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A Synopsis of the Cichlid Fishes of Lake Nyasa.

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THE Cichlid Fishes of Nyasa were revised in 1921 by Regan (Proc. Zool. Soc. Lond. 1921), who increased the number of described species from 38 to 84. The British Museum (Natural History) is fortunate in possessing the types of all those species. Regan's revision was based on a collection made by Mr. Rodney C. Wood, from hauls brought in by native fishermen. Dr. Regan recognized that Mr. Wood's collection indicated the presence in the lake of a rich and varied Cichlid fauna, and he arranged for the late Dr. Cuthbert Christy to make a special expedition to the lake in 1925–26, which resulted in the very fine collection on which the present revision is mainly based. In the Christy Collection the family Cichlidæ is represented by about 3500 specimens. Dr. Regan had already started work on it when I joined the staff of the Natural History Museum in 1928, and he has kindly placed his notes at my disposal, as well as taking a constant and helpful interest in my further work.

In 1927 Ahl * published descriptions of some new Nyasa Cichlidæ, part of a large collection in the Berlin Museum. He has kindly allowed me to examine the types of these in Berlin. Nichols and LaMonte (Amer. Mus. Novit. no. 451, 1931) described two species which they believed to be new, but their *Haplochromis centropristoides* is *H. callipterus*, and their *H. boultoni* is a young specimen of *H. cæruleus*.

A revision of the genus *Lethrinops*, based on the Christy collection, has already been published (Trewavas, Ann. & Mag. Nat. Hist. (10) vii. 1931, p. 133–152). I have now to add one more species to this genus, and I give a synopsis of the remaining Nyasa genera and of their species.

Twenty-three genera are here recognized, of which twenty are endemic and fourteen are monotypic. Of the one hundred and seventy-five species comprised in these genera, one hundred and one belong to the large genus *Haplochromis*. *Haplochromis callipterus* is closely related to *H. moffati* of South Africa; it differs from the other Nyasa species of *Haplochromis* in having the caudal rounded, and scaled only at the base. Of the remaining forms Regan has written — "In the Nyassa species the caudal fin is truncate or emarginate, and appears to be always nearly completely covered with small scales in the adult fish; this feature, the prevalence of a few distinctive types of coloration, and the absence of evident relationship to species found elsewhere lead to the conclusion that the Nyassa species are a natural group and may, perhaps, have evolved in the lake from a single ancestral form." Even in young fish, although scales may be absent from the central part of the caudal fin, they extend along the upper and lower rays nearly to the end.

Efforts to divide the Nyasa *Haplochromis* into smaller genera have been unsatisfactory. On the contrary, it has been necessary to merge in it three previously recognized genera, as is explained below. It would be possible to take certain extreme forms and to define them as genera, but as these would be monotypic the main genus would not be much decreased. The guiding principle has been that monotypic genera have been formed for peculiar species only when they are isolated, and have no obvious close relationship with a more generalized form, whereas a species such as *Haplochromis melanonotus*, which is closely related to *H. semipalatus*, sp. n., is left within the genus, even although this makes its definition more difficult.

Full descriptions of all the species have been written, and figures of all the new ones have been prepared, and

* Sitzungsber. Ges. naturf. Fr. Berlin, July 1926 (1927), pp. 51–62.

will be published when a monograph of the African Cichlidæ has been completed.

Synopsis of the Genera.

I. Apophysis for upper pharyngeals formed by parasphenoid only.
1. *Tilapia*, p. 72.

II. Apophysis for upper pharyngeals formed by parasphenoid in the middle and basioccipital at the sides.

A. Third vertebra with inferior apophyses meeting below dorsal aorta.

1. Otic region and mucus-canals of head not swollen.

a. Scales on nape, chest, and cheek usually very small; vertebræ 30 or 31 *; D. XV–XIX 8–10 (rarely 11); A. III 7–9.

(i) Pharyngeal teeth very small, densely crowded posteriorly.

α. Teeth in jaws forming curved or transverse bands anteriorly, consisting of an outer series of bicuspid teeth and 2 to 7 inner series of tricuspid; at each side of the upper jaw a series of conical teeth, usually enlarged; teeth occasionally unicuspid in large specimens..... 2. *Pseudotropheus*, p. 72.

β. Teeth all tricuspid.

Mouth terminal; teeth movable, with expanded, recurved crowns and slender shafts; a single or double lateral series at each side of lower jaw posterior to the broad band ..... 3. *Petrotilapia*, p. 76.

Mouth inferior-subterminal; teeth fixed, slightly and gradually narrowing to base, in narrow bands; lower jaw without lateral series ..... 4. *Labeotropheus*, p. 76.

γ. Teeth with slender shafts and compressed, spoon-like crowns, those of outer series sloping towards symphysis, with obliquely rounded edge and with a minute lateral cusp; inner teeth with a broad middle and a pair of minute lateral cusps.
5. *Cyathochromis*, p. 77.

δ. Teeth few, conical, the outer, and especially the anterior lower, enlarged; jaws approximately equal anteriorly ..... 6. *Cynotilapia*, p. 77.

ε. Outer teeth slender, close-set, curved, subconical; lower jaw shorter than upper anteriorly.
7. *Christyella*, p. 77.

(ii) Pharyngeal teeth neither very numerous nor densely crowded, those of middle series becoming a little larger posteriorly.

α. Outer anterior teeth in jaws bicuspid, inner tricuspid.

Chin not strongly projecting; posterior teeth of upper jaw usually enlarged; bands of teeth curved ..... 8. *Melanochromis*, p. 77.

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* In thirteen specimens (of five genera) of this group the vertebræ number 14+16 in two, 14+17 in five, and 15+16 in six.

Chin strongly projecting; posterior teeth not enlarged; mouth broad, with broad transverse bands of teeth .... 9. *Genyochromis*, p. 79.

β. Anterior teeth long, pointed, unicuspid, directed forwards ..... 10. *Labidochromis*, p. 80.

b. Scales on cheek, nape, and chest not very small.

Præmaxillaries not beak-like; teeth all tricuspid (rare), or inner tricuspid and outer bicuspid, or inner tricuspid and outer with slender shafts and compressed obliquely truncate crowns, or all teeth conical, at least in full-grown fish, or outer bicuspid and inner simple; vertebræ 29–35 ..... 11. *Haplochromis*, p. 81.

Præmaxillaries not beak-like; jaws with broad bands of small, simple teeth with compressed, sharp-edged crowns; vertebræ 31 or 32..... 12. *Corematodus*, p. 108.

Præmaxillaries not beak-like; jaws strong; teeth stout, incisiform, unicuspid (full-grown), or with a large middle cusp and a pair of small lateral cusps (young), in 4 or 5 well-separated series; outer teeth large, forming a close-set series of about 20 in each jaw; vertebræ 32 ..... 13. *Docimodus*, p. 108.

Præmaxillaries not beak-like; jaws weak, with small teeth, the outer series of lower jaw incurved posteriorly, ending immediately behind the inner, and at some distance from the coronoid process; vertebræ 31 or 32 ..... 14. *Lethrinops*, p. 109.

Præmaxillaries not beak-like; mouth wide; outer anterior teeth bluntly bicuspid in young; in adult teeth stout, all, except a few inner, with crowns shaped like a grain of wheat, bluntly pointed inwards, with a groove on the outer surface; tooth-band of upper jaw wider postero-laterally than near the symphysis; vertebræ 31..... 15. *Chilotilapia*, p. 110.

Præmaxillaries beak-like; teeth simple, with slender shafts and compressed crowns, the outer obliquely truncate and inclined towards the symphysis; vertebræ 31 ..... 16. *Hemitilapia*, p. 110.

Præmaxillaries beak-like; teeth conical, spaced, the anterior enlarged; vertebræ 36 to 40..... [p. 112. 17. *Rhamphochromis*,

2. Otic region of skull and mucus-canals of head swollen; 31 vertebræ.

Cheek with 2 to 4 series of scales..... 18. *Trematocranus*, p. 113.

Cheek with a single series of scales or none. 19. *Aulonocara*, p. 115.

B. Third, or third and fourth vertebræ with inferior apophyses which are short, and do not approach each other below dorsal aorta; vertebræ 16+18; teeth conical, in two series; præmaxillaries not beak-like ..... 20. *Diplotaxodon*, p. 116.

C. No inferior apophyses on anterior vertebræ; præmaxillaries produced forwards and beak-like; teeth in a single series except anteriorly ..... 21. *Lichnochromis*, p. 117.

D. Inferior apophyses either on fourth vertebra, or on fourth on left side, absent or on third on right; vertebræ 33 or 34; præmaxillaries forming a laterally compressed beak; teeth small, conical, in 3 or 4 series anteriorly.
22. *Aristochromis*, p. 117.

E. Inferior apophyses on fourth or fourth and fifth vertebræ *; vertebræ 37 to 39; præmaxillaries not beak-like; teeth conical, in two series, or three anteriorly in upper jaw, in lower in a single series, except anteriorly.
23. *Serranochromis*, p. 118.

Notes on the Generic Characters.

In 1920 Regan classified the African Cichlidæ into two main groups, characterized by the structure of the apophysis that supports the upper pharyngeals †. Except *Tilapia*, the Nyasa genera belong to the *Haplochromis* group, in which the apophysis is formed by the parasphenoid in the middle and the basioccipital at the sides. In 1921 Regan placed two of these in the *Tilapia* group, *Corematodus* and *Hemitilapia*. In *Corematodus* he was misled by the striking superficial resemblance between *C. shiranus* and *Tilapia squamipinnis*, but a second species with an entirely different colour-pattern has now been found, and several specimens of both show the typical *Haplochromis* apophysis. *Hemitilapia* was misplaced on the evidence of a damaged skeleton.

In the genera *Otopharynx* and *Chilotilapia* the apophysis was described as being formed by parasphenoid and prootic. In *O. auromarginatus* the pharyngeals are weak, and the apophysis, correspondingly small, is formed mainly from the parasphenoid, but at the postero-lateral corner the basioccipital contributes to the apophysis a process which usually reaches the level of the articular surface, and may expand to occupy as much as ¼ of each of the pair of facets. As in *Haplochromis*, the edge of the prootic may at one point rise nearly or quite to the level of the facet, but it never expands to form an important part of it. The genus *Otopharynx* must, therefore, in the present state of our knowledge, be merged in *Haplochromis*. *O. selenurus* Regan has a typical

* This applies to *S. thumbergi* and *S. angusticeps*. An example of *S. macrocephalus* has the apophyses on the third vertebra as in *Haplochromis*.

† This character may be easily investigated, even in an unique specimen, by cutting the muscles connecting the whole branchial skeleton, including the pharyngeal bones, to skull, vertebræ, and shoulder-girdle, leaving the branchial apparatus attached only to the base of the hyoid arch, then removing the synovial membrane from the apophysis.

Haplochromis apophysis, and appears to be related to *Cyrtocara moorii*, which is also here included in *Haplochromis* (see below). *Chilotilapia* belongs to the *Haplochromis* group, but its peculiar dentition entitles it to generic rank.

There is considerable variation, both individual and specific, in the degree to which the basioccipital participates in the articular facet, but the apophysis is sharply differentiated from the *Tilapia* type, in which not only the facet, but the whole apophysis, is formed by the parasphenoid, buttressed laterally by the prootic. The only Nyasa species in which the prootic takes any appreciable share in the facet is *Haplochromis placodon*, with massive pharyngeal bones.

Astatotilapia Pellegrin was recognized by Regan (1921) for *A. calliptera* of Nyasa and its allies; but he has since given up the attempt to maintain this genus, which is now included in *Haplochromis*.

Cyrtocara was established by Boulenger for *C. moorii*, and was held to be distinguished by its dentition and by the entire edge of the spinous dorsal. *C. moorii* is further distinguished by the presence of a dermal hump in the frontal region. Regan added *C. annectens*, which is without the hump and has a dentition intermediate between a type common in *Haplochromis* and that of *C. moorii*. Regan also included in this genus *Haplochromis venustus* Boulenger, on the ground of its possessing an entire edge to the spinous dorsal. The types of *H. venustus* are full-grown males; females of the same species have been described, under the name of *Haplochromis simulans*, by Regan (1921), who pointed out the resemblance to *H. venustus*. The straight edge of the dorsal fin is in this species a character of larger males, as it is in some species of *Lethrinops*. In *Cyrtocara moorii* and *C. annectens* large specimens, probably of both sexes, have a spinous dorsal with an even edge, but the young have lappets; it has been thought best to include these two species in *Haplochromis*.

A few of the genera derived from *Haplochromis* differ from it in the degree of development of the inferior vertebral apophyses and in the vertebræ on which they are found. Departure from the *Haplochromis* condition of this feature seems to be accompanied by instability, so that generic definitions involving these apophyses must not be regarded as rigid when based on one or two specimens only. When the anatomy becomes better known it is not improbable that differences in the inferior apophyses will be found to be associated with differences in the shape, size, or position of the air-bladder, which is firmly attached to them. Fishes having the apophyses on the fourth or fifth vertebra are

usually elongate in form. In the very elongate *Rhamphochromis*, however, the apophyses originate on the third vertebra, although they are directed backwards to meet and end below the fourth. Individual variation in genera with the *Haplochromis* type of apophyses is slight; among the specimens examined, one of four specimens of *H. chrysonotus* has a pair of inferior apophyses on the second vertebra and a single one on the right side of the third, a specimen of *Labidochromis vellicans* has the left apophysis on the third vertebra, the right on the fourth.

Genera 2 to 10, from *Pseudotropheus* to *Labidochromis*, are more closely related to each other than to any other genus, although it is very difficult to find an absolute character to distinguish them. The small scales on cheek and nape are very characteristic, but some specimens, of *P. novemfasciatus* and *P. livingstonii*, for example, have no more than are often met with in *Haplochromis*. High numbers of dorsal spines and low numbers of soft dorsal and anal rays are usual. The vertebral count 15+16, found in 6 of 13 specimens in this group, is found in only 1 of 45 specimens of Nyasa *Haplochromis*, or 1 of 23 of the Nyasa *Haplochromis* with the same total number of vertebræ (30 or 31) as these small fishes. The number 14+17 is found in 5 of the 13 specimens of the *Pseudotropheus* group and in 10 of the 23 *Haplochromis*. 14+16 is found in two of each. The remaining 10 *Haplochromis* have 13+17(3) or 13+18 (7). Features of the colour-pattern, which occur in some specimens of most, but not all, species of genera 2 to 10 and are rarely met with elsewhere, are the very broad black submarginal band of the dorsal fin, and the posterior position and intensity of one or more bright spots on the anal fin in males.

Notes on Counts and Measurements.

"Total length" includes the caudal fin.

"The length" is the standard length, from snout to base of caudal.

"Length of snout" is measured from the vertical from the anterior edge of the eye to the *level* of the tip of the snout, along a line parallel to the longitudinal axis of the body.

"Length of head" is measured along the same line.

"Depth of præorbital" is measured from about the middle of the orbital rim of the præorbital bone along a line which continues the radius of the eye at this point. This line approximately bisects the bone.

"Interorbital width" is the narrowest width of the roofing part of the frontal bones, between the eyes.

The lower jaw is measured with dividers from the angle to the symphysis.

The præmaxillary pedicels are measured from between the anterior pair of præmaxillary teeth to the posterior end of the pedicels.

The gill-raker at the angle between epi- and cerato-branchial is not counted unless it is obviously attached to the cerato-branchial. This method occasionally gives one less than Regan's counts.

The longitudinal series of scales is that of the upper lateral line and backwards from its posterior end. The same count is obtained if, at the end of the upper lateral line, one proceeds to the scale of the lower lateral line next behind the transverse row that includes the last scale of the upper lateral line and slopes downwards and forwards from it. These counts are always a little in excess of those of Dr. Ahl, who counted a horizontal series including the lower lateral line.

1. Tilapia A. Smith, 1840.

Four species in L. Nyasa, of which one, *T. squamipinnis*, is endemic. This species is characterized by the dense scaling of the caudal fin, a feature distinguishing also the Nyasa species of *Haplochromis*.

For a synopsis of the species, see Regan, 1921, p. 676. It is intended later to revise the genus *Tilapia*, when the Nyasa forms will be reconsidered.

