

A New Genus and Species of Cichlid of the Mbuna Group  
(Pisces: Cichlidae) from Lake Malawi

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INTRODUCTION

The small, attractive cichlid herein described has been a popular aquarium fish in the UNITED STATES and GERMANY for several years. A member of the *mbuna* group of small, principally petricolous haplochromine cichlids endemic to Lake Malawi (= Nyasa), it was first collected by Mr T.E. DAVIES and family, exporters of aquarium fishes based at Cape Maclear, Malawi. This species has circulated in the aquarium trade under a number of incorrect names, among which *Petrotilapia tridentiger* has enjoyed the widest use. OLIVER is preparing a complete taxonomic revision of the *mbuna*, but in view of its widespread popularity as an aquarium fish, we feel it wisest to describe this species now, to forestall the propagation of further confusion in the aquarium literature with respect to its identity.

Mrs Kappy SPRENGER, outstanding aquarist, aquarium writer and artist of Los Gatos, California, has taken a special interest in the « rusty cichlid », as this species is popularly named. Her persistent efforts to have this fish correctly identified led to the recognition that it was undescribed. It gives us great pleasure to name this species in her honor.

**IODOTROPHEUS** gen. nov.

Type species: *Iodotropheus sprengeræ* sp. nov.

Small cichlid fishes derived from *Haplochromis* or haplochromine ancestral stock and belonging to the *mbuna* group of rock-dwelling cichlids endemic to Lake Malawi (FRYER, 1959: 237-238). Profile of snout almost straight and steeply descending in large specimens. Upper lip joined to snout by a frenum, the development of which is variable in specimens under 50 mm standard length. Jaws and tooth bands rather narrow and rounded. Outer posterolateral teeth of upper jaw bicuspid, wearing to simple in large individuals. Anterior teeth of both jaws robust, bicuspid, sometimes wearing to broadly unicuspid in large specimens, crowns closely spaced and obliquely inclined towards the symphysis. Anterior teeth externally prominent in both living and preserved fishes. Inner teeth tricuspid, loosely arranged in two to four poorly-defined series. Pharyngeal teeth uncrowded, posteromedian teeth not conspicuously enlarged. Both posterior and anterior pharyngeal teeth pointed and very feebly bicuspid, the minor cusp reduced to a bulbous vestige.

Color pattern of flanks poorly defined, generally inconspicuous, traces of vertical markings sometimes present. Ground color of living fishes reddish-brown of variable intensity, often overlaid with intense lavender or purple. Yellow-white to orange-white anal pseudocelli present in the male, variably present in the female.

The name is derived from the Greek words *iodes*, rust-colored, and *trophos*, one who feeds. The latter was used for a genus (*Tropheus* BOULENGER) of small, petricolous cichlids endemic to Lake Tanganyika, and was later employed in a compound name (*Pseudotropheus* REGAN) for a group of *mbuna* strongly convergent with *Tropheus* as regards ecology, general morphology, and particularly dentition. *Iodotropheus* is an *mbuna* whose ground color resembles iron rust, and whose morphology is superficially similar to that of *Pseudotropheus*. The name is to be treated as masculine.

***Iodotropheus sprengeræ*** sp. nov. (fig. 1).

*Petrotilapia tridentiger* (non TREWAVAS), ANONYMOUS, 1968 (color photograph).

Unidentified Malawi cichlid, FRYER, 1969 (color photographs, p. 38, right fish only; p. 39, right fish only).

*Melanochromis perspicax* (non TREWAVAS), GALE, 1970 (black and white photograph, p. 51).

*Melanochromis?* sp., SPRENGER, 1970 (black and white photographs).

HOLOTYPE: A mature male, 79.1 mm SL, B. M. (N. H.) reg. n° 1971.9.8 : 5.

PARATYPES: One male 76.0 mm SL and two females 45.5 and 46.5 mm SL, B. M. (N. H.) reg. n° 1971.9.8 : 6-8; three males 62.0-82.8 mm SL and one female 73.2 mm SL, U.S.N.M. reg. n° 2070-12-2070-15.

