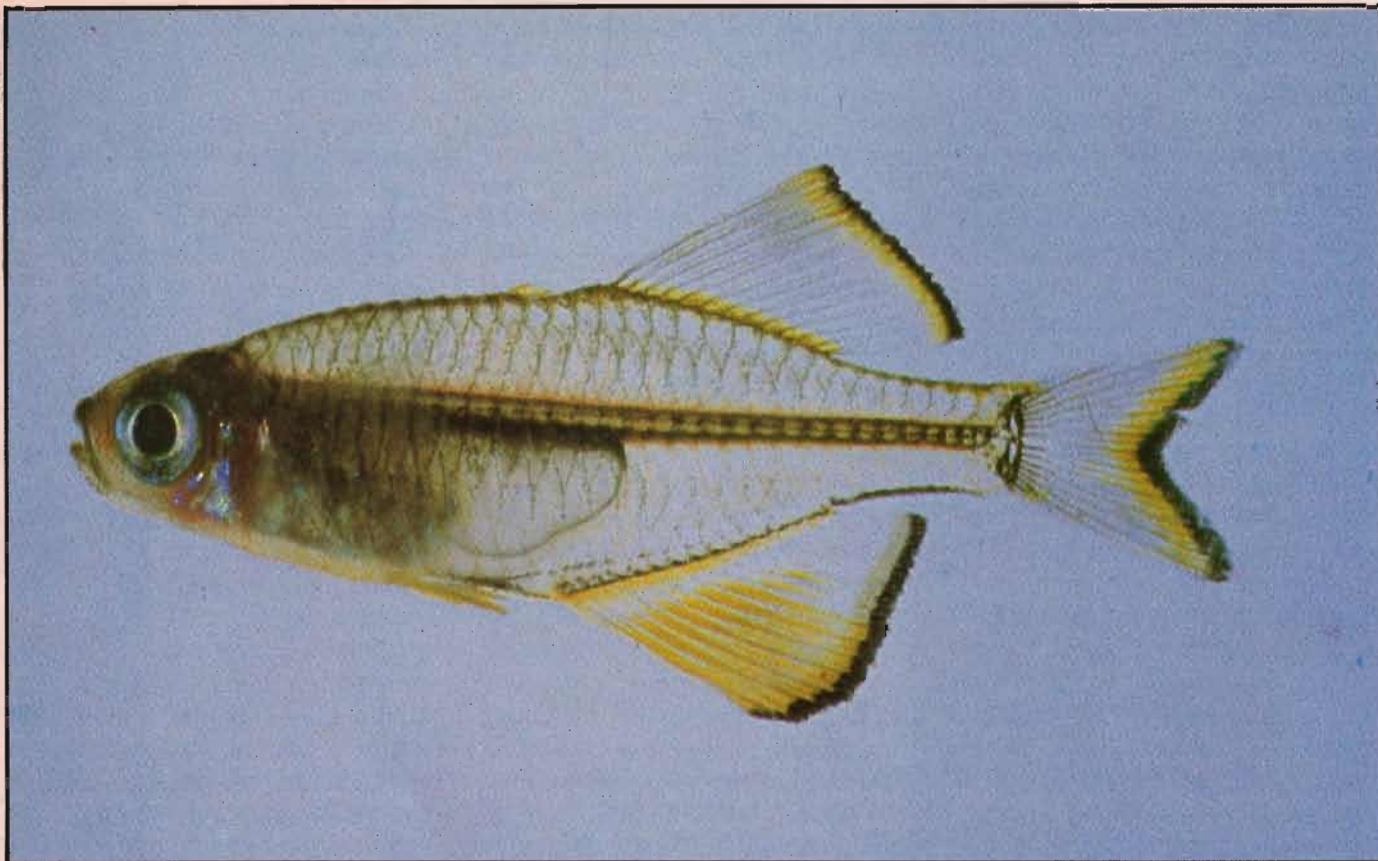
(Collected with holotype unless stated otherwise.) AMS I.23842-001, 5 specimens, 16.6-26.3 mm SL; PNG F.5363.01, 5 specimens, 17.1-29.2 mm SL; RMNH 29230, 6 specimens, 19.5-25.7 mm SL; WAM P27797-002, 40 specimens, 14.7-25.8 mm SL; WAM P27798-001, 21 specimens, 18.0-28.0 mm SL, small creek, a tributary of the Upper Fly River about 50 km north of Kiunga on Tabubil Road, Papua New Guinea (approximately 5°51'S, 141°11'E), seine net, G. Allen and J. Paska, 16 September 1982; ZMA 119.072, 7 specimens, 14.8-22.9 mm SL.