2. Pseudotropheus Regan, 1921.

Synopsis of the Species.

I. Snout as long as or longer than diameter of eye.

A. Depth of body 2½ to 3 in the length.

1. Tooth-band of lower jaw rounded.

a. Colour light brown, with or without 6 dark vertical bars, the 5th below end of dorsal; interorbital width 3¼ to 4 in length of head (in specimens of 71 to 150 mm.); caudal emarginate.

Diameter of eye 3⅓ in length of head (in a fish of 110 mm.); D. XVII 10; A. III 8 .... 1. *elegans*.

Diameter of eye 3½ to 4¼ in length of head; D. XVII–XVIII 8–9; A. III 8 ..... 2. *livingstonii*.

b. Body usually with 5 to 8 dark vertical bars, the 7th or 8th, if present, below end of dorsal; interorbital width 2¾ to 3⅓ in length of head, diameter of eye 3⅔ to 4⅓ (in specimens of 84 to 104 mm.); D. XVII–XIX 8–9; A. III 7–9; caudal truncate ..... 3. *zebra*.

c. A series of spots along middle of side, a second series above upper lateral line, a third at base of dorsal; pattern occasionally masked by general dark colouring; veritcal

bars, if present, very faint; interorbital width 3 to 4½ in length of head, diameter of eye 3½ to 4½ (in specimens of 70 to 165 mm.); D. XVI–XVIII 9–11; A. III 7–9; caudal truncate ..... 4. *williamsi.*

2. Tooth-band of lower jaw transverse; body uniformly brownish, or with traces of vertical bars and of two longitudinal bands; interorbital width 2⅘ to 3⅗ in length of head, diameter of eye 3¼ to 4 (in specimens of 90 to 140 mm.); D. XVII–XVIII 9–10; A. III 7–9. 5. *lucerna.*

B. Depth of body 3 to 3¾ in the length; tooth-band of lower jaw rounded.

1. Colour uniformly dark; interorbital width 4⅖ in length of head; D. XVIII 9; A. III 8 .... 6. *fuscus.*

2. A longitudinal stripe along middle of side, another above upper lateral line, black on gold in female, gold on dark brownish in male; female with a black submarginal band on dorsal fin, male with dorsal pale; interorbital width 3½ to 4 in length of head; D. XVII–XIX 8–9. 7. *auratus.*

II. Snout shorter than or as long as diameter of eye.

A. Upper profile gently sloping, occipital crest well developed; 3 or 4 (rarely 5) series of scales on cheek, 5 (rarely 6) from origin of dorsal to lateral line; D. XV–XVIII 9–10. 8. *novemfasciatus.*

B. Profile of snout steeply descending, occipital crest weak. 3 to 5 series of scales on the cheek.

1. 6 to 8 scales from origin of dorsal to lateral line; D. XVI–XVIII 8–10; A. III 7–8.

a. Width of tooth-band of lower jaw less than ⅓ length of head; tooth-band slightly rounded .. 9. *microstoma.*

b. Width of tooth-band of lower jaw ⅓ length of head or (usually) more; tooth-band transverse. 10. *tropheops.*

Diameter of eye 3 to 3¾ in length of head, interorbital width 2⅘ to 3½ (in fishes of 80 to 120 mm.) ..... 10 *a.* *tropheops* [*tropheops.*

Diameter of eye 3 to 3⅓ in length of head, interorbital width 3 to 3⅘ (in fishes of 76 to 112 mm.) ..... 10*b.* *tropheops gracilior.*

2. 5 to 7 scales from origin of dorsal to lateral line; D. XVII–XIX 8–10; A. III 8–9; diameter of eye 2⅘ to 3⅓ in length of head, interorbital width 2½ to 3⅓ (in fishes of 76 to 115 mm.) ..... 11. *macrophthalmus.*

1. *Pseudotropheus elegans*, sp. n.

A single specimen, 110 mm. in total length, from Deep Bay (coll. Christy).

This species resembles *P. livingstonii* in the relatively narrow and rounded band of teeth and in the emarginate caudal. The larger eye and somewhat narrower præorbital distinguish it from *H. livingstonii*; also it has weaker jaws, the lower contained three times in the length of head. The dentigerous area of the lower pharyngeal is subtriangular instead of almost heart-shaped, as it is in other species of *Pseudotropheus.*

2. *Pseudotropheus livingstonii* (Boulenger), 1899. (Fig. 1.)

Pseudotropheus williamsi (part.) Regan, Proc. Zool. Soc. Lond. 1921, p. 682.

Seven specimens (coll. Christy), 95 to 150 mm. in total length, from the southern end of the lake, re-establish the distinctness of this species.

The vertebræ, counted in one specimen, number 14+17.

Fig. 1.

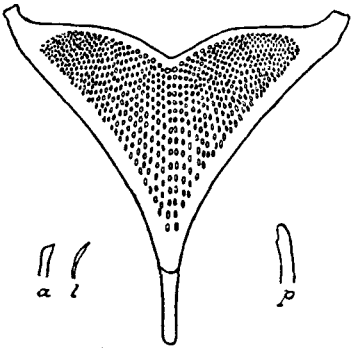


Fig. 2.

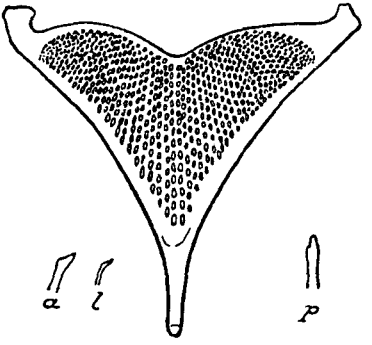


Fig. 1.—*Pseudotropheus livingstonii*. Lower pharyngeal of a fish of 105 mm. × 5. *a.*, anterior; *l.*, lateral; *p.*, middle posterior tooth, enlarged.

Fig. 2.—*Pseudotropheus zebra*. Lower pharyngeal of a fish of 85 mm. × 6⅔. Lettering as in fig. 1.

3. *Pseudotropheus zebra* (Boulenger), 1899. (Fig. 2.)

Pseudotropheus zebra Regan, *t. c.* p. 682.

The type (coll. Miss M. Woodward) and fifteen specimens (coll. Christy), 63 to 104 mm. in total length, from both ends of L. Nyasa.

The vertebræ, counted in two specimens, number 15+16.

4. *Pseudotropheus williamsi* (Günther), 1893.

Pseudotropheus williamsi (part.) Regan, *t. c.* p. 682.

The type (coll. J. A. Williams) and twenty-five specimens (coll. Christy), 40 to 165 mm. in total length.

The vertebræ, counted in one specimen, number 14+16.

5. *Pseudotropheus lucerna*, sp. n.

Ten specimens (coll. Christy), 90 to 135 mm. in total length, from Deep Bay.

P. lucerna has a larger eye and weaker lower jaw (often shorter than the upper anteriorly) than either *P. zebra* or

P. williamsi. Large specimens are easily distinguished from *P. zebra* by the fact that the teeth remain bicuspid (outer) and tricuspid (inner), whereas in *P. zebra* they become simple.

6. *Pseudotropheus fuscus*, sp. n.

A single specimen, 82 mm. in total length (coll. Christy).

This fish resembles *P. williamsi* in the dentition and in the small eye ($3\frac{3}{4}$ in length of head), but differs from all other species in the narrow interorbital region.

7. *Pseudotropheus auratus* (Boulenger), 1897.

Pseudotropheus auratus Regan, *t. c.* p. 683.

The type and forty-four specimens (coll. Christy), 40 to 90 mm. in total length. Of these, 37 are females, 40 to 80 mm. long, and 7 are males, 70 to 90 mm.

The extraordinary differences in coloration between the sexes, with the possibility that the males may be less numerous and larger, indicate that the breeding habits of this species may be unusual. The ova are few and large, about ten in each ovary; thus efficient measures for the care of the brood may be expected.

8. *Pseudotropheus novemfasciatus* Regan, 1921.

Pseudotropheus novemfasciatus Regan, *t. c.* p. 683.

The type (coll. Wood), 65 mm. in total length, and fifteen specimens (coll. Christy), 63 to 94 mm., from Deep Bay, Monkey Bay and the Bar, Lake Nyasa.

The tooth-band, rounded in the young, becomes nearly transverse in the adult.

9. *Pseudotropheus microstoma*, sp. n.

Two specimens (coll. Christy), 68 and 100 mm. in total length, from Monkey Bay.

These fishes resemble *P. tropheops* in every way except in the very narrow mouth and curved tooth-band.

10 *a*. *Pseudotropheus tropheops tropheops* Regan, 1921.

Pseudoropheus tropheops Regan, *t. c.* p. 683, text-fig. 3.

The types (coll. Wood), 116 and 120 mm. in total length, and sixteen specimens (coll. Christy), 80 to 110 mm. long, as well as a number of smaller specimens (coll. Christy), are typical members of the species. They are all from the southern end of L. Nyasa. The vertebræ, in one specimen, number 14+17.

10 *b*. *Pseudotropheus tropheops gracilior*, subsp. n.

Twenty specimens, 76 to 112 mm. in total length (coll. Christy), from Vua and Deep Bay, are, usually, more slender,

and darker in colour than typical examples of *P. tropheops*, as well as having a larger eye and narrower interorbital region.

11. *Pseudotropheus macrophthalmus* Ahl, 1927.

Pseudotropheus macrophthalmus Ahl, Sitzungsber. Ges. naturf. Fr. Berlin, July 1926 (1927), p. 54.

Fifteen specimens (coll. Christy), 76 to 115 mm. in total length.

These fishes resemble the typical specimens of *P. tropheops* in the steep snout and low occipital crest, and are even more extreme in both these characters. They resemble *P. tropheops gracilior* in the large eye. They differ from all *P. tropheops* in the higher average number of dorsal fin-rays, especially spines. The colour appears to be uniformly pale; even the fins are without spots or bands except the single bright spot on the anal in males. I have examined the type in Berlin.

3. PETROTILAPIA, gen. nov.

In the dentition this genus parallels *Petrochromis* of Lake Tanganyika, but the relationships of *Petrochromis* are with the *Tilapia* group, which it resembles in the fundamental character of the pharyngeal apophysis, of which the articular surfaces are formed by the parasphenoid alone, whereas in *Petrotilapia* the basioccipital forms part of each facet. This type of dentition has, indeed, been evolved more than once in Tanganyika Cichlidæ, as well as in Nyasa.

A single species.

Petrotilapia tridentiger, sp. n.

Several specimens (coll. Christy), up to 155 mm. in total length.

In form, numerical characters, and coloration this species resembles *Pseudotropheus* and *Cyathochromis*. Especially noticeable are the broad black submarginal band often present on the spinous dorsal, and one or two bright orange spots near the posterior edge of the anal.

4. LABEOTROPHEUS Ahl, 1927.

Labeotropheus fuelleborni Ahl.

Labeotropheus fuelleborni Ahl, Sitzungsber. Ges. naturf. Fr. Berlin, July 1926 (1927), p. 52.
Labeotropheus curvirostris Ahl, *t. c.* p. 53.

Numerous specimens (coll. Christy), 50 to 110 mm. in total length, from Nkudzi and Deep Bay. The type has been examined by me in Berlin.

There is a dermal thickening of the snout, immediately above the præmaxillary symphysis, producing the nose-like

process characteristic of the types of *L. fuelleborni*. This is very weakly developed in the type of *L. curvirostris*, but, as the Christy collection contains intermediate specimens, I believe that there is only one species.

The vertebræ, counted in one specimen, number 14+16.

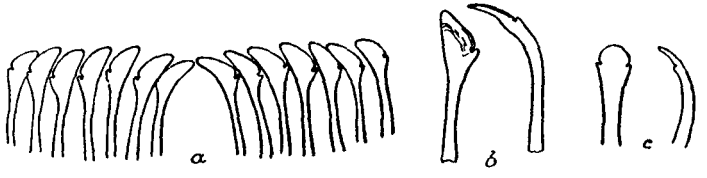
5. CYATHOCHROMIS, gen. nov.

Cyathochromis obliquidens, sp. n. (Fig. 3.)

Numerous specimens, from Vua and the southern end of the lake, up to 150 mm. in total length (coll. Christy).

This species is a *Pseudotropheus* in all except the dentition. The vertebræ, in two specimens, number 15+16.

Fig. 3.



Cyathochromis obliquidens.

a, anterior outer teeth of lower jaw; *b*, two views of one of these; *c*, two views of an inner tooth.

6. CYNOTILAPIA Regan, 1921.

Cynotilapia afra (Günther), 1893.

Cynotilapia afra Regan, *t. c.* p. 684.

Known only from the types, 85 and 95 mm. in total length. The vertebræ, counted in one specimen, number 15+16.

7. CHRISTYELLA, gen. nov.

Christyella nyasana, sp. n.

13 or 14 gill-rakers on lower part of anterior arch. 32 scales in a longitudinal series, 5 from origin of dorsal to lateral line, 7 or 8 between pectoral and pelvic fins. Dorsal XVIII 9. Anal III 8. Colour pale brownish above, silvery below; fins clear; a bright spot near posterior edge of anal.

A single specimen, 114 mm. in total length (coll. Christy).

8. MELANOCHROMIS, gen. nov.
(type, *M. melanopterus*).

This genus is distinguished from *Pseudotropheus* mainly by the larger and fewer pharyngeal teeth, as may be seen by comparing figure 4 with figures 1 and 2. For the dentition of the jaws, see fig. 5.

Fig. 4.

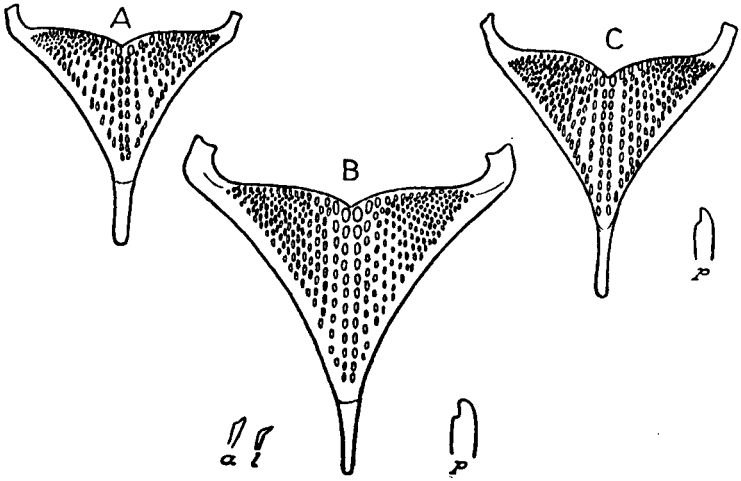


Fig. 5.

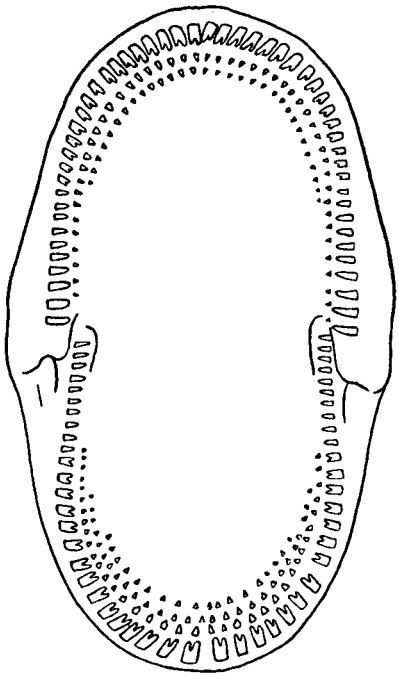


Fig. 4.—Lower pharyngeals of (A) *Melanochromis brevis*, (B) *Melanochromis melanopterus*, and (C) *Melanochromis vermivorus*. ×5.

Fig. 5.—*Melanochromis melanopterus*. Dentition of jaws.

Synopsis of the Species.