*Description*: Based on the holotype and seven paratypes. The principal morphometric data are given in Table 1.

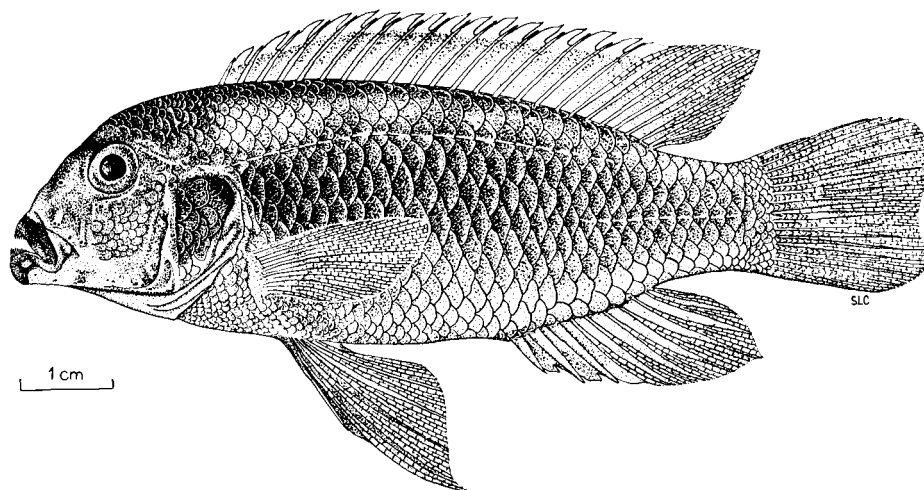


Fig. 1. — *Iodotropheus sprengerae* gen. et sp. nov. Holotype, B.M. (N.H.) reg. n° 1971.9.8 : 5, adult male 79.1 mm standard length.

Drawn by Mrs Sharon L. CHAMBERS.

Dorsal head profile decurved above eye, with a supraorbital depression in examples under 70 mm standard length (fig. 2), becoming nearly straight and descending more steeply, at about 50° to 60° to the horizontal, in larger individuals. Premaxillary pedicels scarcely or not apparent beneath skin of snout.

Upper lip connected to skin of snout by a fleshy frenum (fig. 3). The frenum is always well-developed in specimens over 50 mm standard length, but its presence and development are variable in specimens smaller than this.

Jaws short, the lower projecting slightly in large specimens. Posterior tip of maxilla not reaching vertical through anterior margin of orbit, and slightly closer to orbital margin than to nostril.

Caudal peduncle 0.76 to 0.97 (mean = 0.90) times as long as deep.

*Gill rakers* seven to 10 (mode nine) on lower arm of outer branchial arch, covered with scattered melanophores; lower two or three rakers very short, basally broader than long, remainder about as long as broad or a little longer, and slightly incurved (fig. 4).

*Scales* minutely denticulate, those on nape and chest reduced in size. Lateral line with 31 scales, cheeks with four to seven very poorly defined rows. Two scales between middle of dorsal fin base and upper lateral line, about seven to nine and one-half between pectoral and pelvic fin bases.

*Fins.* Dorsal XVII,8 (frequency 2), XVII,9 (f. 2), XVIII,8 (f. 2), or XVIII,9 (f. 2). Anal III,7 (f. 6) or III,8 (f. 2). Pelvics with first ray produced. Caudal weakly emarginate with rounded lobes, and scaled on its basal portion.

