

membrane of the trachea exactly as in *Ophiophagus*. Moreover, a kind of septum appears to divide that pouch into two, so that there are, at least, traces of metamerism. There is, however, no evidence of any connection in the past between this pouch and the lung.

3. Report on the Fishes collected by Mr. Oscar Neumann and Baron Carlo von Erlanger in Gallaland and Southern Ethiopia. By G. A. BOULENGER, F.R.S., V.P.Z.S.

[Received October 29, 1903.]

(Plates XXIX.-XXXI.*)

Mr. Oscar Neumann has entrusted to me for study the fishes collected on the expedition from Zeila through Southern Ethiopia to the Upper Nile in 1900-1901, of which he gave an account at the Geographical Society in June 1902, and which is printed in the 'Geographical Journal' for October 1902, with a map, to which I refer the readers for the position of the localities mentioned in this report.

The fishes are all from East of the Nile system and were obtained in the following waters:—

Modjo, Iraro, and Wabbi Rivers, affluents of the Webi Shebeli; Kassam, Gadschimboda, and Suksuk Rivers, affluents of the Hawash; Maki River, flowing into Lake Zwai; Omo River, flowing into Lake Rudolf; and Lake Gandjule, south of Lake Abaia.

The following list of 19 species, 4 of which are described as new, extensively supplements our scanty knowledge of the fishes of that part of Africa, based on the small collections previously made by Marquis Antinori, Capt. Bottego, Prince E. Ruspoli, and Dr. Donaldson Smith, which have been reported upon by Dr. Vinciguerra† and Dr. Günther‡. Collections had also previously been made in the Kassam and Maki Rivers by Mr. E. Degen on his way to Lake Tsana, but the five new species discovered by him and described by me§ are, curiously, not represented in the collection made in those rivers by Mr. Neumann and Baron v. Erlanger.

MORMYRIDÆ.

1. MORMYRUS KANNUME Forsk.

A single specimen, from the Wabbi River.

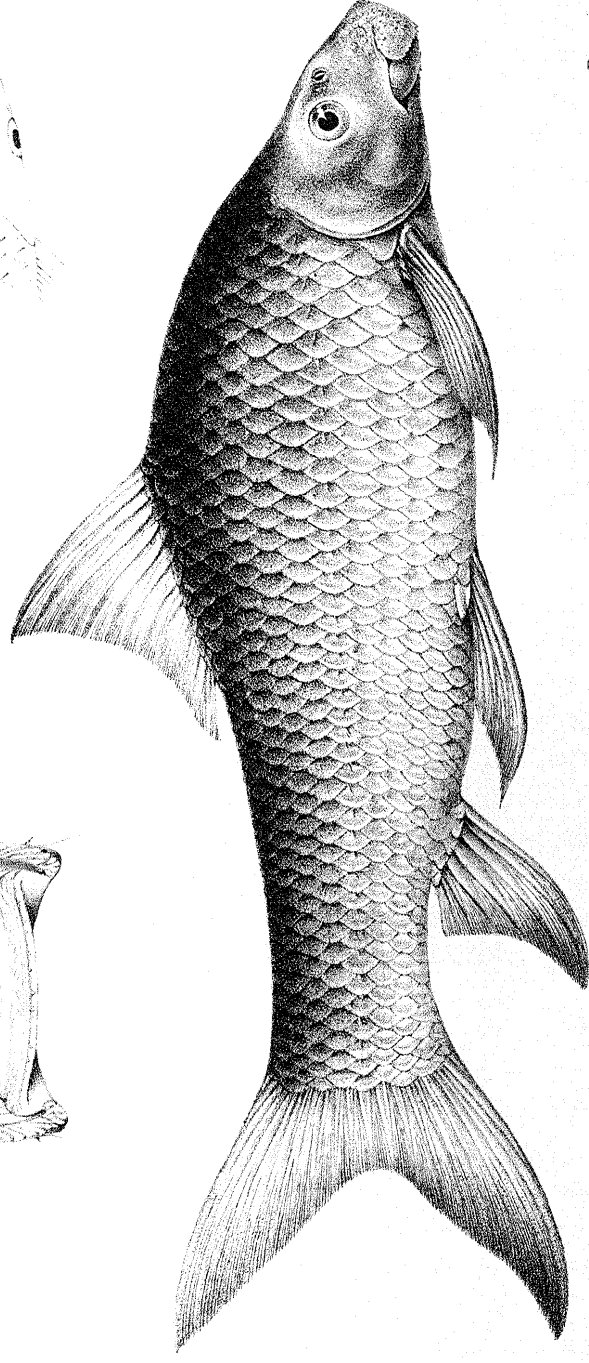
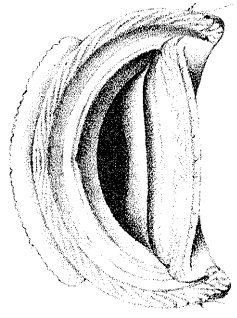
* For explanation of the Plates, see p. 334.