I. Lips not lobed.

A. Diameter of eye 4 to 5 in length of head; 9 to 11 gill-rakers on lower part of anterior arch.

1. Maxillary not reaching vertical from anterior edge of eye.

Lower jaw $2\frac{2}{5}$ to $2\frac{3}{4}$ in length of head ..... 1. *melanopterus.*
Lower jaw $2\frac{3}{4}$ to nearly 3 in length of head ..... 2. *vermivorus.*

2. Maxillary reaching vertical from anterior edge of eye; lower jaw $2\frac{3}{4}$ to 3 in length of head ..... 3. *brevis.*

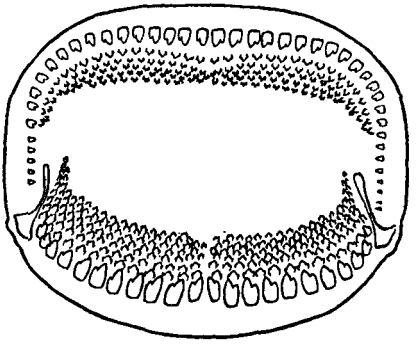
B. Diameter of eye $3\frac{1}{3}$ in length of head; 12 gill-rakers on lower part of anterior arch; maxillary reaching vertical from anterior edge of eye; lower jaw $2\frac{3}{4}$ in length of head. 4. *perspicax.*

II. Lips produced into pointed lobes; diameter of eye $3\frac{1}{4}$ in length of head; 13 gill-rakers on lower part of anterior arch; maxillary not extending to below eye; lower jaw $2\frac{1}{4}$ in length of head. 5. *labrosus.*

The five species of *Melanochromis* are all new to science, and all based on specimens in the Christy collection: *M. melanopterus* on 10 specimens, 76 to 118 mm. in total length, from Monkey Bay; *M. vermivorus* on 25 specimens, 65 to 95 mm., from Nkudzi; *M. brevis* on two specimens, 70 and 120 mm. long, from Nkudzi and Monkey Bay; *M. perspicax* on a single specimen of 81 mm. from Deep Bay; and *M. labrosus* on a single specimen of 54 mm. from Deep Bay.

The vertebræ number 15+16 in a specimen of *M. melanopterus* and in one of *M. vermivorus*, 14+16 in the type of *M. perspicax.*

Fig. 6.



Genyochromis mento. Dentition of jaws.

9. GENYOCHROMIS, gen. nov.

Genyochromis mento, sp. n. (Fig. 6.)

Depth of body $3\frac{1}{4}$ to $3\frac{1}{2}$ in the length. 6 to 8 series of scales on the cheek. 8 or 9 gill-rakers on lower part of anterior

arch. 32 or 33 scales in a longitudinal series, 7 from origin of dorsal to lateral line. Dorsal XVI–XVII 9–10. Anal III 7–8. Pectoral $\frac{2}{3}$ length of head. Caudal truncate.

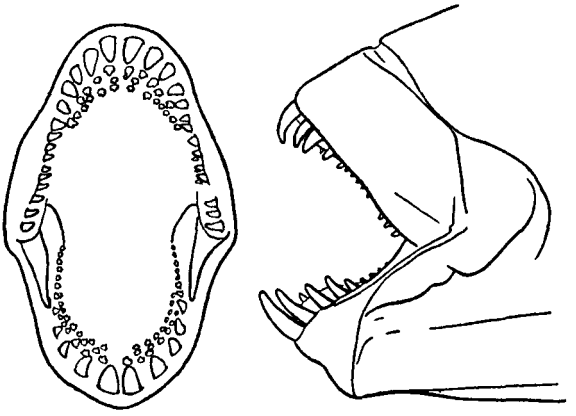
Three specimens, one of 103 mm. (blackish, the soft vertical fins paler towards the margin) from Monkey Bay, and two of 65 and 70 mm. (greyish, the spinous dorsal with a blackish submarginal band) from Nkudzi Bay (coll. Christy).

10. Labidochromis, gen. nov.

Labidochromis vellicans, sp. n. (Fig. 7.)

Depth of body $2\frac{2}{3}$ to $3\frac{1}{2}$ in the length. Snout with straight or slightly convex profile, from a little shorter than to $\frac{1}{2}$ diameter of eye, which is 3 to 4 in length of head. Mouth

Fig. 7.



Dentition of a 98 mm. specimen of *Labidochromis vellicans*.

narrow, terminal; maxillary ending a little behind nostril. 4 to 6 series of scales on cheek. 8 to 10 gill-rakers on lower part of anterior arch. 30 to 32 scales in a longitudinal series, 6 or 7 from origin of dorsal to lateral line. Dorsal XV–XVIII 9–10. Anal III 7–8. Pectoral $\frac{2}{3}$ length of head. Caudal truncate. Greyish or brownish, with or without 10 or 11 dark cross-bars; dorsal sometimes with a blackish submarginal band; males with one or two bright spots near posterior edge of anal.

Several specimens (coll. Christy), 40 to 98 mm. in total length, from Monkey Bay and Nkudzi Bay.

The vertebræ, counted in one specimen, number 15+15.

11. Haplochromis Hilgendorf, 1888.

Ctenochromis Pfeffer, 1893.
Cyrtocara Boulenger, 1902.
Astatotilapia Pellegrin, 1904.
Champsochromis Boulenger, 1915.
Otopharynx Regan, 1920.

Synopsis of the Nyasa Species of Haplochromis.

I. Caudal rounded or rounded-subtruncate. 1. *callipterus.*

II. Caudal truncate or emarginate.

A. Body marked with large dark blotches, one or two of which are behind, and at the level of base of pectoral; blotches either expanded vertically and interdigitating, or united by longitudinal bands, one at base of dorsal, one on upper lateral line, one along middle of side, and the fourth behind pectoral.

1. Pectoral with small dark spots on the rays.

a. 46 to 68 teeth in outer series of upper jaw.

(i) Body not freckled..... 2. *livingstonii.*
(ii) Body freckled.

Lower jaw half length of head ..... 3. *pardalis.*
Lower jaw less than half length of head..... 4. *polystigma.*

b. 80 teeth in outer series of upper jaw..... 5. *maculimanus.*

2. Pectoral immaculate.

Snout $1\frac{1}{4}$ to $1\frac{1}{3}$ diameter of eye; lower jaw $2\frac{1}{4}$ to $2\frac{1}{3}$ in length of head..... 6. *venustus.*
Snout $1\frac{1}{4}$ to $2\frac{1}{3}$ diameter of eye; lower jaw from less than 2 to $2\frac{1}{3}$ in length of head.. 7. *fuscotæniatus.*

B. Six dark vertical bars on the body; occasionally also faint traces of a longitudinal band above the lateral line and one along middle of side; middle pharyngeal teeth enlarged; 10 to 12 gill-rakers on lower part of anterior arch. 8. *johnstoni.*

C. Three longitudinal series of spots on the body, faintly united to form six cross-bars; snout longer than postorbital part of head; pharyngeal teeth compressed, bicuspid; 14 to 19 gill-rakers on lower part of anterior arch ..... 9. *rostratus.*

D. Colour-pattern, if present, consisting of a dark band or series of spots along middle of side from caudal nearly to operculum, usually curved upwards near anterior end; often a second band or series of spots above upper lateral line, and a third at base of dorsal; cross-bars, if present, numbering more than four below dorsal fin. Mouth not strongly protractile. Lips without median lobes, lower sometimes with a lobe on each side of middle line.

1. Snout longer than postorbital part of head.

a. Depth of præorbital $3\frac{1}{4}$ to $3\frac{2}{3}$ in length of head; at dorsal outline a stripe, continuous from snout to base of caudal. 10. *compressiceps.*

b. Depth of præorbital 4 to $4\frac{2}{3}$ in length of head; at dorsal outline a series of spots from nape to base of caudal.

(i) Interorbital width $4\frac{1}{3}$ to $5\frac{1}{4}$ in length of head.

Depth of body 3 to $3\frac{2}{5}$ in the length; pectoral $\frac{2}{3}$ to $\frac{4}{5}$ length of head ..... 11. *macrostoma*.

Depth of body less than $2\frac{2}{3}$ in the length (at 215 mm. total length); pectoral $\frac{2}{3}$ length of head ..... 12. *polyodon*.

(ii) Interorbital width $5\frac{1}{3}$ to $6\frac{2}{3}$ in length of head; depth of body $3\frac{1}{4}$ to $3\frac{2}{3}$ in the length; pectoral not much more than $\frac{1}{2}$ length of head ..... 13. *maculiceps*.

2. Snout not longer than postorbital part of head.

a. Pharyngeal teeth all compressed, pointed, usually bicuspid, rarely a few slightly enlarged and even blunt.

(i) Teeth in 2 or 3 series, outer conical, spaced, 30 to 45 in upper jaw in specimens of 100 to 200 mm.; 10 to 13 gill-rakers on lower part of anterior arch.

Depth of præorbital $4\frac{1}{3}$ to 5 in length of head, length of lower jaw 2 to $2\frac{1}{4}$ ..... 14. *urotænia*.

Depth of præorbital $5\frac{3}{4}$ to $6\frac{1}{2}$ in length of head, length of lower jaw $2\frac{1}{4}$ to $2\frac{2}{5}$..... 15. *spilopterus*.

(ii) Teeth in 3 to 6 series, outer bicuspid or tricuspid, or, if conical, more than 50 in upper jaw.

α. Lower pharyngeal teeth small, but not minute, nor densely crowded posteriorly.

* Outer teeth mostly tricuspid, 36 to 70 in upper jaw. 16. *triænodon*.

** Outer teeth bicuspid.

§ 31 to 33 scales in a longitudinal series; 10 to 15 gill-rakers on lower part of anterior arch.

Lower jaw $3\frac{1}{8}$ to $3\frac{1}{2}$ in length of head; 24 to 37 teeth in outer series of upper jaw ..... 17. *fenestratus*.

Lower jaw $2\frac{1}{3}$ to 3 in length of head; 40 to 72 teeth in outer series of upper jaw; diameter of eye $3\frac{1}{4}$ to $3\frac{2}{3}$ in length of head; 10 to 13 gill-rakers on lower part of anterior arch ..... 18. *similis*.

Mouth and teeth as in *H. similis*; diameter of eye $2\frac{2}{3}$ to $3\frac{1}{2}$ in length of head; 12 to 15 gill-rakers on lower part of anterior arch ..... 19. *marginatus*.

§§ 33 to 36 scales in a longitudinal series.

10 to 14 gill-rakers on lower part of anterior arch; depth of body $2\frac{2}{3}$ to 3 in the length, length of head $3\frac{1}{3}$ to $3\frac{2}{3}$ ..... 20. *leuciscus*.

18 gill-rakers on lower part of anterior arch; depth of body $2\frac{1}{3}$ in the length, length of head $2\frac{2}{3}$ ..... 21. *spilonotus*.

*** Outer teeth conical in full-grown fish, bicuspid in young; lower jaw $2\frac{1}{4}$ to $2\frac{2}{5}$ in length of head; 11 to 13 gill-rakers on lower part of anterior arch.

Depth of præorbital $4\frac{1}{2}$ to $5\frac{3}{4}$ in length of head; D. XVII–XVIII 10–11; 32 to 34 scales in a longitudinal series ..... 22. *insignis*.

Depth of præorbital $3\frac{3}{4}$ to $4\frac{1}{4}$ in length of head; D. XVI–XVII 11–12; 33 to 36 scales in a longitudinal series ..... 23. *annectens*.

β. Lower pharyngeal teeth minute and numerous, densely crowded, especially posteriorly.

* Head 3 to 3⅓ in length of fish; 11 to 13 gill-rakers on lower part of anterior arch. 24. *tæniolatus.*

** Head 3⅔ to 3¾ in length of fish.

§ 13 to 15 gill-rakers on lower part of anterior arch.

Depth of body 3 in the length; pectoral as long as head; lower longitudinal stripe strong. 25. *breviceps.*

Depth of body 2¾ to nearly 3 in the length; pectoral 1⅛ to 1¼ as long as head; no stripes ..... 26. *microcephalus.*

§§ 14 to 17 gill-rakers on lower part of anterior arch; depth of body 2⅓ to 2½ in the length; depth of præorbital 4 to 4½ in length of head. 27. *nigritæniatus.*

§§§ 16 to 19 gill-rakers on lower part of anterior arch; depth of body 2½ to 3 in the length; depth of præorbital 4¼ to 5 in length of head.

Interorbital width 3⅓ to 3⅔ in length of head; 46 to 64 teeth in outer series of upper jaw. 28. *serenus.*

Interorbital width from nearly 4 to 4½ in length of head; 66 to 72 teeth in outer series of upper jaw ..... 29. *purpurans.*

b. Lower pharyngeal with some or all of the middle teeth enlarged and blunt.

(i) Snout shorter than postorbital part of head.

α. Head 3⅔ to 3¾ in length of fish. 30. *microstoma.*

β. Head from nearly 3 to 3¼ in length of fish.

* Outer teeth bicuspid.

Lower jaw 2⅔ to nearly 3 in length of head .. 31. *kirkii.*

Lower jaw 3 to 3⅓ in length of head ..... 32. *labridens.*

Lower jaw 3½ in length of head ..... 33. *virgatus.*

** Teeth conical; lower jaw 2½ in length of head. 34. *phenochilus.*

(ii) Snout as long as postorbital part of head; head 2⅔ in length of fish (88 mm. specimen); outer teeth bicuspid, inner tricuspid ..... 35. *festivus.*

E. A series of five spots at base of dorsal; alternating with these, at least posteriorly, another series of spots on or above lateral line; sometimes a third series; spots often expanded vertically; lips continuous, and produced at or near middle line.

12 or 13 gill-rakers on lower part of anterior arch; posterior pharyngeal teeth with spherical crowns ..... 36. *ornatus.*

15 gill-rakers on lower part of anterior arch; posterior pharyngeal teeth large, but not spherical ..... 37. *lobochilus.*

F. Two black longitudinal bands from head to caudal fin, one on middle of side, the other above upper lateral line and on upper edge of caudal peduncle; lips produced into median lobes; tooth few, outer compressed, 30 in upper jaw; pharyngeal teeth small ..... 38. *euchilus.*

G. A dark lateral band along middle of side, extending forwards through eye and across snout; teeth conical, close-set, 60 to 94 in outer series of upper jaw ..... 39. *holotænia.*

H. A dark stripe from operculum to caudal, not extending forwards to eye; teeth rather strong, curved, conical, spaced.

Lower jaw 2⅔ to 2¾ in length of head; 13 to 16 gill-rakers on lower part of anterior arch . 40. *kiwinge.*

Lower jaw 2 to 2¼ in length of head; 11 to 13 gill-rakers on lower part of anterior arch; 32 to 34 scales in longitudinal series .... 41. *strigatus.*

Lower jaw 2⅛ to 2⅓ in length of head; 10 to 12 gill-rakers on lower part of anterior arch; 34 to 36 scales in longitudinal series .... 42. *dimidiatus.*

J. A series of seven spots along back, the first in front of dorsal, the last two on caudal peduncle; a second series along upper lateral line, and a third below it; spots of second and third series usually fused to form an elongate blotch below spinous dorsal; spots often united vertically to form cross-bars; middle pharyngeal teeth enlarged and blunt. 43. *subocularis.*

K. An oblique band, or series of spots, from nape to base of caudal.

1. Middle lower pharyngeal teeth enlarged, usually with rounded crowns; oblique band continuous or interrupted.

a. Snout 1⅔ to 2⅓ diameter of eye (in specimens of 100 to 195 mm. in total length) ..... 44. *lateristriga.*

b. Snout from a little shorter than to 1½ diameter of eye (in specimens of 65 to 200 mm.).

(i) Head 2⅔ to 3 in length of fish; caudal only slightly emarginate.

Lower pharyngeal with middle teeth moderately enlarged ..... 45. *incola.*

Lower pharyngeal with middle teeth greatly enlarged, with spherical crowns ..... 46. *mola.*

(ii) Head 3 to 3½ in length of fish; caudal moderately or rather deeply emarginate; pharyngeal teeth well enlarged.

A continuous dark band from nape to caudal, covering the posterior end of upper lateral line ..... 47. *sphærodon.*

A series of spots from nape to caudal, one of which is below posterior end of upper lateral line; spots sometimes in part united to form an incomplete band..... 48. *ericotænia.*

(iii) Head 3 to 3⅔ in length of fish; caudal only slightly emarginate; pharyngeal teeth little enlarged.