The *buccal dental array* of a 62.0 mm standard length specimen of *I. sprengerae* is presented in figure 5. The buccal teeth are present as a single row of well-developed outer bicuspid teeth and a somewhat indistinctly defined array of inner tricuspid teeth, present in two to four irregular rows. The median teeth of the outer series in both jaws are somewhat incurved, obliquely inclined toward the symphysis, unequally but markedly bicuspid and heavily pigmented on their crowns (fig. 6, a). These median teeth are visible externally in both living and preserved specimens. In fishes larger than 60 mm standard length, these teeth may present an unequally bicuspid or roughly spatulate unicuspid appearance, apparently due to wear. The posterolateral teeth of the outer series of the upper jaw are rather slender, incurved and unequally bicuspid. They are much reduced compared to the median outer teeth and their crowns are less heavily pigmented (fig. 6, b). The inner teeth of the lower jaw are rather broad-based, with flaring crowns, slightly recurved posteriorly and subequally tricuspid, with pigmented crowns (fig. 6, d). Those of the upper jaw are narrow-based, less broadly flaring at the crown than those of the lower jaw, more unequally tricuspid, and have unpigmented crowns (fig. 6, c).

The *lower pharyngeal bone* is roughly triangular, slightly longer than broad, with a rather slender anterior process. The dentigerous area is roughly heart-shaped and covers about three-quarters of the total area of the pharyngeal bone. The pharyngeal dentition is uncrowded. A single row of very slightly enlarged teeth is present posteriorly. These are vertically implanted and feebly bicuspid, the minor cusp being reduced to a bulbous vestige. The remaining pharyngeal teeth are rather loosely arranged over the remainder of the dentigerous area. They are more slender than the

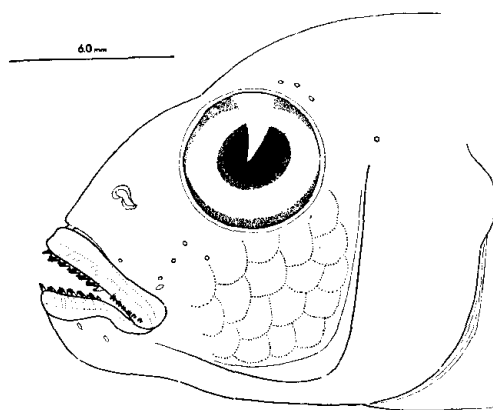


Fig. 2. — Lateral view of the head of *I. sprengerae*, showing somewhat diagrammatically the outer buccal dentition.

posterior teeth, and implanted at an angle of  $30^{\circ}$  to  $45^{\circ}$  to the vertical pointing rearward. The anterior cusp of these very feebly bicuspid teeth is even further reduced. The crowns of all the pharyngeal teeth are pigmented.

*Coloration, in living specimens:* The dorsum, nuchal region, snout and preopercular region are brown, with a strong rusty orange overlay. In young specimens, the lips are similarly colored, but in older fish, they frequently have a gray-white appearance, possibly due to the presence of keloid tissue resulting from continual abrasion against rock surfaces. The opercular region and flanks are variably colored lavender to saturated blue-violet. The ventral region is dusky white. The iris of the eye is coppery gold. The dorsal lappets are blue-white, with an indistinctly defined, dusky submarginal band extending along the length of the spinous dorsal. The basal portion of the spinous dorsal and the entire soft dorsal are rusty orange. The

membrane of the posterior portion of the soft dorsal is variably marked with metallic blue streaks. The caudal is colored and marked as the soft dorsal. The anal fin is dusky violet with a rusty orange margin. One to five orange-white anal pseudo-ocelli are present basally and along the trailing edge of the anal of the male, one to three in the anal of the female. The ventral fins are rusty