† Ann. Mus. Genova, xviii. 1883, p. 691, xxxv. 1895, p. 21, xxxvii. 1896-97, pp. 24 & 343.

‡ P. Z. S. 1896, p. 217.

§ Ann. & Mag. N. H. (7) x. 1902, p. 421.

P.Z.S. 1903, vol. II, Pl. XXIX.

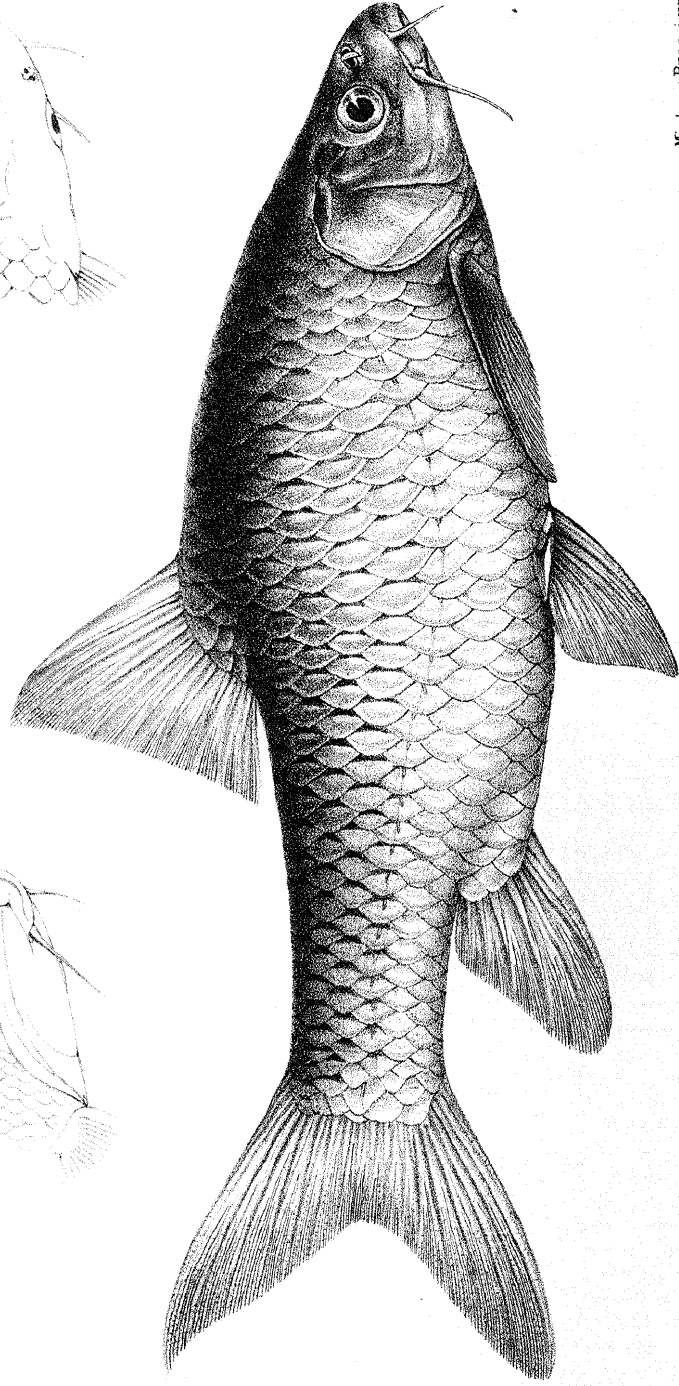
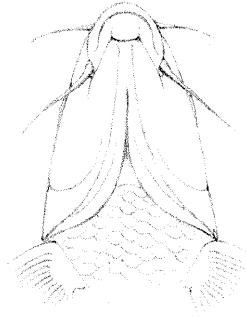
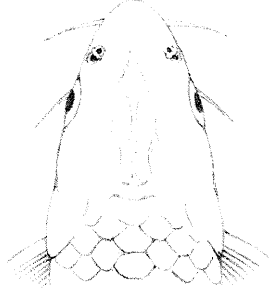