Outer anterior teeth of jaws bicuspid, with the major cusp rounded or truncate ..... 49. *plagiotænia.*

Outer anterior teeth of jaws simple, compressed, with bluntly rounded or truncate ends ..... 50. *labidodon.*

2. Pharyngeal teeth few, rather large, but not with rounded crowns; black oblique band continuous.

a. Snout from a little shorter than to 1¼ diameter of eye.

52 to 56 outer teeth in upper jaw; oblique band below posterior third of upper lateral line ..... 51. *balteatus.*

38 to 46 outer teeth in upper jaw; oblique band on upper lateral line to its posterior end, or nearly ..... 52. *melanotænia.*

b. Snout $1\frac{2}{3}$ to $1\frac{1}{4}$ diameter of eye; 30 to 38 outer teeth in upper jaw; oblique band below posterior third of upper lateral line ..... 53. *epichorialis.*

3. Lower pharyngeal teeth moderately small, compressed, bicuspid; black oblique band continuous, sometimes not distinct from general dark colour of back.

a. Teeth in jaws conical, curved, outer rather strong and spaced, 25 to 48 in upper jaw; chin strong; 36 to 38 scales in a longitudinal series.

Depth of body $3\frac{1}{5}$ to $3\frac{3}{5}$ in the length; XIV to XVII, usually XVI, dorsal spines; a dark bar on the præorbital ..... 54. *spilorhynchus.*

Depth of body $3\frac{3}{4}$ to $4\frac{2}{5}$ in the length; XVI–XVIII dorsal spines, usually XVII; præorbital bar faint ..... 55. *cæruleus.*

b. Outer teeth bicuspid or conical, 46 to 82 in outer series of upper jaw in fishes of 120 mm. or more; mental ridge weak or absent.

(i) XVII–XIX, usually XVIII, dorsal spines; 34 to 36 scales in a longitudinal series.

α. No mental ridge; lower jaw flat, but strong, with broad coronoid process; posterior teeth of upper jaw enlarged, often in 2 or more series. 56. *melanonotus.*

β. A slight mental ridge; coronoid process slender; teeth in a single series posteriorly. 57. *semipalatus.*

(ii) XVI or XVII dorsal spines; 33 or 34 scales in a longitudinal series; lower jaw weak, with slight mental ridge; teeth very small and weak.

Lower jaw included, $2\frac{3}{4}$ to 3 in length of head . 58. *guentheri.*

Jaws equal anteriorly, lower $2\frac{2}{3}$ in length of head ..... 59. *mollis.*

c. Teeth conical in adult, outer unequally bicuspid in young; upper teeth buried in thick papillose lips, about 30 in outer series; mouth nearly vertical .. 60. *orthognathus.*

d. Teeth conical in adult, outer bicuspid, inner unequally tricuspid in young; outer forming a close-set series, of 58 to 90 in upper jaw. Chin moderate to strong.

(i) Lower jaw 2 to $2\frac{1}{3}$ in length of head in specimens of more than 180 mm., $2\frac{1}{6}$ to $2\frac{2}{5}$ in specimens of 120 to 180 mm.; snout $1\frac{1}{3}$ to $2\frac{3}{4}$ diameter of eye.

α. 37 to 39 scales in a longitudinal series; caudal peduncle $1\frac{2}{3}$ to twice as long as deep.. 61. *lepturus.*

β. 35 to 37 scales in a longitudinal series; caudal peduncle $1\frac{1}{3}$ to $1\frac{3}{5}$ as long as deep.

* Diameter of eye $3\frac{3}{4}$ to $4\frac{2}{3}$ (120 to 260 mm. specimens) or 5 to 6 (300 to 360 mm.) in length of head; maxillary extending to below eye, or nearly. 62. *nototænia.*

** Diameter of eye 4 to $5\frac{3}{4}$ (120 to 265 mm. specimens) or $5\frac{5}{8}$ to $6\frac{1}{2}$ (270 to 330 mm.) in length of head; maxillary not extending to below eye.

Back dark; oblique band covering upper lateral line ..... 63. *rhoadesii*.
Back pale above oblique band, which is below posterior half of upper lateral line ..... 64. *heterotænia*.

γ. 33 to 36 scales in a longitudinal series.

Diameter of eye 4 to 5 in length of head (145 to 240 mm. specimens), depth of præorbital $3\frac{3}{4}$ to $4\frac{1}{2}$ ..... 65. *atritæniatus*.
Diameter of eye $3\frac{4}{5}$ to $4\frac{4}{5}$ in length of head (155 to 260 mm. specimens), depth of præorbital 4 to $5\frac{1}{8}$ ..... 66. *oculatus*.

(ii) Lower jaw $2\frac{3}{5}$ to $2\frac{1}{2}$ in length of head in specimens of 185 to 250 mm.; snout $1\frac{1}{2}$ to $1\frac{3}{4}$ diameter of eye.

Depth of body 3 to $3\frac{1}{2}$ in the length; 35 to 37 scales in a longitudinal series ..... 67. *spectabilis*.
Depth of body $2\frac{1}{2}$ in the length; 33 scales in a longitudinal series ..... 68. *obtusus*.

e. Outer teeth bicuspid, inner almost equally tricuspid; lower jaw $2\frac{3}{5}$ in length of head; snout less than $1\frac{1}{3}$ diameter of eye (specimens of 122 to 125 mm.).
69. *formosus*.

4. Lower pharyngeal teeth moderately small, compressed, bicuspid; a series of about ten dark spots obliquely from nape to caudal.

Diameter of eye $4\frac{1}{4}$ to $4\frac{1}{2}$ in length of head, depth of præorbital 5 to $5\frac{1}{4}$ ..... 70. *gracilis*.
Diameter of eye 4 in length of head, depth of præorbital 6..... 71. *spilostichus*.

L. A dark spot below, or sometimes touching, upper lateral line, another between the lateral lines, and a third at base of caudal; mouth not strongly protractile.

1. Lower pharyngeal teeth all small and compressed.

a. Maxillary extending to below anterior edge of eye, or beyond; 9 to 11 gill-rakers on lower part of anterior arch; D. XV–XVII 9–12.

Interorbital width 6 to 7 in length of head (in fish of 115 to 160 mm.) ..... 72. *ahli*.
Interorbital width $5\frac{1}{4}$ in length of head (in a fish of 52 mm.) ..... 73. *pleurospilus*.

b. Maxillary not extending to below eye.

(i) 14 to 18 gill-rakers on lower part of anterior arch; D. XVII–XVIII 10–12; diameter of eye $3\frac{1}{3}$ to 4 in length of head, depth of præorbital $3\frac{3}{4}$ to 4.
74. *auromarginatus*.

(ii) 12 or 13 gill-rakers on lower part of anterior arch; D. XVII–XVIII 10–11; diameter of eye $3\frac{1}{3}$ to $4\frac{2}{5}$ in length of head, depth of præorbital $4\frac{2}{3}$ to $5\frac{3}{4}$ (in fish of 130 to 190 mm.) ..... 75. *ovatus*.

(iii) 9 to 12 gill-rakers on lower part of anterior arch; D. XV–XVII 10–12.

α. Diameter of eye 3½ to 4½ in length of head, depth of præorbital 3¾ to 4½ (in specimens of 115 to 210 mm.).

Præmaxillary pedicels less than ½ length of head ..... 76. *woodi.*
Præmaxillary pedicels ½ length of head or more. 77. *modestus.*

β. Diameter of eye 4½ in length of head, depth of præorbital 4⅞ (in a fish of 105 mm.) 78. *pholidophorus.*

2. Lower pharyngeal with a group of slightly enlarged teeth posteriorly.

Diameter of eye 3½ to 4 in length of head (in fish of 100 to 136 mm.); D. XV–XVI 10–11 ..... 79. *tetrastigma.*
Diameter of eye 3 to 3¼ in length of head (in fish of 86 to 128 mm.) D. XVII–XVIII 9–11 ..... 80. *heterodon.*

M. Colour-pattern, if present, consisting of a dark spot or blotch on or above upper lateral line, often also another between the lateral lines and sometimes overlapping one or both, and a third at base of caudal; anterior spot often produced towards nape, where there may be another large spot. Mouth not strongly protractile.

1. 10 to 13 gill-rakers on lower part of anterior arch.

a. Lower pharyngeal with numerous minute teeth; D. XVI–XVII 9–11 ..... 81. *tetraspilus.*

b. Lower pharyngeal with moderately small, compressed teeth; D. XVI–XVII 10–12.

(i) Mouth wide; 10 to 20 teeth in outer series of upper jaw. 82. *chrysogaster.*

(ii) Mouth moderate; 56 to 66 teeth in outer series of upper jaw.

Maxillary ending half-way between nostril and eye; diameter of eye less than ¼ length of head (in specimens of 163 to 200 mm. or more) ..... 83. *labifer.*
Maxillary ending nearer to eye than to nostril; diameter of eye ¼ length of head (in a specimen of 210 mm.) ..... 84. *speciosus.*

c. Lower pharyngeal with a group of enlarged teeth posteriorly.

(i) 36 to 38 scales in a longitudinal series; D. XVI–XVII 13–14 ..... 85. *decorus.*

(ii) 34 to 36 scales in a longitudinal series; D. XV–XVII 10–12.

α. Depth of præorbital 4½ to 5⅝ in length of head (in specimens of 74 to 145 mm.).... 86. *argyrosoma.*

β. Depth of præorbital 3⅝ to 4½ in length of head (in specimens of 90 to 165 mm.).

Anterior outer teeth bicuspid, 48 to 56 outer teeth in upper jaw; no dermal hump on the head ..... 87. *selenurus.*
Outer teeth conical and directed outwards in adults; 34 to 46 in upper jaw; a frontal dermal hump ..... 88. *moorii.*

2. 7 to 9 gill-rakers on lower part of anterior arch; lower pharyngeal massive, with large molariform teeth. 89. *placodon.*

3. 15 to 39 gill-rakers on lower part of anterior arch; lower pharyngeal very slender, deeply notched behind, with slender, bicuspid teeth; teeth in jaws small and weak.

a. 15 to 18 gill-rakers on lower part of anterior arch. 90. *nitidus.*

b. 31 to 39 gill-rakers on lower part of anterior arch.

Lower jaw 2 to $2\frac{1}{4}$ in length of head ..... 91. *pictus.*
Lower jaw $2\frac{1}{3}$ to $2\frac{1}{2}$ in length of head ..... 92. *intermedius.*

N. Colour various; upper jaw strongly protractile, the præmaxillary pedicels sliding well forwards when the lower jaw is depressed.

1. 13 to 17 gill-rakers on lower part of anterior arch.

a. Colour uniform, or with dark cross-bars; 15 to 17 gill-rakers on lower part of anterior arch.

Diameter of eye $\frac{1}{3}$ length of head or more in specimens of 85 to 95 mm., length of præmaxillary pedicels nearly 3 in length of head ..... 93. *inornatus.*
Diameter of eye less than $\frac{1}{3}$ length of head in specimens of 88 mm. or more, length of præmaxillary pedicels $2\frac{1}{2}$ to $2\frac{2}{3}$ in length of head ..... 94. *eucinostomus.*

b. A dark band from operculum to caudal fin, traces of another above upper lateral line, and a series of spots at base of dorsal; 13 to 16 gill-rakers on lower part of anterior arch; diameter of eye less than $\frac{1}{3}$ length of head, præmaxillary pedicels $2\frac{2}{3}$ to 3 in length of head. 95. *prostoma.*

2. 17 to 23 gill-rakers on lower part of anterior arch.

A dark spot on the side on and below upper lateral line, often another between the lateral lines, a third at base of caudal; præmaxillary pedicels $2\frac{3}{4}$ to $3\frac{1}{4}$ in length of head ..... 96. *chrysonotus.*
No spots, except one at base of caudal; occasionally a stripe extending forwards from this spot; præmaxillary pedicels $2\frac{1}{2}$ to $2\frac{2}{3}$ in length of head ..... 97. *cyaneus.*

3. 20 to 28 gill-rakers on lower part of anterior arch; colour uniform, or with a spot below upper lateral line, one on lower lateral line, and a third at base of caudal; præmaxillary pedicels $2\frac{1}{2}$ to $2\frac{1}{3}$ in length of head. 98. *quadrimaculatus.*

O. A single dark spot on each side of the body; upper jaw protractile; lower pharyngeal teeth small, numerous; 18 gill-rakers on lower part of anterior arch; D. XIX 11. 99. *pleurostigma.*

P. Body-colour uniform, except for ten or eleven cross-bars which may be faint or well marked; mouth not strongly protractile; lower pharyngeal rather broad, with numerous minute teeth; jaws weak, teeth minute.

11 to 14 gill-rakers on lower part of anterior arch ..... 100. *longimanus.*
16 or 17 gill-rakers on lower part of anterior arch ..... 101. *micrentodon.*

NOTES ON THE SPECIES OF *HAPLOCHROMIS*.

1. *Haplocromis callipterus* (Günther), 1893.

Astatotilapia calliptera Pellegrin, 1904; Regan, Proc. Zool. Soc. Lond. 1921, p. 680.
Haplochromis centropristoides Nichols & LaMonte, Amer. Mus. Novit. no. 451, 1931, p. 3, fig. 1.

Numerous specimens, up to 140 mm. in total length, from both ends of the lake.

2. *Haplochromis livingstonii* (Günther), 1893.

Haplochromis livingstonii Regan, Proc. Zool. Soc. Lond. 1921, p. 688.

Eighteen specimens, 120 to 200 mm. in total length, from the south end of the lake.

3. *Haplochromis pardalis*, sp. n.

A single specimen, 190 mm. in total length, from Deep Bay, near the north end of the lake.

This shows the basic colour pattern of *H. livingstonii* with the spotting of *H. polystigma*, but has a larger eye and larger mouth than either.

4. *Haplochromis polystigma* Regan.

Haplochromis polystigma Regan, *t. c.* p. 688, pl. i.

Sixteen specimens, 105 to 230 mm. in total length, from the south end of the lake.

5. *Haplochromis maculimanus* Regan.

Haplochromis maculimanus Regan, *t. c.* p. 689.

Known only from the type, 190 mm. in total length.

6. *Haplochromis venustus* Boulenger, 1908.

Cyrtocara venusta Regan, *t. c.* p. 722.
Haplochromis simulans Regan, *t. c.* p. 689, text-fig. 5.

Fifty specimens, 110 to 225 mm. in total length, from both north and south ends of the lake.

As already noted, the presence or absence of lappets at the edge of the membrane of the spinous dorsal fin is not of generic importance, as was supposed by Boulenger and by Regan. The types of *H. venustus* are males. The gonads have been removed from the types of *H. simulans*, but the largest specimen (190 mm.) is probably a female, to judge from the paleness of the ground-colour and the distinctness of the pattern; in it the lappets of the dorsal fin are well-developed. The lappets are well developed in males up to about 180 mm., at which size a reduction begins to be obvious, and in specimens of 185 mm. the edge of the fin-membrane is entire, or nearly so, at least in the posterior half of the spinous region.

7. *Haplochromis fuscotæniatus* Regan.

Haplochromis fuscotæniatus Regan, *t. c.* p. 696, text-fig. 12.

Six specimens, 143 to 220 mm. in total length, from the south end of the lake.

8. *Haplochromis johnstoni* (Günther), 1893.

Haplochromis johnstoni Regan, *t. c.* p. 691.
Haplochromis sexfasciatus Regan, *t. c.* p. 692, text-fig. 7.

Sixty-seven specimens, 60 to 170 mm. in total length, from both ends of the lake.

The types of *H. johnstoni* and of *H. sexfasciatus* prove to represent almost the extremes of a series showing different degrees of enlargement of the pharyngeal teeth.

9. *Haplochromis rostratus* (Boulenger), 1899.

Haplochromis rostratus Regan, *t. c.* p. 718.
Haplochromis macrorhynchus Regan, *t. c.* p. 717, text-fig. 28.

Forty specimens, 105 to 255 mm. in total length, from both ends of the lake.

The placing of *H. macrorhynchus* in the synonymy of *H. rostratus* gives a species with a very wide range of gill-raker numbers, but the differences in the shape of the snout and the slope of the mouth show no constant correlation with high or low numbers.

10. *Haplochromis compressiceps* (Boulenger), 1908.