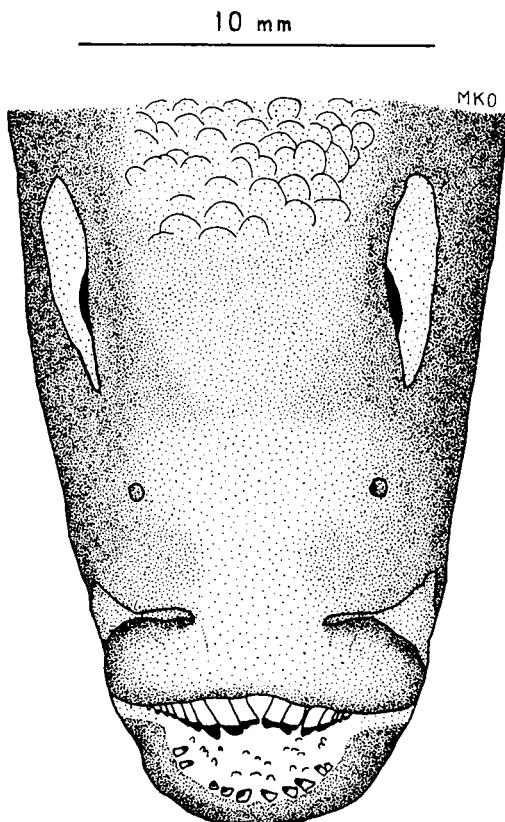


Fig. 3. — Dorsal view of the head of *I. sprengerae*, showing the frenum and the dental pattern externally visible in the upper jaw.

brown with a blue-violet leading edge, paling to metallic blue-white distally. The pectorals are clear rusty orange. This coloration is somewhat variable in its intensity. It is possible to find individuals corresponding to the description given above in the same spawning as individuals in which the rusty overlay and blue-violet coloration are faded almost to the point of complete

disappearance. This variability is not correlated with the sex of the fish, nor does it appear to be behaviorally correlated. It would appear to represent some sort of color polymorphism, whose functional significance and genetic mechanism remain undiscovered. *In formalin-fixed specimens*, the body is a uniform brown, darker dorsally and in the cephalic region, paling to dirty white ventrally. The opercular region and flanks are marked with an indistinct dusky wash. In some specimens, the scales of the anterior half of the flanks are marked basally with a narrow vertical bar of melanophores. The dorsal lappets are gray-white, the submarginal band being somewhat darker and more pronounced than in living specimens. The basal portion of the spinous dorsal, the soft dorsal and the caudal are a uniform gray. The anal is a dusky gray with a lighter margin. The anal pseudo-ocelli appear dull white in preserved material. The ventrals are gray with a dusky leading edge. The pectorals are transparent.

*Sexual differences.* This species shows a mild degree of sexual dimorphism, males growing larger and having a more rounded cranial profile than do females. Both the soft dorsal and anal are more produced in males than in females. Males display a higher modal number of anal pseudo-ocelli than do females, although this characteristic may vary from one aquarium population to another. The anal pseudo-ocelli, when present in females, are generally placed right upon the trailing edge, and in the absence of a dark margin of fin tissue, appear as if they are ready to fall off the fin, whereas in males, a narrow dark margin generally separates the rearmost pseudo-ocellus from the actual margin of the trailing edge of the anal.

*Ecology and Biology.* *Iodotropheus sprengerae* has been collected only at Boadzulu Island in the southeast arm of Lake Malawi (T.E. DAVIES, personal communication). OLIVER visited the island on 15 August 1971. Boadzulu is a wooded rocky mass 1.0 kilometer long and 100-300 meters wide, elevated some 50 m above lake level, its long axis roughly north-south. The island rises abruptly from a sand bottom in 20-25 fathoms, an echo sounder giving a reading of 20 fm only about 50 m off the southwest corner. A seasonal breeding place for cormorants (*Phalacrocorax*), Boadzulu is white with guano. We suggest that rain and wave action wash some of the guano into the water where it is responsible for an unusually rich carpet of algal Aufwuchs on the submerged rocks.