Mintern Bros. imp.

LABEO NEUMANNI.

J. Green del. et lith.

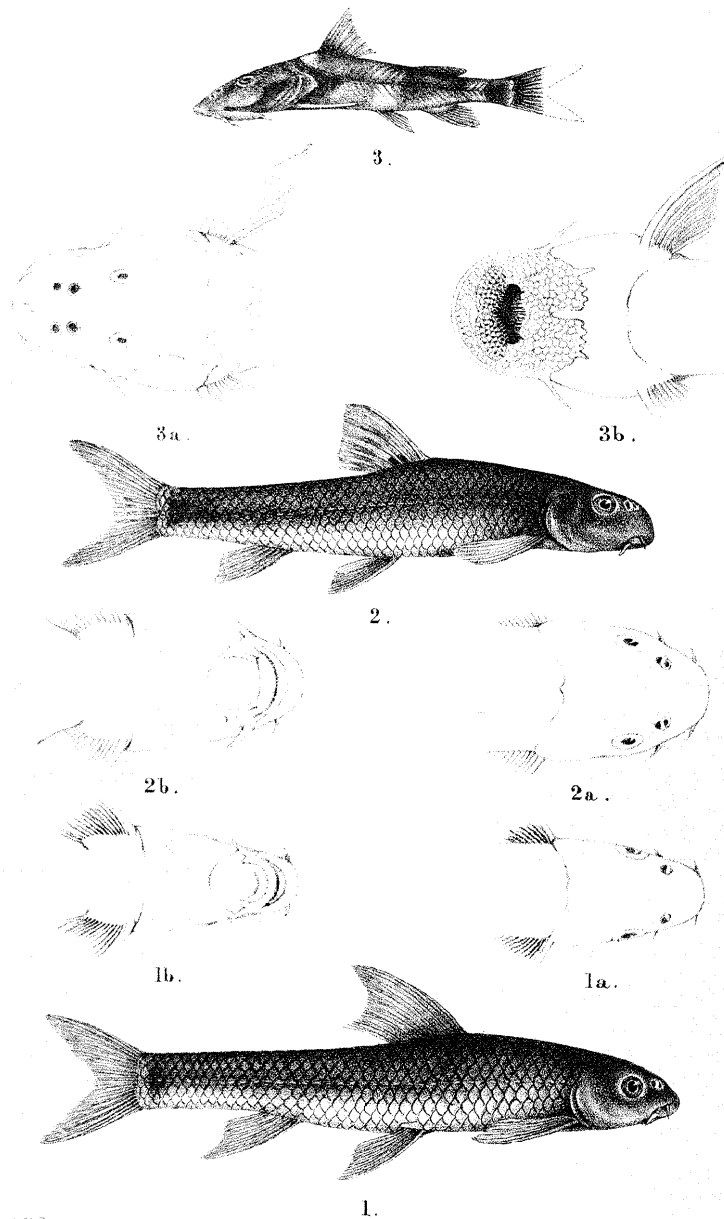
P.Z.S. 1903, vol. II, Pl. XXX.