Haplochromis compressiceps Regan, *t. c.* p. 717.

Forty-six specimens, 100 to 210 mm. in total length, from both ends of the lake.

11. *Haplochromis macrostoma* Regan.

Haplochromis macrostoma Regan, *t. c.* p. 719, pl. iv. fig. 2.

Five specimens, 120 to 260 mm. in total length, from the south end of the lake.

12. *Haplochromis polyodon*, sp. n.

A single specimen, 215 mm. in total length, from Vua.

13. *Haplochromis maculiceps* Ahl.

Haplochromis maculiceps Ahl, Sitzungsber. Ges. naturf. Fr. Berlin, July 1926 (1927), p. 57.

Two specimens, the type, 195 mm. (examined by me in Berlin) and a specimen of 295 mm. in total length, both from the northern end of the lake.

14. *Haplochromis urotænia* Regan.

Haplochromis urotænia Regan, *t. c.* p. 695, text-fig. 11.

Thirty-three specimens, 140 to 222 mm. in total length, from both ends of the lake.

15. *Haplochromis spilopterus*, sp. n.

Twenty-seven specimens, 100 to 200 mm. in total length, from both ends of the lake.

Easily recognized by the broad mouth, with maxillary well exposed, and the cleft at an angle of about 45° to the horizontal. The narrow præorbital and large eye (diameter 3 to 4 in length of head) are also characteristic. In males the anal fin has two series of oval, yellow spots.

16. *Haplochromis triænodon*, sp. n.

Twenty-six specimens, 65 to 145 mm. in total length, from the south end of the lake.

Very close to *H. similis*, from which it differs in the dentition and in having 13 or 14 gill-rakers on the lower part of the anterior arch (10 to 13, usually 11 or 12, in *H. similis*).

17. *Haplochromis fenestratus*, sp. n.

Eleven specimens, 93 to 118 mm. in total length, eight of which are from the north end of the lake, the rest from the south-west arm.

This little fish, distinguished by its small mouth with few teeth, usually has 9 to 12 dark vertical bars crossing the longitudinal bands so as to produce a chequered pattern.

18. *Haplochromis similis* Regan.

Haplochromis similis Regan, *t. c.* p. 693, text-fig. 8.

Sixty-two specimens, 57 to 170 mm. in total length, from both ends of the lake.

19. *Haplochromis marginatus*, sp. n.

This species is near *H. similis*, but differs not only in the larger eye and more numerous gill-rakers, but in having a narrower præorbital and usually a larger mouth. There is a slight but constant difference also in the pharyngeal dentition, one or two teeth of each of the two middle series being slightly enlarged in *H. marginatus*, but not in *H. similis*.

Two subspecies are recognized, from the south and north ends of the lake respectively.

a. *Haplochromis marginatus marginatus*, subsp. n.

Depth of body $2\frac{1}{2}$ to $2\frac{3}{4}$ in the length. Diameter of eye $2\frac{4}{5}$ to $3\frac{1}{2}$ in length of head, interorbital width $3\frac{2}{5}$ to $3\frac{3}{5}$, length

of lower jaw $2\frac{2}{3}$ to $2\frac{4}{5}$. 12 to 15 gill-rakers on lower part of anterior arch. Dorsal XV–XVIII 10–11.

Eighty-three specimens, 65 to 162 mm. in total length, from the south end of the lake (specimens of less than 105 mm. not included in the description).

b. *Haplochromis marginatus vuæ*, subsp. n.

Depth of body $2\frac{2}{3}$ to 3 in the length. Diameter of eye $2\frac{2}{3}$ to $3\frac{1}{2}$ in length of head, interorbital width $3\frac{1}{2}$ to $3\frac{3}{4}$, length of lower jaw $2\frac{1}{2}$ to $2\frac{3}{4}$. 12 to 14 gill-rakers on lower part of anterior arch. Dorsal XVI–XVII 10–11.

Fifteen specimens, 92 to 144 mm. in total length, from Vua, near the north end of the lake.

Of seventy-six specimens of *H. marginatus marginatus*, one has 12 gill-rakers on the lower part of the anterior arch, seven have 13, forty-six have 14, and twenty-two 15. Of the fifteen specimens of *H. m. vuæ*, seven have 12, seven 13, and one 14.

Of twenty-seven specimens of *H. m. marginatus*, seventeen have a total of 26 dorsal rays, nine have 27, and one has 28. Of the fifteen specimens of *H. m. vuæ*, five have 26 dorsal rays and ten have 27.

20. *Haplochromis leuciscus* Regan.

Haplochromis leuciscus Regan, *t. c.* p. 714, text-fig. 26.

Forty-two specimens, 72 to 145 mm. in total length, from both ends of the lake.

The colour is usually silvery, as in the types, but a faint, or rarely conspicuous, longitudinal dark band may be present from operculum to base of caudal. This species is probably related to *H. breviceps* and *H. purpurans*, but differs from them in the pharyngeal dentition.

21. *Haplochromis spilonotus*, sp. n.

Two specimens, 130 and 165 mm. in total length, from Deep Bay and the south-west arm of the lake.

Most nearly related to *H. marginatus*.

22. *Haplochromis insignis*, sp. n.

Five specimens, 73 to 196 mm. in total length, from Monkey Bay. The proportions of the 73 mm. specimen are not included in the synopsis.

23. *Haplochromis annectens* (Regan) *, 1921.

Cyrtocara annectens Regan, *t. c.* p. 723, text-fig. 30.

Twenty-six specimens, 95 to 195 mm. in total length, from both ends of the lake.

* This predates *Haplochromis annectens* Regan (Proc. Zool. Soc. Lond. 1922, p. 168, text-fig. 2), a Lake Victoria fish, for which I here propose the name *H. prodromus*.

The edges of dorsal and anal fins are entire in older specimens; in younger fishes there are small lappets between the spines.

24. *Haplochromis tæniolatus*, sp. n.

Seven specimens, 84 to 113 mm. in total length, from both ends of the lake.

A series of cross-bars, sometimes more conspicuous than the longitudinal bands.

25. *Haplochromis breviceps* Regan.

Haplochromis breviceps Regan, *t. c.* p. 694, text-fig. 9.

Four specimens, 130 to 150 mm. in total length, from the south end of the lake.

26. *Haplochromis microcephalus*, sp. n.

Two specimens, 122 and 125 mm. in total length, from Monkey Bay.

27. *Haplochromis nigritæniatus*, sp. n.

Nine specimens, 135 to 204 mm. in total length, from Monkey Bay.

This species differs from the following in the pharyngeal dentition (see below) and from *H. purpurans* in having fewer teeth in the outer series of the upper jaw (54 to 60), as well as in the characters noted in the synopsis.

28. *Haplochromis serenus*, sp. n. (Fig. 13 A, p. 114.)

Thirteen specimens, 145 to 200 mm. in total length, from Vua and Deep Bay, near the north end of the lake.

The lower pharyngeal bone of this species is broader and stouter than in either *H. nigritæniatus* or *H. purpurans*, less concave laterally, and with a pair of pronounced convexities posteriorly; moreover, the pharyngeal teeth are a little larger.

29. *Haplochromis purpurans*, sp. n.

Fifteen specimens, 145 to 175 mm. in total length, from the northern end of the lake.

30. *Haplochromis microstoma* Regan, 1921.

Haplochromis microstoma Regan, *t. c.* p. 695, text-fig. 10.

Twenty-one specimens, 80 to 190 mm. in total length, from both ends of the lake.

31. *Haplochromis kirkii* (Günther), 1893.

Haplochromis kirkii Regan, *t. c.* p. 693.

Eighty-five specimens, 85 to 180 mm. in total length, from both ends of the lake and from the Upper Shiré River.

32. *Haplochromis labridens*, sp. n.

Fifty-three specimens, 75 to 165 mm. in total length, from the south end of the lake.

These differ from *H. kirkii* in having a narrow præorbital bone ($4\frac{1}{2}$ to $5\frac{1}{3}$ in length of head, as against 4 to 5 in *H. kirkii*), a shorter snout, and smaller mouth with, usually, fewer teeth (26 to 40 in outer series of upper jaw as against 28 to 52 in *H. kirkii*). Also the number of dorsal spines is usually XV in *H. kirkii* and XVI in *H. labridens*. In forty-two specimens of *H. kirkii* the spines number XIV in one, XV in thirty-seven, XVI in four. In the same number of *H. labridens* there is none with XIV, there are XV in ten, XVI in thirty-one, and XVII in one.

33. *Haplochromis virgatus*, sp. n.

A single specimen, 125 mm. in total length, from Monkey Bay.

The mouth is small and rather narrow, with thick lips. The anterior outer teeth are enlarged and bicuspid, the inner simple, in two series; posteriorly there is a single series of small, simple teeth; there are 26 teeth in the outer series of the upper jaw.

34. *Haplochromis phenochilus*, sp. n.

A single specimen, 157 mm. in total length, from Vua.

The name refers to the lips, which are conspicuous by their pallor.

35. *Haplochromis festivus*, sp. n.

A single specimen, 88 mm. in total length, from Nkudzi.

This species may well be related to *H. ornatus* and *H. lobochilus*, but is more generalized. The lobes of the lower lip are well developed, but are paired, one on each side of the middle line. The gill-rakers number 13 on the lower part of the anterior arch.

36. *Haplochromis ornatus* Regan.

Haplochromis ornatus **Regan, *t. c.* p. 691, text-fig. 6.**

Two specimens, 140 and 160 mm. in total length, one (type) probably from the south end of the lake, the other from Karonga in the north.

37. *Haplochromis lobochilus*, sp. n.

A single specimen, 100 mm. in total length, from Deep Bay.

38. *Haplochromis euchilus*, sp. n.

Two specimens, 95 and 115 mm. in total length, from Deep Bay.

This species appears to be closely related to *Chilotilapia rhoadesii*, but differs in the structure of mouth and dentition.

39. *Haplochromis holotænia.*

Paratilapia dimidiata (part.) Boulenger, Cat. Afr. Fish. iii. p. 360, fig. 244 (1915).
Haplochromis holotænia Regan, *t. c.* p. 697.
Haplochromis bodyi Ahl, Sitzungsber. Ges. naturf. Fr. Berlin, July 1926 (1927), p. 58.

Twelve specimens, 170 to 200 mm. in total length, all (except perhaps the type) from the north end of the lake.

The types of *H. bodyi* have also been examined by me. They were taken at Langenburg.

40. *Haplochromis kiwinge* Ahl.

Haplochromis kiwinge Ahl, *t. c.* p. 56.
Haplochromis fuelleborni (not *Tilapia fuelleborni* Hilgendorf & Pappenheim), Ahl, *t. c.* p. 58.

Fifty specimens, 125 to 290 mm. in total length, from both ends of the lake. Also thirty-three young of 50 to 117 mm.

The types of *H. kiwinge* and *H. fuelleborni* have been examined by me in Berlin.

41. *Haplochromis strigatus* Regan.

Haplochromis strigatus Regan, *t. c.* p. 697, text-fig. 13.

Sixty-four specimens, 108 to 223 mm. in total length, and ten young, 48 to 100 mm. long, from all parts of the lake.

42. *Haplochromis dimidiatus* (Günther), 1864.

Haplochromis dimidiatus Regan, *t. c.* p. 698.

Thirty specimens, 100 to 220 mm. in total length, and six young fish (65 to 95 mm.), from both ends of the lake, but mainly from the north.

43. *Haplochromis subocularis* (Günther), 1893.

Chromis subocularis Günther, Proc. Zool. Soc. Lond. 1893, p. 621, pl. liv. fig. B.
Haplochromis subocularis Regan, *t. c.* p. 690.

Twenty-five specimens, 100 to 160 mm. in total length, from the south end of the lake.

This species appears to be related to *H. ericotænia*, but is intermediate in colour-pattern between that species and *H. kirkii* etc. It differs from *H. ericotænia* in having more scales in a longitudinal series (32 to 35, as against 30 to 33 in *H. ericotænia*); also the teeth in the jaws are usually in fewer series (3 to 5, as against 4 to 8 in *H. ericotænia*), with 40 to 50 in outer series of upper jaw (48 to 60 in *H. ericotænia*); the

inner teeth are simple in the adult, unequally tricuspid in young, whereas in *H. ericotænia* they are simple at all ages.

44. *Haplochromis lateristriga* (Günther), 1864.

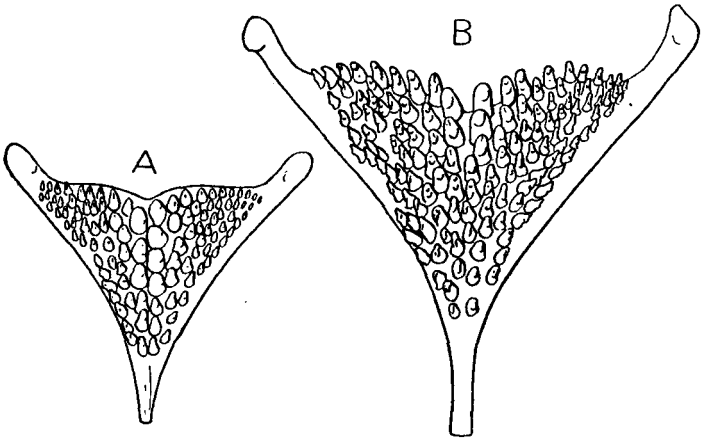
Haplochromis lateristriga Regan, *t. c.* p. 705, text-fig. 18.

Forty-four specimens, 100 to 195 mm. in total length, from both ends of the lake.

45. *Haplochromis incola*, sp. n. (Fig. 8.)

Eighteen specimens, 115 to 195 mm. in total length, from both ends of the lake, mostly from the south.

Fig. 8.



Haplochromis incola. Lower pharyngeal of two specimens. A, 120 mm. long (from Monkey Bay); B, 195 mm. (from Deep Bay.)

46. *Haplochromis mola*, sp. n.

Four specimens, 138 to 170 mm. in total length, from Deep Bay and Vua; also a young fish of 85 mm. from the south-west arm.

The oblique band crosses the upper lateral line so as to lie on the ventral side of its posterior half.

47. *Haplochromis sphærodon* Regan.

Haplochromis sphærodon Regan, *t. c.* p. 703, text-fig. 16.

Six specimens, 80 to 115 mm. in total length.

This species is distinguished from *H. incola* and *H. mola* by the smaller head. The teeth in the jaws are also more numerous (44 to 60 in outer series of upper jaw in these

six fishes, not more than 50 in specimens of *H. incola* of 115 mm., never more than 44 in *H. mola*). The pharyngeal teeth are larger and more rounded than in *H. incola*. It differs further from *H. mola* in having fewer and larger scales on the chest (5 between pectoral and pelvic fins in *H. sphærodon*, 7 to 10 in *H. mola*) and in the position of the oblique band, which includes the posterior end of the upper lateral line.

48. *Haplochromis ericotænia* Regan.

Sixty-four specimens, 65 to 200 mm. in total length, from both ends of the lake.

Very near *H. sphærodon*, but with smaller scales on the chest (7 between pectoral and pelvic fins), with a slightly smaller eye and with the oblique band usually broken into spots. (See also notes on *H. subocularis*.)

49. *Haplochromis plagiotænia* Regan.

Haplochromis plagiotænia Regan, *t. c.* p. 706, text-fig. 19.

Seventeen specimens, 70 to 110 mm. in total length.

50. *Haplochromis labidodon*, sp. n.

Five specimens, 95 to 180 mm. in total length, from Mwaya and Deep Bay.

The dentition of this fish is peculiar, the large anterior teeth of the lower jaw grading rather sharply into the posterior.

51. *Haplochromis balteatus*, sp. n.

Three specimens, 106 to 162 mm. in total length, from Karonga and Vua. Three young fish, 68 to 90 mm., from the south-west arm, may also belong to this species.

52. *Haplochromis melanotænia* Regan.

Haplochromis melanotænia Regan, *t. c.* p. 706, text-fig. 20.

Four specimens, 120 to 180 mm. in total length, from the south end of the lake.

This is easily distinguished from other fishes with an oblique band by the thick lips and large mouth, and by the stout, subconical pharyngeal teeth.

53. *Haplochromis epichorialis*, sp. n.