At a spot on the western shore a few hundred m north of the southern tip OLIVER, using SCUBA, made a mid-day dive to 50 feet (15.5 m) lasting 45 minutes. At this locality the substrate, composed entirely of boulders, dropped away at an angle of about  $40^\circ$  to the horizontal, decreasing to about  $30^\circ$  in 15 m. Macrophytic vegetation was absent. Except for the impression that the Aufwuchs was thicker here, the area appeared typical of rocky shores in the southern part of the lake. In 1 m of water one individual probably of *I. sprengerae* was followed for a minute. In 10-15 m about five more, certainly

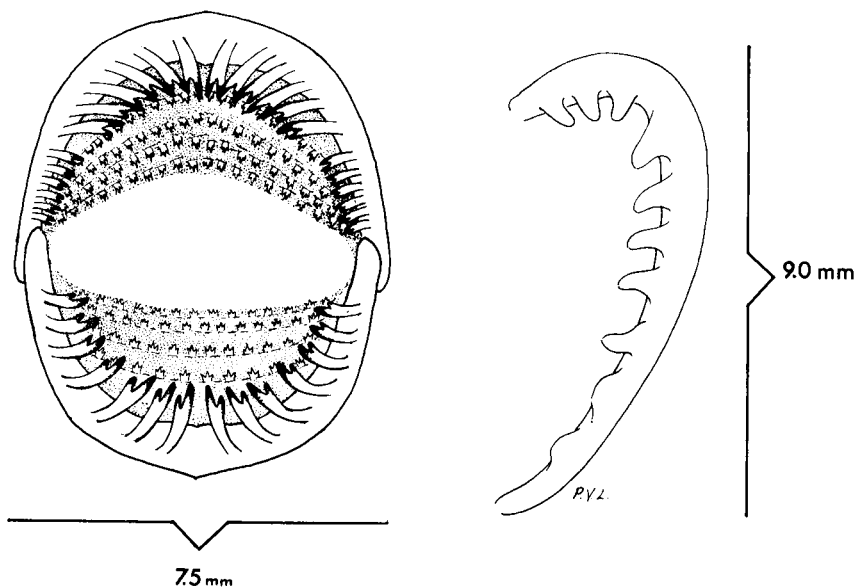


Fig. 4. — First branchial arch of *I. sprengerae*, showing the associated gill rakers.

Fig. 5. — Diagrammatic representation of the buccal dental array of *I. sprengerae*.

of this species, were observed for one to several minutes each. The fishes bore faint vertical bars and appeared a dull golden brown overlaid with blue. Each was solitary and wandered laterally along the rocks, apparently without a fixed territory, in contrast to most algivorous rocky shore *mbuna* which are extremely sedentary (OLIVER, in prep.). Normal feeding habits were not reliably determined. The fishes snapped up macroscopic suspended particulate matter which had appeared even on the sheltered western side of the island during a *mwera*, or southeast wind, then blowing. This matter may



represent a « bloom » of colonial Cyanophyta triggered by wind-induced upwelling of nutrients (D.H. ECCLES, pers. comm.). However OLIVER also observed this behavior elsewhere on many occasions by other *mbuna*, including normally rock-scraping algivores, and we do not interpret this as the usual feeding method of *Iodotropheus*. Nor does the somewhat specialized buccal dentition necessarily indicate diet in a rapidly-evolving group such as the *mbuna*. FRYER (1959: 182) found that adult *Cynotilapia afra*, one of the few *mbuna* with conical outer buccal teeth, feed almost entirely on zooplankton.