Münster Bros. imp.

BARBUS ERLANGERI.

J. Green del. et lith.



J. Green del. et lith.

Mintern Bros. imp.

1. DISCOGNATHUS MAKIENSIS. 2. DISCOGNATHUS BLANFORDII.
3. CHILOGLANIS MODJENSIS.

CHARACINIDÆ.

2. *HYDROCYON FORSKALII* Cuv.

Several young specimens from Lake Gandjule.

3. *ALESTES AFFINIS* Gthr.

Several specimens, from the Wabbi and Modjo Rivers.

4. *ALESTES MACROLEPIDOTUS* Cuv.

Several specimens from the Omo River.

5. *MICRALESTES ACUTIDENS* Peters.

Several specimens from the Omo River.

This fish, originally described from Mozambique, has since been found in the Ubanghi, in the Nile, and in the Niger.

CYPRINIDÆ.

6. *LABEO NEUMANNI*, sp. n. (Plate XXIX.)

Depth of body $3\frac{1}{4}$ to $3\frac{3}{4}$ times in total length, length of head $4\frac{1}{3}$ to $4\frac{2}{3}$ times. Head $1\frac{1}{4}$ to $1\frac{1}{2}$ as long as broad; snout rounded, with small horny warts, its length $\frac{2}{5}$ to a little less than $\frac{1}{2}$ that of the head; eye perfectly lateral, its diameter $4\frac{1}{3}$ to $5\frac{1}{2}$ times in the length of the head; interorbital width $\frac{1}{2}$ length of head, $2\frac{1}{3}$ to 3 times the diameter of the eye; mouth strongly arched, its width $\frac{2}{5}$ to $\frac{1}{2}$ the length of the head; lips with small papillæ forming transverse plicæ; lower lip with a fringe of conical papillæ; rostral flap large, with denticulate edge; a minute barbel in the corner of the mouth, hidden under the folds of the mouth. Dorsal fin composed of III 11-12 rays, a little nearer the end of the snout than the root of the caudal, its upper edge concave, the last simple ray longest and as long as or slightly longer than the head. Anal with III 5 rays, falcate, its longest ray nearly as long as the head, reaching or nearly reaching the root of the caudal. Pectoral subfalciform, as long as or a little longer than the head, not quite reaching the ventral, the first ray of which falls below the 4th or 5th branched ray of the dorsal. Caudal fin deeply emarginate, crescentic when fully spread out. Caudal peduncle $1\frac{1}{4}$ to $1\frac{1}{2}$ as long as deep. Scales finely striated longitudinally, 39-40 $\frac{7\frac{1}{2}}{1\frac{1}{3}-1\frac{2}{3}}$, 5 between the lateral line and the base of the ventral, 16 or 18 round the caudal peduncle. Olive above, whitish beneath; fins greyish (in spirit).

Five specimens, measuring 140 to 320 millimetres, from the Modjo and Wabbi Rivers.

Distinguished from *L. gregorii* Gthr. by the broader interorbital space and the more numerous scales.

Three very small specimens, measuring from 18 to 27 millimetres, from the Wabbi, may, I think, be safely referred to the same species.

7. *LABEO CYLINDRICUS* Peters.

Two specimens, measuring 64 and 150 millimetres respectively, from the Modjo River. Diameter of eye $4\frac{1}{2}$ and 5 times in length of head. D. III 9. Sq. 35-37 $\frac{5\frac{1}{2}}{7\frac{1}{3}}$, 4, 16.

8. *DISCOGNATHUS MAKIENSIS*, sp. n. (Plate XXXI. fig. 1.)