Two specimens, each 200 mm. in total length, from Deep Bay.

Lower pharyngeal rather large, bearing few large, rather blunt, but not molariform teeth. 33 or 34 scales in a longitudinal series. Dorsal XVI 10–11. Anal III 9. Spines short.

54. *Haplochromis spilorhynchus* Regan.

Haplochromis spilorhynchus Regan, *t. c.* p. 711, pl. vi. fig. 2.
Haplochromis longipes Regan, *t. c.* p. 712, pl. v. fig. 2.

Fifty-six specimens, 100 to 260 mm. in total length, from the south end of the lake.

The type of *H. longipes* is a large male.

55. *Haplochromis cæruleus* (Boulenger), 1908.

Champsochromis cæruleus Boulenger, Cat. Afr. Fish. iii. p. 433, fig. 295.
Haplochromis cæruleus Regan, *t. c.* p. 712.
Haplochromis bellicosus Ahl, Sitzungsber. Ges. naturf. Fr. Berlin, July 1926 (1927), p. 56.
Haplochromis boultoni Nichols & LaMonte, Amer. Mus. Novit. no. 451, 1931, p. 4.

Eighteen specimens, 170 to 285 mm. in total length, from both ends of the lake.

The type of *H. bellicosus* Ahl has been examined by me in Berlin. It is larger than any of the British Museum specimens, and has, as may be expected, a relatively wider interorbital region.

56. *Haplochromis melanonotus* Regan.

Haplochromis melanonotus Regan, *t. c.* p. 708, text-fig. 21.

Fifty specimens, 85 to 240 mm. in total length, from both ends of the lake.

The peculiar jaws and dentition of this species would entitle it to generic rank were it not for its evident close relationship to the following.

57. *Haplochromis semipalatus*, sp. n.

Three specimens, 173 to 185 mm. in total length, and a fish of 84 mm., from Kapora and Deep Bay.

Teeth in 4 or 5 series, all conical, or anterior outer bicuspid or tricuspid and inner unequally tricuspid ; 54 to 64 in outer series of upper jaw, the posterior enlarged.

58. *Haplochromis guentheri* Regan.

Eighteen specimens, 120 to 200 mm. in total length, from both ends of the lake.

The weak jaws and weak teeth are unique in *Haplochromis*. The outer teeth of the included lower jaw project outwards to meet those of the upper.

59. *Haplochromis mollis*, sp. n.

Two specimens, 106 and 160 mm. in total length, from Monkey Bay.

The 106 mm. specimen has a relatively shorter lower jaw (nearly 3 in length of head), larger eye, etc. The jaws and teeth in this species are very similar to those of the genus *Lethrinops*, but there is a short single series posteriorly in the lower jaw.

60. *Haplochromis orthognathus*, sp. n.

Four specimens, 165 to 195 mm. in total length, from rather deep water in the south-west arm of the lake.

Upper profile of head convex to between eyes, concave in front. 33 scales in a longitudinal series. Dorsal XVI–XVII 9–10. Anal III 8–9.

61. *Haplochromis lepturus* Regan.

Haplochromis lepturus Regan, *t. c.* p. 709, text-fig. 22.
Haplochromis rhoadesii (part.) Regan, *t. c.* p. 710.
Haplochromis gigas Ahl, Sitzungsber. Ges. naturf. Fr. Berlin, July 1926 (1927), p. 55.

Forty-five specimens, 115 to 400 mm. in total length. The type of *H. gigas* has also been examined by me in Berlin. Dr. Ahl's count of 35 scales in a longitudinal series was obtained by counting in a straight line, including the lower lateral line ; by the method used here the count is 38.

Dorsal XVI–XVIII 11–13. Anal III 9–11.

62. *Haplochromis nototænia* (Boulenger).

Haplochromis nototænia (part.) Regan, *t. c.* p. 709.

Thirty-four specimens, 123 to 360 mm. in total length, from both ends of the lake.

Dorsal XVI–XVIII 10–12. Anal III 9–11.

63. *Haplochromis rhoadesii* (Boulenger).

Haplochromis rhoadesii (part.) Regan, *t. c.* p. 710.

Twenty-four specimens, 120 to 330 mm. in total length, from both ends of the lake.

Dorsal XV–XVII 11–13.

64. *Haplochromis heterotænia*, sp. n.

Two specimens, 145 and 210 mm. in total length.

Dorsal XVII 11. Anal III 10. These fishes have a somewhat larger eye, shorter præmaxillary pedicels, and longer dorsal spines than specimens of *H. rhoadesii* of the same size, as well as differing in the coloration.

65. *Haplochromis atritæniatus* Regan.

Haplochromis atritæniatus Regan, *t. c.* p. 711, text-fig. 23.

Sixteen specimens, 165 to 240 mm. in total length, from the south end of the lake.

Dorsal XV–XVI 10–12. Anal III 9–10.

66. *Haplochromis oculatus*, sp. n.

Haplochromis nototænia (part.) Regan, *t. c.* p. 709.

Twenty specimens, 155 to 260 mm. in total length, from the south end of the lake.

Dorsal XVI–XVII 11–12. Anal III 9–10.

67. *Haplochromis spectabilis*, sp. n.

Eight specimens, 185 to 250 mm. in total length, from both ends of the lake.

The seven preceding species are so closely related that it is worth while emphasizing the differences in the fin-counts, as shown by frequencies and averages in the following table :—

	Total number of rays.					
	26.	27.	28.	29.	30.	Average.
H. lepturus	..	..	3	36	6	29·07
H. nototænia	..	5	21	6	1	28·09
H. rhoadesii.....	..	6	19	2	..	27·85
H. heterotænia....	..	..	3	..	..	28·00
H. atritæniatus ..	4	12	..	..	..	26·75
H. oculatus	..	13	7	..	..	27·35
H. spectabilis	..	1	4	3	..	28·25

68. *Haplochromis obtusus*, sp. n.

A single specimen, 220 mm. in total length, from the south end of the lake.

Dorsal XVIII 9. Anal III 10. Diameter of eye nearly $5\frac{1}{2}$ in length of head, depth of præorbital $4\frac{1}{2}$, interorbital width $3\frac{1}{3}$, lower jaw $2\frac{1}{2}$.

69. *Haplochromis formosus*, sp. n.

Two specimens, 122 and 125 mm. in total length, from Vua.

Very near to the following, but with a smaller eye and deeper præorbital than would be expected in young of *H. gracilis*. In *H. formosus* also the oblique dark band is continuous, and there is a dark bar on the præorbital.

70. *Haplochromis gracilis*, sp. n.

Three specimens, 200 to 210 mm. in total length.

Dorsal XVII 12–13. Anal III 10. 36 or 37 scales in a longitudinal series. 11 or 12 gill-rakers on lower part of anterior arch.

71. *Haplochromis spilostichus*, sp. n.

A single specimen, 220 mm. in total length, from Monkey Bay.

Dorsal XVIII 12. Anal III 10. 38 scales in a longitudinal series. 13 gill-rakers on lower part of anterior arch.

72. *Haplochromis ahli*, nom. nov.

Haplochromis serranoides (*non* Regan) Ahl. Sitzungsber. Ges. naturf. Fr. Berlin, July 1926 (1927), p. 54.

Nineteen specimens, 115 to 160 mm. in total length, from both ends of the lake.

The type has been examined by me in Berlin. It is larger than any of the British Museum specimens, and has, accordingly, a wider interorbital region (nearly $\frac{1}{6}$ length of head).

73. *Haplochromis pleurospilus*, sp. n.

A single specimen, 53 mm. in total length, from Lupembe sand-bank, in the northern part of the lake.

32 scales in a longitudinal series. Dorsal XV 12. Anal III 10.

This small fish is probably not closely related to *H. ahli*.

74. *Haplochromis auromarginatus* (Boulenger), 1908.

Tilapia auromarginata Boulenger, Cat. Afr. Fish. iii. p. 180, fig. 115 (1915).

Otopharynx auromarginatus Regan, *t. c.* p. 678.

Fifteen specimens, 145 to 240 mm. in total length, from both ends of the lake.

In the males no spots are visible on the body, and the general coloration is much darker than in females.

75. *Haplochromis ovatus*, sp. n.

Three specimens, 130 to 190 mm. in total length, from the south end of the lake.

76. *Haplochromis woodi* Regan.

Haplochromis woodi Regan, *t. c.* p. 702, pl. ii.

Eighty-one specimens, 115 to 230 mm. in total length, from all parts of the lake.

Fifty-eight of these, from the south end of the lake, agree well with the types. In a very uniform sample of nine specimens taken together between Fort Johnston and Nkudzi the body is more slender, the eye is rather large ($3\frac{1}{2}$ to nearly 4 in length of head), and the scale-counts differ slightly from those of the fifty-eight (33 to 35 in a longitudinal series as against 32 to 34; 4, rarely 5, between origin of dorsal and lateral line, as against 5 or 6, rarely 4; 6 to 8, rarely 5, between pectoral and pelvic fins, as against 5 or 6, rarely 7).

Twenty-three specimens from the north end of the lake, including all the largest specimens, have a larger eye (diameter

always more than ¼ length of head), narrower interorbital region (6 to 7¼ in length of head, as against 5 to 6⅗), and somewhat longer præmaxillary pedicels. The fin-ray counts of the dorsal fin resemble those of the sample of nine rather than those of the more typical specimens.

Total of dorsal rays.	Typical *H. woodi* from the south.	Northern specimens.	Nine specimens from between Ft. Johnston and Nkudzi.
25	1	0	0
26	40	3	2
27	16	10	7
28	1	1	0

77. *Haplochromis modestus* (Günther).

Haplochromis modestus Regan, *t. c.* p. 701.

Known only from the type, 150 mm. in total length.

Very near *H. woodi*, from which it is distinguished by the larger mouth and by the præmaxillary pedicels, which extend nearly to between the orbits. Also in specimens of *H. woodi* of this size the eye is usually larger and the interorbital width less.

78. *Haplochromis pholidophorus*, sp. n.

A single specimen, 105 mm. in total length, from Vua.

Snout longer than postorbital part of head. Teeth conical, in 3 series in upper jaw, 2 in lower, 50 in outer series of upper jaw. 11 gill-rakers on lower part of anterior arch. 32 scales in a longitudinal series. Dorsal XVI 12. Anal III 10.

79. *Haplochromis tetrastigma* (Günther). (Fig. 9.)

Haplochromis tetrastigma Regan, *t. c.* p. 699.

Seventy-four specimens, 44 to 136 mm. in total length, from both ends of the lake.

The dentition of the lower jaw in many specimens of this species is like that of *Lethrinops*, although in others there is a short single series posteriorly. It is possible that this species is in a transitional stage between the two genera.

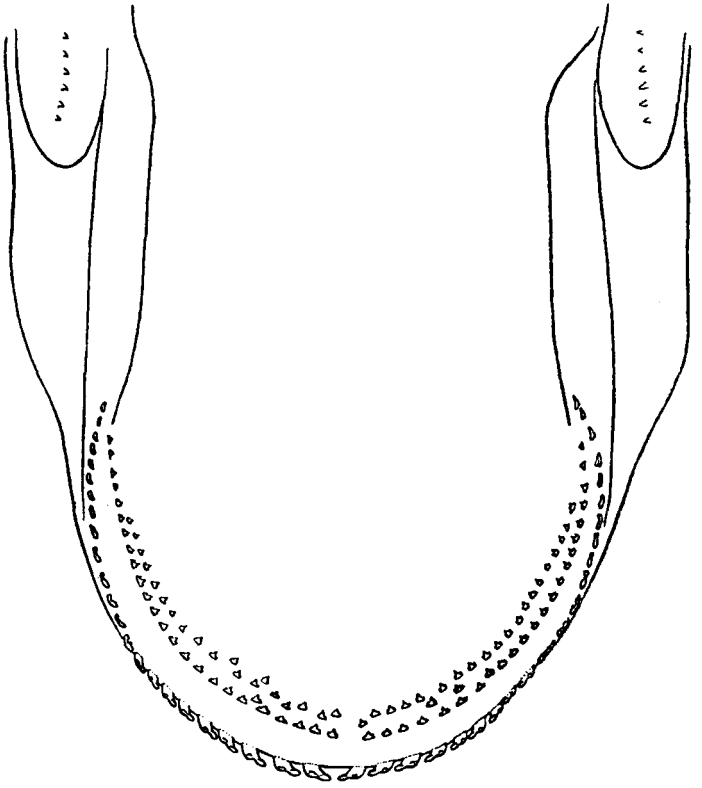
80. *Haplochromis heterodon*, sp. n.

Eleven specimens, 86 to 128 mm. in total length, from Deep Bay and Monkey Bay.

Teeth in 3 or 4 series, inner tricuspid, outer bicuspid, or some tricuspid, or, in larger specimens, simple. 11 to 14 gill-rakers on lower part of anterior arch. 32 or 33 scales in a longitudinal series. Caudal peduncle as long as deep or a little longer.

A fish from Monkey Bay has 9 gill-rakers on the lower part of the anterior arch on one side, 10 on the other, but otherwise cannot be separated from this species.

Fig. 9.



Haplochromis tetrastigma. Dentition of lower jaw.

81. *Haplochromis tetraspilus*, sp. n.

Ninety-six specimens, up to 156 mm. in total length, from the south end of the lake.

Mouth small; maxillary ending below nostril or a little behind. Teeth in 3 or 4 series, outer bicuspid, inner tricuspid. 30 to 32 scales in a longitudinal series. Dorsal XVI–XVII 9–11. Anal III 9–10.

82. *Haplochromis chrysogaster*, sp. n.

Three specimens, 150 to 175 mm. in total length, from Karonga and the south-west arm of the lake.

Lower jaw rather strong, with prominent chin. Teeth in 2 series in upper jaw, 3 in lower, rather small, embedded in papillæ of the gums, outer with one, two, or three cusps. 34 scales in a longitudinal series. Dorsal XVI 10. Anal III 9–10.

83. *Haplochromis labifer*, sp. n.

Six specimens, 163 to 217 mm. in total length, from both ends of the lake.

Snout $1\frac{1}{2}$ to $1\frac{2}{3}$ diameter of eye. Lower jaw rather prominent. Teeth in 3 or 4 series above, 3 below, simple, or outer bicuspid and inner tricuspid; 56 to 62 in outer series of upper jaw. 32 to 34 scales in a longitudinal series. Anal III 8–10. Caudal peduncle $1\frac{1}{4}$ to $1\frac{1}{2}$ as long as deep. Colour-pattern in larger males masked by general dark coloration.

84. *Haplochromis speciosus*, sp. n.

Two specimens, from Vua and Monkey Bay, 210 and 245 mm. in total length.

Snout $1\frac{1}{3}$ to $1\frac{2}{3}$ diameter of eye. Teeth in 3 series, outer simple, inner simple or unequally tricuspid, 66 in outer series of upper jaw. 33 or 34 scales in a longitudinal series. Anal III 9. Caudal peduncle $1\frac{1}{2}$ as long as deep.

85. *Haplochromis decorus*, sp. n.

Six specimens, 108 to 165 mm. in total length, from both ends of the lake.

There is a tendency for the dark blotches to become elongated and to unite to form a more or less broken oblique band.

86. *Haplochromis argyrosoma* Regan.

Haplochromis argyrosoma Regan, *t. c.* p. 713, text-fig. 25.

Eleven specimens, 74 to 145 mm. in total length, from both ends of the lake.

The spots, or blotches, of the colour-pattern are sometimes lacking, as in the type. Teeth in 3 series, outer bicuspid, inner tricuspid or simple; 44 to 60 in outer series of upper jaw. Caudal crescentically emarginate. Caudal peduncle $1\frac{1}{2}$ to $1\frac{3}{4}$ as long as deep.

87. *Haplochromis selenurus* ((Regan).

Otopharynx selenurus Regan, *t. c.* p. 679, text-fig. 1.

Nineteen specimens, from both ends of the lake, 110 to 165 mm. in total length.

The colour is often uniformly purplish brown, darker above, especially on nape; a vague dark blotch above upper lateral

line in some is all that is visible of the colour-pattern, except occasionally traces of about eleven cross-bars.

88. *Haplochromis moorii* (Boulenger), 1902.