Description:

Counts and proportions that appear in parentheses refer to the range for paratypes (based on 20 specimens, 18-29 mm SL) if different from the holotype.

Dorsal rays II-13 (II or III-13 to 16); anal rays I,16 (I,15 to 17); pectoral rays 11 (11 or 12); pelvic rays I,5; branched caudal rays 12 (10); principal caudal rays 14; vertical scale rows from upper pectoral base to caudal fin base 28 (28 or 29); horizontal scale rows from base of anal fin origin to base of first dorsal fin 5; scales between dorsal fins 3 (3 or 4); predorsal scales 15 (12 to 17); preopercle scales 3 (2 or 3); scales on opercular series 5 (5 or 6); gill rakers on first arch 2 + 8 = 10 (1 or 2 + 7 or 8 = 8 to 10).

Body depth 3.5 (2.9 to 3.5); head length 4.2 (3.7 to 4.2), both in stan-



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Figure 1A (above): *Kiunga ballochi*, holotype, 24.5 mm standard length, about 40 km north of Kiunga, Papua New Guinea. Figure 2 (left): Type locality of *Kiunga ballochi*.

standard length. Greatest width of body 2.0 (2.0 to 2.8) in body depth. Snout length 3.9 (3.5 to 4.3); eye diameter 2.3 (2.1 to 2.5); interorbital width 2.8 (2.4 to 2.8); depth of caudal peduncle 2.1 (1.9 to 2.3); length of caudal peduncle 1.2 (1.1 to 1.3), all in head length.

First dorsal fin originates opposite about one-fourth to one-half eye diameter anterior to anal fin origin; longest element of first dorsal fin 4.2 (3.9 to 5.8); of second dorsal fin 0.8 (0.8 to 1.3); of anal fin 0.9 (0.9 to 1.4), all in head length. All soft (segmented) rays of second dorsal and anal fins branched except first ray frequently unbranched in specimens under about 20 mm SL. Pelvic fin tips not reaching origin of anal fin when depressed; innermost pelvic fin ray connected to abdomen along most of length by delicate membrane (usually damaged during collecting or examination); urogenital openings positioned on midventral line about



Figure 1B: *Kiunga ballochi*, 30 mm total length, photographed in an aquarium. The fins of this individual lack the normal yellow coloration.

one-third to one-half distance between origin and posterior tip of depressed pelvic fins; length of pelvic fin 1.7 (1.6 to 1.9) in head length. Pectoral fins pointed, longest rays 1.3 (1.2 to 1.5) in head length. Caudal fin emarginate, its length 1.0 (0.9 to 1.0) in head length.

Jaws oblique, mouth terminal; maxilla extends posteriorly to level between anterior edge of eye and anterior edge of pupil; premaxilla (Fig. 3A) without accessory ascending process. Upper jaw (premaxilla) covered with about 45 to 60 teeth arranged in 2 to 4 irregular rows on each side that are exposed when mouth is closed, those on lateral "wing" of premaxilla mainly enlarged, thorn-like, with conical shapes; a pair of prominent patches of similar thorn-like teeth at front of premaxilla on either side of median symphysis; innermost teeth of upper jaw small and villiform. Lower jaw with less conspicuous teeth confined mainly

to anterior portion, about 25 to 30 on each side, those at front of jaws largest and arranged in two large patches on each side of median symphysis.