Body feebly compressed, its depth 5 to 6 times in the total length. Head as broad as deep, $1\frac{1}{2}$ as long as broad, $\frac{1}{5}$ to $\frac{1}{4}$ total length; snout rounded, projecting beyond the mouth; interorbital region convex, its width not quite half the length of the head; eye lateral, but better visible from above than from below, in the middle of the length of the head, its diameter 4 to $5\frac{1}{2}$ times in the length of the head and twice to twice and a half in the interorbital width; width of mouth not quite $\frac{1}{3}$ the length of the head; upper lip well developed, not fringed; lower lip forming a mental disk which is broader than long; two barbels on each side, measuring $\frac{2}{3}$ to $\frac{4}{5}$ the diameter of the eye. Dorsal with 10 rays, 7 of which are branched, equally distant from the end of the snout or the nostrils and from the root of the caudal; first branched ray longest, a little longer than the head. Anal II 5, first branched ray longest, $\frac{3}{4}$ to $\frac{5}{6}$ the length of the head. Pectoral as long as or slightly longer than the head, not reaching the ventral, which is situated below the middle of the dorsal. Caudal fin deeply emarginate, longer than the head. Caudal peduncle $1\frac{1}{2}$ to $1\frac{3}{4}$ as long as deep. Scales 38-40 $\frac{5\frac{1}{2}}{7\frac{1}{3}}$, $3\frac{1}{2}$ or 4 between the lateral line and the ventral, 16 round the caudal peduncle. Olive above, white beneath.

Six specimens, measuring from 48 to 80 millimetres. Maki River, running into L. Zwai.

9. *DISCOGNATHUS BLANFORDII* Blgr. (Plate XXXI. fig. 2.)

Several specimens from the Gadschimboda R., affluent of the Hawash.

10. *DISCOGNATHUS QUADRIMACULATUS* Rüpp.

Several specimens from the Gadschimboda and Suksuk Rivers.

Eye in the middle of the length of the head, its diameter $3\frac{1}{2}$ (young) to 5 times in the length of the head; barbels $\frac{1}{2}$ to $\frac{2}{3}$ the diameter of the eye; mental disk small, feebly marked, a little longer than broad. Scales 39-42 $\frac{5\frac{1}{2}}{7\frac{1}{3}}$, 4 between lateral line and ventral. The largest specimen is 55 millimetres long.

Described from Abyssinia by Rüppell under the names of *Gobio quadrimaculatus* and *G. kirticeps*. Young specimens from Lake Arsadé, south of Shoa, have been described by Vinciguerra as *Discognathus chiarinii*.

We are now acquainted with six African species of the genus

Discognathus, which may be distinguished by means of the following synopsis:—

- I. Pupil of the eye in the second half of the length of the head; barbels not more than half diameter of eye; caudal peduncle $1\frac{1}{3}$ to $1\frac{1}{2}$ as long as deep; scales in lateral line 37 to 40.
 - Snout projecting strongly beyond the mouth, the width of which is less than half the length of the head; upper lip well developed, with a series of papille forming a fringe *D. dembeensis* Rüpp.
 - Snout projecting feebly beyond the mouth, the width of which equals half the length of the head; upper lip scarcely developed, not fringed *D. johnstonii* Blgr.
- II. Pupil of the eye in the middle, or anterior to the middle, of the length of the head.
 1. Mental disk well developed, with free posterior border.
 - Barbels $\frac{2}{3}$ diameter of eye; eye lateral; dorsal fin equally distant from centre or posterior border of eye and root of caudal; caudal peduncle as long as deep; lat. l. 35-38 *D. vinciguerræ* Blgr.
 - Barbels $\frac{1}{2}$ to $\frac{2}{3}$ diameter of eye; eye supero-lateral; dorsal fin equally distant from eye and root of caudal, or a little nearer the latter; caudal peduncle $1\frac{1}{3}$ to $1\frac{1}{2}$ as long as deep; lat. l. 33-37. *D. blanfordii* Blgr.
 - Barbels $\frac{2}{3}$ to $\frac{1}{2}$ diameter of eye; eye lateral; dorsal fin equally distant from end of snout or nostrils and root of caudal; caudal peduncle $1\frac{1}{3}$ to $1\frac{1}{2}$ as long as deep; lat. l. 38-40 *D. makiensis* Blgr.
 2. Mental disk very indistinct, or reduced to a mere pad, without free posterior border; barbels $\frac{1}{2}$ to $\frac{2}{3}$ diameter of eye; dorsal fin equally distant from centre or posterior border of eye and root of caudal; caudal peduncle about $1\frac{1}{2}$ as long as deep; lat. l. 37-42 *D. quadrimaculatus* Rüpp.