Cyrtocara moorii Boulenger, Cat. Afr. Fish. iii. p. 445, fig. 304 (1915); Regan, *t. c.* p. 724.

Forty-nine specimens, 67 to 195 mm. in total length, from both ends of the lake.

This very distinct species appears to be related to *H. selenurus*, from which it differs chiefly in the dentition, in the presence of a dermal frontal hump, and in the less emarginate caudal fin. The dermal hump is present in both sexes and increases with age at a rate showing considerable individual variation.

89. *Haplochromis placodon* Regan.

Haplochromis placodon Regan, *t. c.* p. 700, text-fig. 15.

Sixty-eight specimens, 105 to 195 mm. in total length, from both ends of the lake.

This well-marked species seems to be more closely related to *Trematocranus* than to any species of *Haplochromis*, but shows no sign of enlargement of mucus-canals.

90. *Haplochromis nitidus*, sp. n.

Eleven specimens, 80 to 139 mm. in total length, from both ends of the lake.

Teeth in 2 series, occasionally with an incomplete third, minute, outer conical in adult, bicuspid or tricuspid in young, 40 to 76 in outer series of upper jaw. 31 or 32 scales in a longitudinal series. Dorsal XV–XVI 11–13. Anal III 8–10.

The dark patches on the side are very conspicuous, and may be elongated antero-posteriorly so as almost to meet.

91. *Haplochromis pictus*, sp. n.

Eight specimens, 103 to 126 mm. in total length, from both ends of the lake.

Teeth as in *H. nitidus*; 60 to 84 in outer series of upper jaw. 31 to 33 scales in a longitudinal series. Dorsal XV–XVII 10–12. Anal III 9–10. Colour-pattern very conspicuous.

92. *Haplochromis intermedius* (Günther), 1864. (Fig. 10.)

Haplochromis intermedius Regan, *t. c.* p. 701.

Twenty-three specimens, 45 to 212 mm. in total length, from the south end of the lake. One of these is the type, a skin, in which gill-rakers and pharyngeal bones were not

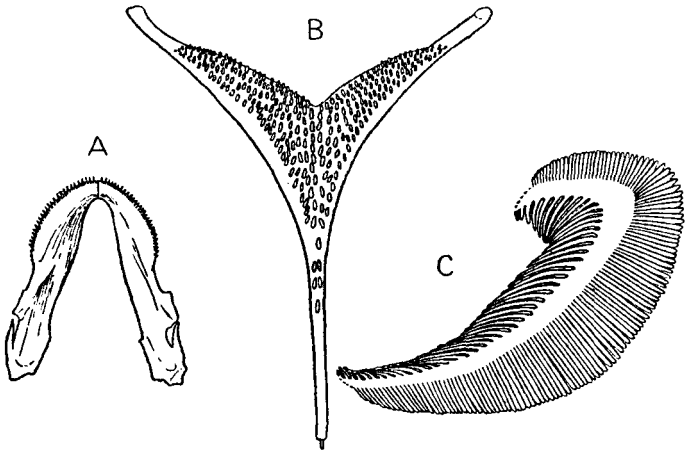
preserved. The dentition and proportions are, however, unmistakable.

93. *Haplochromis inornatus* (Boulenger), 1908.

Tilapia inornata Boulenger, Cat. Afr. Fish. iii. p. 263, fig. 178 (1915).
Haplochromis inornatus Regan, *t. c.* p. 715.

Known only from the types, two specimens, 85 and 95 mm. in total length.

Fig. 10.



Haplochromis intermedius.

A, Lower jaw ; B, lower pharyngeal ; C, first gill-arch.

94. *Haplochromis eucinostomus* Regan.

Haplochromis eucinostomus Regan, *t. c.* p. 761, pl. iv. fig. 1.

Twenty-two specimens, 88 to 125 mm. in total length, probably from both ends of the lake.

Teeth very small, in 2 or 3 series, outer simple or bicuspid, inner simple or tricuspid, 40 to 50 in outer series of upper jaw. 34 or 35 scales in a longitudinal series. Dorsal XV–XVII 11–12. Anal III 9–11. Caudal crescentically emarginate. Caudal peduncle $1\frac{1}{2}$ to $1\frac{2}{3}$ as long as deep.

95. *Haplochromis prostoma*, sp. n.

Six specimens, 76 to 115 mm. in total length, from Vua and Deep Bay.

Teeth as in *H. eucinostomus*. 33 or 34 scales in a longitudinal series. Dorsal XVI–XVII 11–12. Anal III 9–10. Caudal emarginate. Caudal peduncle $1\frac{1}{3}$ to $1\frac{2}{3}$ as long as deep.

Externally this species closely resembles specimens of *H. cyaneus* that have the same colour-pattern, but specimens of *H. cyaneus* that have as few as 17 or 18 gill-rakers are rare, and only one of *H. prostoma* has as many as 16, and even this not on both sides. Moreover, in *H. cyaneus* the præmaxillary pedicels are a little shorter.

96. *Haplochromis chrysonotus* (Boulenger), 1908.

Paratilapia chrysonota Boulenger, Cat. Afr. Fish. iii. p. 362, fig. 246 (1915).
Haplochromis chrysonotus Regan, *t. c.* p. 702.

One hundred and twenty-one specimens, 76 to 163 mm. in total length, from both ends of the lake.

Teeth in 3 or 4 series, conical; 50 to 70 in outer series of upper jaw. 31 to 34 scales in a longitudinal series. Dorsal XV–XVII 9–12. Anal III 9–11. Caudal emarginate. Caudal peduncle as long as or a little longer than deep.

Males often have a bright yellow dorsal fin and back.

97. *Haplochromis cyaneus*, sp. n.

Sixty-two specimens, 100 to 190 mm. in total length, from both ends of the lake.

Teeth in 2 or 3 series, all simple, or some outer bicuspid and inner tricuspid; 50 to 64 in outer series of upper jaw. 31 to 34 scales in a longitudinal series. Dorsal XVI–XVIII 10–12. Anal III 9–11.

98. *Haplochromis quadrimaculatus* Regan.

Haplochromis quadrimaculatus Regan, *t. c.* p. 703.

Sixty-seven specimens, 108 to 200 mm. in total length, from both ends of the lake. Also eighteen young fishes, 38 to 92 mm. long.

Teeth in 2 to 4 series, very small, conical, 50 to 74 in outer series of upper jaw. 32 to 36 scales in a longitudinal series. Dorsal XVI–XVIII 10–12. Anal III 10–12. Caudal emarginate. Caudal peduncle from as long as to $1\frac{1}{2}$ times as long as deep.

This species is very variable in form. The Christy collection includes some very slender specimens, with long caudal peduncle and rather deeply emarginate caudal fin, that contrast sharply with the deep-bodied form represented by some of the types and by other specimens of all sizes; but the extremes are linked by intermediates.

99. *Haplochromis pleurostigma*, sp. n.

A single specimen; 195 mm. in total length, from Deep Bay.

This fish bears some resemblance to *H. serenus*, but has a larger head, longer lower jaw, deeper caudal peduncle, and

less emarginate caudal fin, as well as a different coloration. The teeth are conical, in 4 series, with 68 in the outer series of the upper jaw. There are 34 scales in a longitudinal series.

100. *Haplochromis longimanus*, sp. n.

Forty specimens, 85 to 145 mm. in total length, from the south end of the lake.

Closely related to *H. micrentodon*, from which it differs in the number of gill-rakers. Also the eye is usually a little smaller in specimens of a given size.

101. *Haplochromis micrentodon* Regan.

Haplochromis micrentodon Regan, *t. c.* p. 715, text-fig. 27.

Three specimens, 110 to 150 mm. in total length, from the south end of the lake.

12. Corematodus Boulenger, 1896.

Corematodus Boulenger, Cat. Afr. Fish. iii. 1915, p. 494, fig. 342.

1. *Corematodus shiranus* Boulenger.

Corematodus shiranus Boulenger, Proc. Zool. Soc. London, 1896, p. 919, fig. 4.

Diameter of eye 3⅘ to 5 in length of head, equal to or greater than preorbital depth; interorbital width 2½ to 4 in length of head. Teeth in about 10 (young) to 20 series in broadest part of upper jaw. 31 to 34 scales in a longitudinal series. Dorsal XV–XVI 10–12. Anal III 9–10. Caudal truncate. 5 to 10 narrow blackish cross-bars on body, the first from origin of dorsal to opercular spot; one or two transverse bands on nape and one or two curved bands from eye to eye.

Thirteen specimens, 86 to 230 mm. in total length, from the south end of the lake and the Upper Shiré River.

2. *Corematodus tæniatus*, sp. n.

Diameter of eye 3 to 3½ in length of head, much greater than præorbital depth; interorbital width 3½ to nearly 5 in length of head. Teeth in about 7 (young) to 10 series in broadest part of upper jaw. 31 to 33 scales in a longitudinal series. Dorsal XV–XVII 9–10. Anal III 8–10. Caudal truncate or slightly emarginate. An oblique dark band from nape to base of caudal; a series of spots at base of dorsal.

About thirty specimens, 82 to 170 mm. in total length, and a few smaller (coll. Christy).

13. Docimodus Boulenger, 1896.

A single species, *D. johnstoni* Boulenger (1896, and Cat. Afr. Fish. iii. p. 282, fig. 192 (1915); Regan, *t. c.* p. 722).

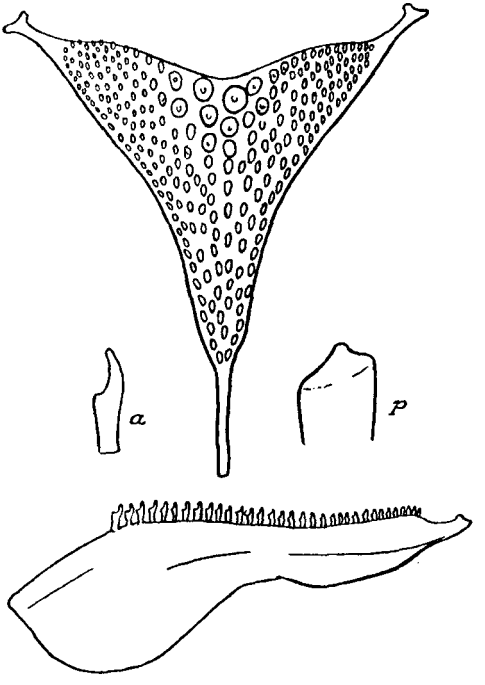
14. Lethrinops Regan, 1921.

To the synopsis of this genus already given (Trewavas, 1931) the following species has now to be added :—

Lethrinops intermedia, sp. n. (Fig. 11.)

Snout from a little shorter to a little longer than diameter of eye, which is $3\frac{1}{6}$ to $3\frac{2}{5}$ in length of head. Lower pharyngeal

Fig. 11.



Lethrinops intermedia. Lower pharyngeal from above and from the side.

a., anterior ; *p.*, posterior tooth of a middle series.

with short, descending, anterior blade ; anterior pharyngeal teeth bicuspid, with ends directed forwards, middle posterior enlarged and blunt. Depth of præorbital 4 to $4\frac{1}{2}$ in length of head. 8 to 10 gill-rakers on lower part of anterior arch. Depth of body $2\frac{2}{5}$ to $2\frac{3}{5}$ in the length. Dorsal XV 10–11. Anal III 8–9. Colour silvery or dark purplish ; sometimes traces of eight vertical bars below dorsal fin ; a dark patch

on nape, one on upper lateral line below spinous dorsal and one below soft dorsal.

Six specimens (coll. Christy), 108 to 160 mm. in total length, from Fort Johnston, Monkey Bay, and the south-west arm of the lake. Also a young fish of 84 mm.

The short snout, few gill-rakers, and short pharyngeal blade indicate relationship with *L. brevis*, but the structure of the pharyngeal teeth places it in the other group of the genus, where its affinities are with *L. argenteus* and *L. lethrinus*.

15. Chilotilapia Boulenger.

Chilotilapia Boulenger, Ann. & Mag. Nat. Hist. (8) ii. 1908, p. 248.

A single species.

Chilotilapia rhoadesii Boulenger. (Fig. 12.)

Chilotilapia rhoadesii Boulenger, *l. c.* and Cat. Afr. Fish. iii. p. 499, fig. 346; Regan, *t. c.* p. 680.

Seventy-two specimens, 40 to 225 mm. in total length, from both ends of the lake, mainly the south.

The colour-pattern, obscured in the types, consists of two dark bands on each side from head to caudal fin, one on middle of side, the other from occiput, above upper lateral line and along upper edge of caudal peduncle. The only other species in Lake Nyasa with two stripes in exactly these positions is *Haplochromis euchilus*, which shows other evidences of close relationship with *Chilotilapia*. The teeth of young *Chilotilapia* are less peculiar than those of the adult, are few and stout, and laterally in the lower jaw are set transversely.

16. Hemitilapia Boulenger.

Hemitilapia Boulenger, Ann. & Mag. Nat. Hist. (7) x. 1902, p. 71.

A single species.

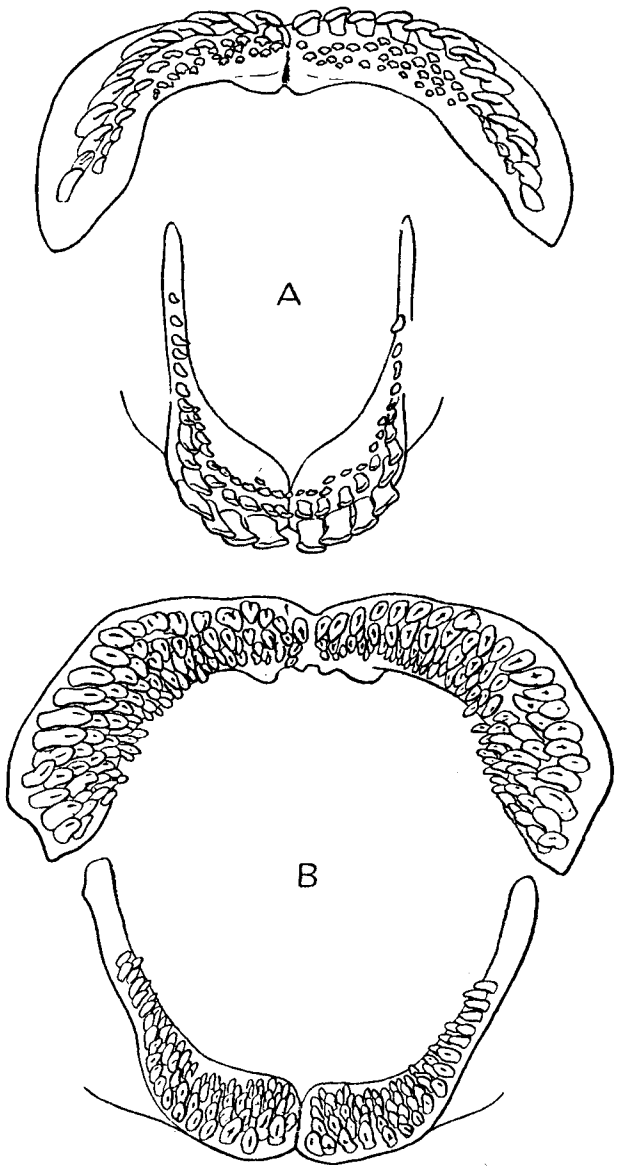
Hemitilapia oxyrhynchus Boulenger, 1902.

Hemitilapia oxyrhynchus Regan, *t. c.* p. 677.

Numerous specimens, 90 to 190 mm. in total length, from both ends of the lake, mainly from the south.

This species is distinguished from *Haplochromis* by the jaws and teeth. Although the obliquely crowned teeth are very like those of the type-species of *Haplochromis* (*H. obliquidens* Hilgendorf, of Lake Victoria), the produced præmaxillaries makes it quite distinct. Its nearest relative in the genus *Haplochromis* is probably *H. labifer* (see above, p. 104), which, however, does not approach it in the dentition of jaws or pharyngeals. The pharyngeal teeth of *Hemitilapia* are minute and numerous.

Fig. 12.



Chilotilapia rhoadesii.

Dentition of jaws in (A) young (×9) and (B) adult (×3).

17. Rhamphochromis Regan, 1921.

Synopsis of the Species.