Scales cycloid, relatively large and elongated anteroventrally, arranged in regular horizontal rows; predorsal scales extending to middle of interorbital, including two relatively enlarged scales on frontal-interorbital; 2 or 3 scales below eye covering cheek; pores of cephalic sensory canals relatively large and conspicuous, 9 in dentary-preopercle series and 10 in supraorbital series; anterior nostril opening relatively small with low rim, placed on side of snout next to premaxillary; posterior nostril opening enlarged, next to upper anterior corner of eye and similar in appearance to other sensory pores in supraorbital region.

Color in Alcohol: Overall whitish with scale margins of most of body except ventral region thinly outlin-

ed with black; thin black line along middle of side from pectoral region to base of caudal fin; concentration of melanophores on middorsal line between origin of second dorsal fin and interorbital; similar concentrations of dark pigment on dorsal and ventral midlines of caudal peduncle and along bases of second dorsal and anal fins; fins mainly translucent, outer edges of second dorsal, anal, and caudal fins with prominent black borders.

Color in Life: Body and swim bladder mainly transparent; linings of stomach and opercle silvery; iris blue; scales thinly outlined with pepper-like melanophores; middorsal line, ventral edge of caudal peduncle, and bases of dorsal, caudal, and anal fins with dense concentrations of melanophores; spinous dorsal fin translucent yellow; second dorsal, caudal, and anal fins with bold black borders and yellow submarginal bands, remaining portions of these

Proportional measurements of selected type specimens of *Kiunga ballochi*
(expressed as a percentage of the standard length)

	Holotype WAM P27797-001	Paratype PNG F.5363.01	Paratypes WAM P27797-002			
Standard length (mm)	24.5	29.2	25.5	23.0	20.0	19.0
Depth	29.0	32.9	29.8	29.6	30.0	30.0
Width	14.3	12.3	11.4	11.7	13.0	15.3
Head length	24.1	24.0	23.9	23.9	26.0	27.4
Snout length	6.1	6.8	6.7	6.5	6.5	6.3
Orbit diameter	10.6	10.3	11.0	10.4	12.0	13.2
Bony interorbital width	8.6	8.9	9.4	10.0	9.5	10.5
Depth of caudal peduncle	11.4	11.3	11.8	11.7	12.5	12.6
Length of caudal peduncle	20.4	18.8	22.7	20.4	22.5	21.0
Snout to first dorsal fin origin	46.1	47.3	47.8	47.0	58.0	47.4
Snout to anal fin origin	53.5	52.7	52.9	50.0	54.0	54.2
Snout to pelvic fin origin	35.1	37.7	37.3	35.7	37.5	40.0
Length of second dorsal fin base	23.7	27.4	23.5	25.2	22.0	26.3
Length of anal fin base	29.0	31.5	29.0	29.1	26.0	28.0
Length of pectoral fin	18.4	17.8	16.5	17.4	18.5	18.4
Length of pelvic fin	14.3	14.4	13.3	13.5	14.0	14.7
Longest ray of first dorsal fin	5.7	4.1	5.5	6.1	6.5	6.3
Longest ray of second dorsal fin	28.6	27.4	25.5	28.3	26.5	21.1
Longest anal ray	27.8	25.0	26.3	29.1	26.5	20.0
Length of caudal fin	24.5	25.7	23.5	24.3	28.0	26.3

Figure 3: Camera lucida drawings showing diagnostic features of *Kiunga ballochi*. (A) Lateral view of premaxillary from 24 mm SL specimen; (B) ventral view of pelvic girdle from 22 mm SL specimen; (C) mid-lateral scale from 28 mm SL specimen; and (D) lateral view of left pectoral girdle from 23 mm SL specimen.