11. BARBUS ERLANGERI, sp. n. (Plate XXX.)

Depth of body 3 to $3\frac{1}{3}$ times in total length, length of head $3\frac{1}{2}$ to $4\frac{1}{3}$ times. Snout rounded or subacuminate, prominent, its length 3 to $3\frac{1}{2}$ times in length of head; diameter of eye $3\frac{1}{3}$ (young) to 5 times in length of head, interorbital width $2\frac{1}{2}$ to 3 times; mouth small, inferior, its width $\frac{1}{5}$ to $\frac{1}{4}$ length of head; lips well developed, the lower continuous across the chin, forming a small, rounded median lobe; barbels two on each side, the anterior $\frac{2}{3}$ the diameter of the eye in the young, $1\frac{1}{3}$ in the adult, the posterior longer, as long as the eye in the young, twice as long as the eye in the adult, the distance between them measuring $\frac{1}{2}$ (young) to 1 diameter of eye. Dorsal IV 9; last simple ray very strong, bony, smooth, its ossified part $\frac{2}{3}$ to $\frac{5}{6}$ the length of the head; the border of the fin feebly emarginate; the distance of the dorsal from the occiput equal to or a little less than its distance from the root of the caudal fin. Anal with III 5 rays, not reaching, or nearly reaching, the caudal when folded. Pectoral fin pointed, as long as or a little shorter than the head, not reaching ventral; latter originating slightly in advance of first

ray of dorsal. Caudal fin deeply forked. Caudal peduncle $1\frac{1}{2}$ to $1\frac{2}{3}$ as long as deep. Scales finely striated, 30-35 $\frac{5\frac{1}{2}-6\frac{1}{2}}{4\frac{1}{2}-5\frac{1}{2}}$, $2\frac{1}{2}$ between lateral line and ventral fin, 12 or 14 round caudal peduncle.

Silvery, back olive-brown (in spirit).

14 specimens, measuring from 65 to 270 millimetres.

Wabbi, Modjo, and Iraro Rivers.

A very close ally of *B. duchesnii* Blgr., differing in the shorter anterior barbels.

12. BARBUS PALUDINOSUS Peters.

Several specimens from the Suksuk River.

13. BARILIUS NILOTICUS Joannis.

Several specimens from the Omo River, between Malo and Koscha.

14. BARILIUS LOATI Blgr.

A single young specimen, same locality as the preceding.

15. NEOBOLA BOTTEGI Vincig.

Several specimens from the Wabbi and Modjo Rivers, and from the Omo River.

The genus *Neobola* is very closely related to *Chelaethiops*, from which it differs in the origin of the dorsal fin corresponding or nearly corresponding to that of the anal, and in the absence of a ventral keel. The snout of *Neobola bottegi* is shorter and more obtuse than that of *Chelaethiops bibie*, and does not at all project beyond the mouth; the pectoral fin does not extend or extends but very slightly beyond the root of the ventral. The largest specimen collected by Mr. Neumann measures 73 millimetres.

SILURIDE.

16. CLARIAS ROBECCHII Vincig.

Three specimens, Hawash River and its affluent the Kassam River.