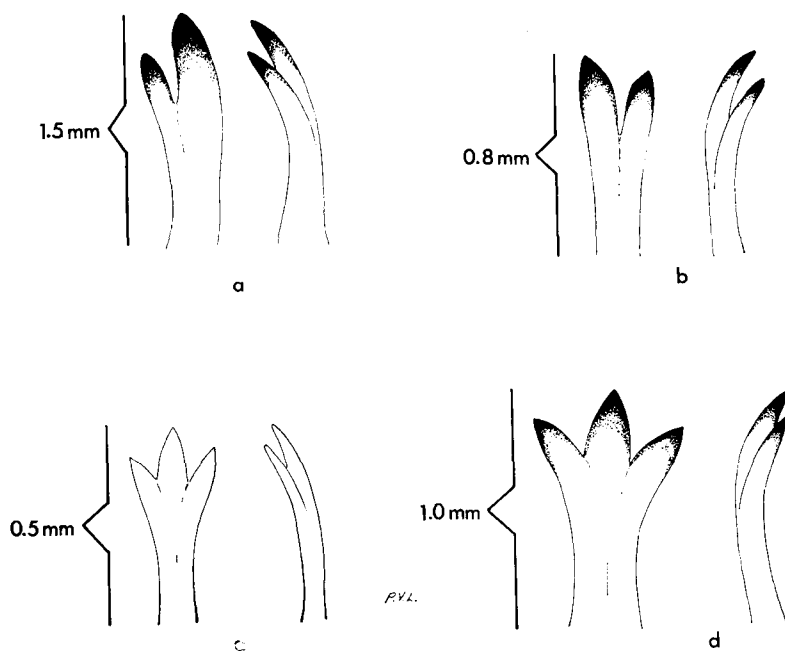


Fig. 6. — Details of the buccal dentition of *I. sprengerae*.  
 a. Median tooth of the outer series, lower jaw;  
 b. Posterolateral tooth of the outer series, lower jaw.

Other fishes noted in the study area at Boadzulu include the cypri- nids *Labeo cylindricus*, *Engraulicypris sardella*, young *Barilius* sp., the cichlids *Haplochromis polystigma*, *H. fenestratus*, *H. cf macrostoma*, *Petrotilapia tridentiger*, *Genyochromis mento*, *Labidochromis* sp. nov., *Labeotropheus fuelleborni*, *Pseudotropheus zebra*, and *P. elongatus*. The only common cichlid at 15 m was that taken to be *P. zebra*, although these deep-water fish may have been *Cynotilapia afra*, easily mistaken in the field for the common black-barred blue form of *P. zebra* (FRYER, pers. comm.).

*Iodotropheus* was not represented among the more than 200 cichlids collected by seining to a depth of about 4 m at the dive area, which tends to support the visual impression that this is an *mbuna* of deeper water than most.

In the aquarium *I. sprengerae* males reach at least 100 mm total length and females slightly less (SPRENGER, 1970). However, those observed at Boadzulu were estimated to be only 60 mm total length and the aquarium fish exporter has not seen any much larger than this among the hundreds he has collected (DAVIES, pers. comm.).

*I. sprengerae* has bred in the aquarium on many occasions. SPRENGER (1970) reported that individuals have spawned at as young as seven months, at 1.25 inches (32 mm) total length. This is a maternal mouthbrooding species with a small brood, 27 fry in one case, as is typical of the *mbuna*.

*Affinities.* The relationships of *Iodotropheus* to other *mbuna* genera are obscure. It is unique among members of this group in possessing a frenum on the upper lip. The form of the head is suggestive of *Genyochromis*, a monotypic scale-eating genus. From most members of the *Pseudotropheus-Melanochromis* group, similar in general facies, it differs by its enlarged anterior buccal teeth in large specimens. In this respect it resembles the genus *Labidochromis* as presently defined, but the jaws and tooth bands, while rather narrow, are rounded rather than almost pointed. We hesitate to erect a new monotypic genus in the *mbuna* group, which already contains a number of small, inadequately defined genera, but we cannot place *I. sprengerae* at all comfortably in any existing genus. *Iodotropheus* does not in fact appear to be closely related to any *mbuna* genus described to date.

Boadzulu Island is isolated from other rocky shores. It rises from a sand bottom 4.6 km from the western shore of the southeast arm and 8.7 km from the eastern shore. The only closer rocky habitat is at Crocodile Rocks, 4.4 km to the south and 1.2 km from the western shore of the southeast arm. FRYER (1959) noted that rocky shore *mbuna* usually are rigorously restricted to that habitat, even a few feet of bare sand effectively barring their movement. The broad expanse of sandy substrate surrounding Boadzulu has apparently isolated there the stock from which *Iodotropheus* evolved and has perhaps prevented it from colonizing the lakeshore. However, the possibility that *I. sprengerae* occurs elsewhere cannot be dismissed, for no part of the rocky coastline of Lake Malawi has yet been thoroughly surveyed.