I. 36 to 40 scales in a longitudinal series; caudal peduncle 1⅓ to 2 as long as deep.

A. Teeth moderate, 20 to 30 on each side of upper jaw. 1. *longiceps*.

B. Teeth fewer and stronger.

1. Eyes rather large, diameter 5 to 6⅔ in length of head (in specimens of 200 to 400 mm.).

Depth 4 to 4⅓ in length ..... 2. *macrophthalmus*.
Depth 3¼ to 3⅔ in length ..... 3. *brevis*.

2. Eyes smaller, diameter 5⅔ to 8½ in length of head (in specimens of 190 to 420 mm.).

Snout ⅓ length of head or a little less, interorbital width 4½ to 5 in head, præmaxillaries from symphysis to end of pedicels 3½ to 3¾.. 4. *woodi*.
Snout ⅓ head or a little less; interorbital width 3⅔ to 4½ in head, præmaxillaries 4 to 4½.... 5. *ferox*.
Snout a little more than ⅓ head, 1½ times postorbital length ..... 6. *lucius*.

II. 40 to 45 scales in a longitudinal series; caudal peduncle 2 to 2¼ as long as deep.

Profile of snout convex: interorbital width 3½ to 4 in length of head, length of lower jaw 2¼ to 2½ ..... 7. *esox*.
Profile of snout straight; interorbital width 4 to 4⅓ in head, lower jaw 2 to 2¼ ..... 8. *leptosoma*.

1. *Rhamphochromis longiceps* (Günther), 1864.

Rhamphochromis longiceps Regan, *t. c.* p. 724.

Eleven specimens, 190 to 250 mm. in total length, from both ends of the lake.

2. *Rhamphochromis macrophthalmus* Regan.

Rhamphochromis macrophthalmus Regan, *t. c.* p. 725, pl. vi. fig. 2.

Eight specimens, 200 to 270 mm. in total length, from both ends of the lake.

3. *Rhamphochromis brevis*, sp. n.

Five specimens, 255 to 400 mm. in total length.

4. *Rhamphochromis woodi* Regan.

Rhamphochromis woodi Regan, *t. c.* p. 725.

Ten specimens, 160 to 420 mm. in total length, from both ends of the lake.

5. *Rhamphochromis ferox* Regan.

Rhamphochromis ferox Regan, *t. c.* p. 725.

Fourteen specimens, 190 to 430 mm. in total length, from both ends of the lake.

6. *Rhamphochromis lucius* Ahl.

Rhamphochromis lucius Ahl, Sitzungsber. Ges. naturf. Fr. Berlin, July 1926 (1927), p. 59.

Two specimens, each 360 mm. in total length, from Deep Bay and Monkey Bay. I have examined the types in Berlin.

7. *Rhamphochromis esox* (Boulenger), 1908.

Rhamphochromis esox Regan, *t. c.* p. 726.

Eight specimens, 175 to 370 mm. in total length, from both ends of the lake.

8. *Rhamphochromis leptosoma* Regan.

Rhamphochromis leptosoma Regan, *t. c.* p. 726.
Rhamphochromis melanotus Ahl, *t. c.* p. 60.

Eight specimens, 330 to 380 mm. in total length, from both ends of the lake.

The types of *H. melanotus* have been examined by me in Berlin. I count only 5 or 6 series of scales on the cheek. The scales, counted by our method, number 42 to 44 in a longitudinal series. My sketch of the head of the smaller specimen (310 mm.) shows it to be a typical *R. leptosoma*. The larger specimen, of which I have no drawing, may perhaps belong to *R. esox*.

18. TREMATOCRANUS, gen. nov.
(type, *T. microstoma*).

Otic region of skull slightly swollen; mucus-cavities of suborbital bones not greatly swollen; cheek with 2 to 4 series of scales. In Nyasa this genus stands in the same relation to *Aulonocara* that *Aulonocranus* does to *Trematocara* in Tanganyika.

Synopsis of the Species.

A. Inner teeth of jaws unicuspid or (young) tricuspid, with middle cusp much bigger than lateral.

Snout short; upper jaw 3⅔ to 3½ in length of head; pharyngeal teeth not much enlarged ..... 1. *brevirostris.*
Snout long; upper jaw 3⅔ to 4 in length of head; pharyngeal teeth considerably enlarged ..... 2. *microstoma.*

B. Inner teeth of jaws with three subequal cusps.. 3. *auditor.*

1. *Trematocranus brevirostris*, sp. n. (Fig. 14, B.)

Snout shorter than diameter of eye, which is 2⅘ to 3 in length of head. 9 to 11 gill-rakers on lower part of anterior arch. 32 or 33 scales in a longitudinal series. Dorsal XV 10–11. Anal III 9. Pectoral as long as head. Caudal peduncle a little longer than deep. Body with about eleven vertical bars; a spot on upper lateral line below spinous

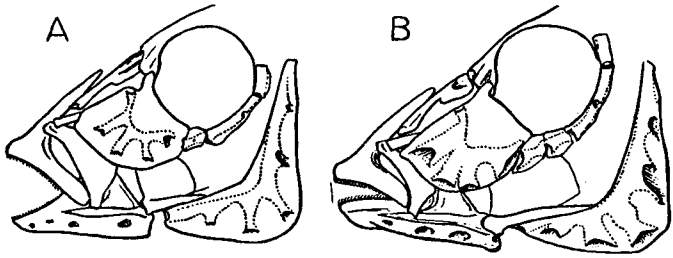
dorsal, one below soft dorsal and a third at base of caudal; an opercular spot.

Two young specimens (coll. Christy), 53 and 72 mm. in total length, from the bar at the south end of Lake Nyasa.

2. *Trematocranus microstoma*, sp. n. (Fig. 13, B.)

Snout, in large specimens, longer than postorbital part of head; diameter of eye 4 to 5 in length of head. 10 or 11 gill-rakers on lower part of anterior arch. Teeth slender, curved, pointed, in 6 to 8 series anteriorly. 32 to 34 scales in a longitudinal series. Dorsal XV–XVI 11–12. Anal III 9–11. Pectoral as long as head or longer. Caudal peduncle as long as or a little longer than deep. A dark blotch on nape, another on upper lateral line below spinous dorsal, a third below soft dorsal, and a fourth, often faint or absent, at base of caudal; an opercular spot.

Fig. 13.



Head-skeleton of (A) *Haplochromis serenus*, (B) *Trematocranus microstoma*. Both natural size.

Twenty specimens (coll. Christy), 140 to 232 mm. in total length, one from the south end of Lake Nyasa, the rest from the northern part of the lake.

This species bears a resemblance to *Haplochromis placodon* in coloration, in dentition of jaws and pharyngeals, in number of gill-rakers, etc. It is also, and more nearly, related to *Aulonocara rostrata*. Probably *H. placodon* is the *Haplochromis* most nearly representing the stock from which *Trematocranus* and *Aulonocara* have evolved.

3. *Trematocranus auditor*, sp. n. (Fig. 14, A.)

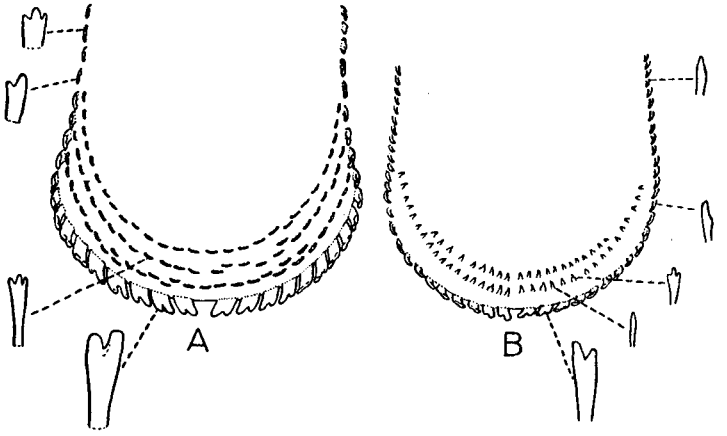
Snout a little shorter than diameter of eye, which is $3\frac{1}{5}$ in length of head. Teeth in four series, those of lower jaw forming a rather broad band anteriorly, giving place abruptly to a single series posteriorly on each side. 11 or 12 gill-rakers on lower part of anterior arch. 33 scales in a longitudinal series. Dorsal XVI 10. Anal III 9. Pectoral not quite

as long as head. Caudal peduncle 1½ as long as deep. Eleven dark vertical bars on each side, bearing a series of spots at base of dorsal, another series on upper lateral line, and a third series below and parallel to the second.

Three specimens, one (coll. Christy) 96 mm., the others (coll. Rhoades) 77 and 84 mm. in total length. The Christy specimen is from Vua.

That this species may not be closely related to the other two is suggested by the different dentition, smaller head, and different coloration.

Fig. 14.



Dentition of lower jaw in (A) *Trematocranus auditor*, (B) *Trematocranus brevirostris*, ×10. Single teeth, ×20.

19. Aulonocara Regan, 1921.

Aulonocara Regan, Proc. Zool. Soc. 1921, p. 726.

In this genus the otic region is more bullate than in *Trematocranus*, and the suborbital bones are so much enlarged as to occupy the whole cheek to the exclusion either of all the scales or of all but a single complete series. The enlargement of the other mucus-channels of the head has proceeded farther than in *Trematocranus*.

Synopsis of the Species.

1. Diameter of eye more than 4¼ in length of head in specimens of 150 mm. or more.

Length of snout 2½ to 3¼ in length of head, interorbital width 4 to 4⅓ ..... 1. *nyassæ*.

Length of snout 2⅓ to 2⅘ in length of head, interorbital width 4¼ to 5¾ ..... 2. *rostrata*.

2. Diameter of eye 4¼ in length of head in a specimen of 170 mm. 3. *macrochir*.

1. *Aulonocara nyassæ* Regan.

Aulonocara nyassæ **Regan, Proc. Zool. Soc. Lond. 1921, p. 727, pl. v. fig. 1.**

In addition to the three types (coll. Wood), the British Museum (Nat. Hist.) collection now contains forty-three specimens (coll. Christy), 50 to 180 mm. in total length.

The original description must be modified to include the larger specimens. Teeth in 4 to 8 series, outer bicuspid in young, all slender and conical in larger specimens. No scales on cheek in young; a single series and occasionally one or two of a second series in large specimens. A few middle pharyngeal teeth slightly enlarged.

2. *Aulonocara rostrata*, sp. n.

Distinguished from *A. nyassæ* by the longer snout and narrower interorbital region. Also, even in older specimens, scales are absent from the cheek, or there is only a single, incomplete series. The young of both species have the body marked with a number of vertical bars, but in *A. nyassæ* 9 or 10 of these are below the dorsal fin, in *A. rostrata* 6 or 7.

Twenty-seven specimens (coll. Christy), 48 to 180 mm. in total length.

3. *Aulonocara macrochir*, sp. n.

Distinguished by the larger eye and by the long pectoral fin, longer than the head. In the other species the pectoral does not exceed the head in length.

A single specimen, 170 mm. in total length (coll. Christy).

20. Diplotaxodon, gen. nov.

Near *Haplochromis*. Mouth oblique; teeth conical, biserial. Paired laminar inferior apophyses extending the whole length of third or third and fourth vertebræ.

Diplotaxodon argenteus, sp. n.

Depth of body $3\frac{1}{2}$ in the length, length of head $2\frac{2}{3}$ to 3. Head $2\frac{1}{2}$ to 3 as long as broad. Snout with straight profile, longer than diameter of eye, which is $3\frac{1}{2}$ to $3\frac{3}{4}$ in length of head, greater than depth of præorbital or cheek; interorbital width 5 to 6 in length of head. Mouth very oblique; lower jaw strongly projecting; maxillary not nearly reaching eye; teeth conical, in two well-separated series, the outer larger, rather strong anteriorly, 60 to 70 in upper jaw. 3 series of scales on cheek. 23 to 25 gill-rakers on lower part of anterior arch. Pharyngeal teeth small, bicuspid; 14 or 15 in a middle series. 34 to 36 scales in a longitudinal series, 5 from origin of dorsal to lateral line. Dorsal XIV–XV 11–13; spines

slender, last $\frac{1}{3}$ length of head. Anal III 10–11 ; third spine stronger and shorter than last dorsal. Pectoral $\frac{2}{3}$ to $\frac{3}{4}$ length of head, not reaching anal. Caudal emarginate. Caudal peduncle $1\frac{1}{2}$ to $1\frac{3}{4}$ as long as deep. Silvery.

Three specimens, 170 to 180 mm. in total length, from the south end of the lake ; also a skeleton.

21. LICHNOCHROMIS, gen. nov.

Near *Haplochromis*, but without inferior apophyses on anterior vertebræ. Snout long ; mouth narrow ; præmaxillaries produced and beak-like. Teeth in a single series except anteriorly ; outer teeth compressed, entire, notched or distinctly bicuspid.

Lichnochromis acuticeps, sp. n.

Depth of body $3\frac{2}{5}$ in the length, length of head $2\frac{1}{2}$. Snout straight, oblique, nearly $\frac{1}{2}$ length of head ; præmaxillary pedicels $\frac{2}{3}$ length of head ; lower jaw projecting ; maxillary ending below nostril ; teeth of outer series close-set ; in front 2 or 3 inner series of smaller teeth, the anterior pair of the first lower series somewhat enlarged. 4 series of scales on cheek. 12 gill-rakers on lower part of anterior arch. Pharyngeal teeth small. 33 scales in a longitudinal series, 5 from origin of dorsal to lateral line. Dorsal XVI 11 ; last spine $\frac{1}{3}$ length of head. Anal III 9 ; third spine stronger and a little shorter than last dorsal. Pectoral $\frac{2}{3}$ length of head, reaching origin of anal. Caudal scaly, emarginate. Caudal peduncle $1\frac{1}{2}$ as long as deep. A dark bar from eye to maxillary ; two curved bars across snout, and another across anterior part of interorbital region ; a transverse band across posterior part of interorbital region, an opercular spot ; a blackish oblique band from nape to base of caudal ; dorsal spotted.

One specimen, 125 mm. in total length.

22. ARISTOCHROMIS, gen. nov.

Perhaps related to *Haplochromis rhoadesii*. The strongly compressed head recalls that of the Labrid *Xyrichthys*.

Aristochromis christyi, sp. n.

Depth of body 3 in the length, length of head $2\frac{2}{3}$ to 3. Upper profile of head convex to in front of eyes, then declivous. Snout as long as or a little shorter than postorbital part of head ; diameter of eye 5 to $6\frac{1}{2}$ in length of head, less than præorbital depth, $\frac{1}{2}$ to $\frac{2}{3}$ depth of cheek ; interorbital width 6 to 8 in length of head. Præmaxillaries beak-like anteriorly, projecting a little beyond lower jaw ; fold of upper lip narrow,

widely interrupted; maxillary extending to below eye; teeth small, conical, in 3 or 4 series anteriorly. 5 to 7 series of scales on cheek. 10 to 12 gill-rakers on lower part of anterior arch. Pharyngeal teeth small. 34 to 36 scales in a longitudinal series, 5 or 6 from origin of dorsal to lateral line. Dorsal XV–XVII 11–13; last spine from less than $\frac{1}{4}$ to $\frac{2}{7}$ length of head. Anal III 9–11; third spine stronger and as long as or shorter than last dorsal. Pectoral $\frac{3}{5}$ to $\frac{3}{4}$ length of head. Caudal densely scaled, truncate or somewhat emarginate. Caudal peduncle $1\frac{1}{3}$ to $1\frac{2}{3}$ as long as deep. Head usually with irregular spots, body sometimes with cross-bars; a blackish band or series of spots at base of dorsal, extending on to upper edge of caudal peduncle; an oblique blackish band, mainly below upper lateral, and from nape to middle of base of caudal; soft dorsal usually spotted.

Nineteen specimens, 130 to 250 mm. in total length.

23. Serranochromis Regan, 1920.

One species in Lake Nyasa.

Serranochromis thumbergi (Castelnau), 1861.

***Serranochromis thumbergi* Regan, *t. c.* p. 264.**

Katanga and Angola to Lake Nyasa.

Numerous specimens, up to about 380 mm. in total length, from both ends of the lake.