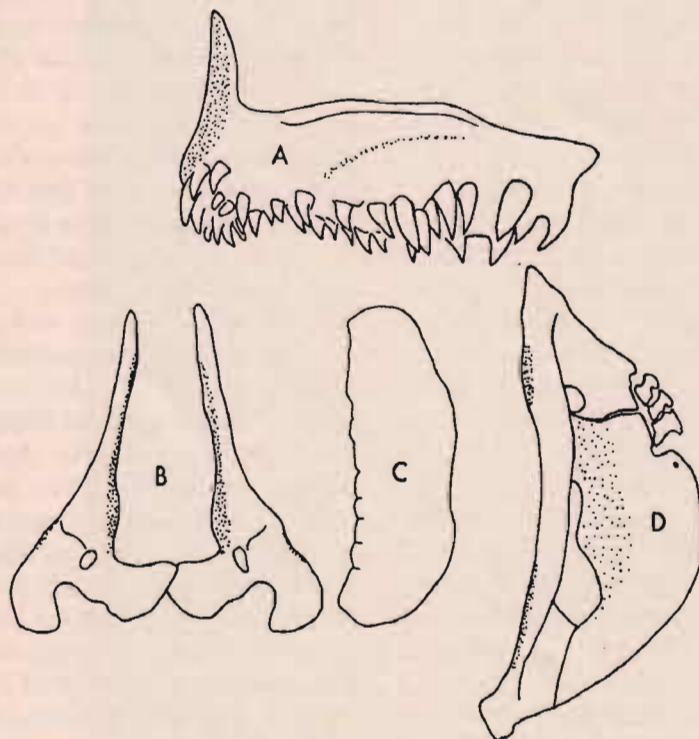


TABLE 2

Fin ray counts of selected type specimens of *Kiunga ballochi*

First dorsal fin spines

II	III
9	21

Second dorsal fin soft rays

13	14	15	16
14	9	6	1

Anal fin soft rays

15	16	17
6	12	12

Pectoral fin rays

11	12
12	18



Figure 4: Map of New Guinea with type locality of *Kiunga ballochi* indicated by arrow.

fins transparent except dorsal and anal fins with narrow strips of yellow basally and anterior half of anal fin with membranes mainly yellow; pelvic fins pale yellow; pectoral fins transparent; all fins with soft rays faintly outlined with black.

Remarks:

Kiunga ballochi is the only known member of the genus. It differs from other melanotaeniids in a number of characters discussed under the generic description above.

The species appears to be restricted to several small creeks that are tributaries of the Upper Fly River system located approximately 30-40 kilometers north of Klunga or approximately 900 kilometers upstream from the mouth of the Fly (Fig. 4). These streams cross the recently completed road linking Klunga and Tabubil in the section between the villages of Runginae and Ningerum. This

area is situated only 24 kilometers east of the Irian Jaya border. The habitat consists of clear, shallow creeks flowing through dense rainforest with occasional sunlit clearings. A temperature of 24.5°C and a pH of 7.8 were recorded at the type locality. The fish was found in relatively large aggregations that were easily netted. The type locality is illustrated in Fig. 2.

The species is named in honor of Dr. David Balloch, who provided invaluable logistic support and collecting assistance. His efforts were directly responsible for the discovery of this new species.

ACKNOWLEDGMENTS

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collecting assistance and to Dr. John Lock, Chief Biologist of the same institution, for logistic aid and for providing funds for Mr. Paska's participation. The success of the *Kiunga* fish collections was largely due to the aid of Ok Tedi Mining Ltd., particularly the efforts of Dr. Roger Higgins and Dr. David Balloch, both staff biologists. Mr. Norbert Cross prepared the cleared and stained specimens of *K. ballochi* utilized in this study. Finally, I thank Mrs. Connie Allen for her careful preparation of the typescript.

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