#### ACKNOWLEDGMENTS

Dr P. H. GREENWOOD of the British Museum (Natural History) placed the facilities and collections of that institution at our disposal several times in 1971. A student international study fellowship from Occidental College made it possible for OLIVER to visit Malawi during the spring and summer of 1971. Mr D. H. ECCLES, Senior Fisheries Research Officer at Monkey Bay, graciously shared his house with OLIVER during the entire four months of his stay in Malawi. Robert and Valerie HEATH extended him the same generosity in London while he visited the British Museum for two periods totalling almost a month, as they did to LOISELLE during his stay in London in August, 1971. Mr Curt CAMPBELL of Manhattan Beach, California, Mrs Kappy SPRENGER of Los Gatos, California, and Mr Edward C. TAYLOR of Virginia Beach, Virginia provided the type material from fishes raised in their aquaria, while Dr Robert J. GOLDSTEIN of Emory University, Atlanta, Georgia placed a single large specimen of unknown origin at our disposal for inclusion in the type series. CAMPBELL also arranged for LOISELLE to photograph for this paper his *I. sprengerae* of the stock from which he provided the holotype and a paratype. Mrs Sharon L. CHAMBERS of the British Museum (Natural History) drew the excellent illustration of the holotype. Mr T.E. DAVIES of Cape Maclear, Malawi, supplied information on the distribution of *I. sprengerae* in Lake Malawi. Dr John S. STEPHENS, Jr., of Occidental College and Dr Ethelwynn TREWAVAS of the British Museum (Natural History) critically read the manuscript.

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Table 1. — Summary of morphometric data for type series of *Iodo tropeus sprengerae*.

Character	Mean								
	Mean	Values	Values	Values	Values	Values	Values	Values	Values
Standard length (mm)	82.8	<b>79.1</b>	76.0	74.1	73.2	62.0	46.5	45.5	
Body depth (% SL)	35.0	34.2	36.0	36.6	36.3	36.1	33.9	33.8	33.2
Head length (% SL)	31.9	30.0	32.5	30.9	32.9	31.1	31.5	33.3	33.0
Snout (% Hd L)	33.8	32.7	37.7	34.0	36.9	39.5	30.8	29.0	30.0
Orbit (% Hd L)	28.5	28.6	26.8	28.1	27.5	28.5	27.7	30.3	30.7
Preorbital (% Hd L)	20.4	20.2	22.2	23.0	20.5	21.9	20.0	18.1	17.3
Bony interorbital (% Hd L)	26.5	27.4	28.4	26.8	27.9	26.8	28.2	23.9	22.7
Postorb. distance (% Hd L)	44.2	46.4	44.0	47.2	44.3	44.3	43.1	41.9	42.7
Cheek depth (% Hd L)	25.9	27.8	29.2	28.9	27.5	26.3	24.6	22.6	20.0
Premax. ped. (% Hd L)	25.1	26.2	24.9	22.6	24.6	28.1	23.6	—	26.0
Head width (% Hd L)	52.9	58.9	50.2	54.9	50.8	51.8	52.8	52.3	51.3
Lower jaw length (% Hd L)	35.2	39.9	35.8	32.3	35.2	37.7	33.3	34.2	33.3
Caudal peduncle length (% SL)	11.8	10.1	12.3	12.2	12.4	10.9	12.1	12.0	12.1
Last dorsal spine (% Hd L)	46.2	47.2	47.5	51.5	45.1	43.9	45.1	43.2	46.0
Last anal spine (% Hd L)	42.6	40.3	39.7	44.7	42.6	40.4	46.2	43.2	43.3
Pelvic spine (% Hd L)	45.9	45.2	45.9	49.8	45.9	42.1	46.2	47.7	44.0
Pectoral length (% SL)	25.7	—	24.3	27.0	26.3	24.3	—	—	26.4