17. CHILOGLANIS MODJENSIS, sp. n. (Plate XXXI. fig. 3.)

Body slightly compressed, its depth $5\frac{1}{2}$ times in the total length. Head depressed, $1\frac{1}{3}$ as long as broad, its length 3 times in the total length. Eye directed upwards, in the second half of the head, its diameter 7 times in the length of the head, $1\frac{2}{3}$ or twice in the interorbital width, which is greater than the distance between the eye and the posterior nostril; premaxillary teeth in two large contiguous groups, forming 4 or 5 transverse series; a group of 7 to 9 slender mandibular teeth; maxillary barbel $\frac{1}{4}$ the

length of the head, longer than the lower labials. Dorsal I 5; spine not serrated, not quite $\frac{1}{2}$ the length of the head. Adipose fin low, its base measuring about $\frac{2}{3}$ its distance from the rayed dorsal. Anal III 6-7. Pectoral spine not serrated, $\frac{2}{3}$ the length of the head. Ventral extending to a little beyond the origin of the anal. Caudal peduncle twice and a half as long as deep. Dark brown above and on the sides, with three yellowish bars, the first in front of the dorsal fin, the second above the ventral, the third on the caudal peduncle; lower parts white.

Total length 40 millim.

Two specimens from the Modjo River.

The four species now known of this genus differ in the following characters:—

A. Maxillary barbel much longer than eye.

C. deckenii Peters.—Depth of body $5\frac{1}{2}$ to $6\frac{1}{3}$ times in total length; interorbital width equal to distance between posterior nostril and eye; D. I 5; A. III 6; pectoral spine more than $\frac{2}{3}$ length of head.

C. modjensis Blgr.—Depth of body $5\frac{1}{2}$ times in total length; interorbital width greater than distance between posterior nostril and eye; D. I 5; A. III 6-7; pectoral spine $\frac{2}{3}$ length of head.

C. niloticus Blgr.—Depth of body 4 to $4\frac{1}{2}$ times in total length; interorbital width greater than distance between posterior nostril and eye; D. I 6; A. III 8; pectoral spine $\frac{2}{3}$ length of head.

B. Maxillary barbel scarcely longer than eye.

C. brevibarbis Blgr.—Depth of body 6 times in total length; interorbital width greater than distance between posterior nostril and eye; D. I 5; A. III 7; pectoral spine $\frac{2}{3}$ length of head.

The new species may therefore be regarded as intermediate between the two previously described, *C. deckenii* from German East Africa, and *C. niloticus* from the Upper Nile.

CYPRINODONTIDÆ.

18. HAPLOCHILUS ANTINORII Vincig.

A single specimen from the Suksuk River.

The species was only known from Lake Arsade, south of Shoa, in the district of the Adda-Gallas, whence the types of the *Discognathus chiarinii* noticed above (p. 330) were also obtained.

CICHLIDÆ.

19. TILAPIA NILOTICA L.

Numerous specimens. Lake Gandjule, and Wabbi, Modjo, and Suksuk Rivers; also in the hot springs of the Hawash River near Filoa.

EXPLANATION OF THE PLATES.

PLATE XXIX.

Labeo neumanni, p. 329, reduced $\frac{1}{2}$, with upper view of head, reduced $\frac{1}{2}$, and open mouth, nat. size.

PLATE XXX.

Barbus erlangeri, p. 331, reduced $\frac{3}{5}$, with upper and lower views of head, same reduction.

PLATE XXXI.

- Fig. 1. *Discognathus makiensis*, p. 330, nat. size, with upper (a) and lower (b) views of head, $\times 1\frac{1}{2}$.
 2. *Discognathus blanfordii*, p. 330, do., do.
 3. *Chiloglanis modjensis*, p. 332, nat. size, with upper (a) and lower (b) views of head, $\times 2$.

December 1, 1903.

DR. HENRY WOODWARD, F.R.S., Vice-President, in the Chair.

Mr. F. Martin Duncan exhibited, by means of the Bioscope, a series of pictures of Zoological subjects, and made the following remarks:—

For many years past I have kept a permanent record of my investigations in various branches of Natural Science, by means of the Camera, using in the field various forms of hand and stand cameras, and in the laboratory a special photomicrographic outfit.

My first application of photography as a means of recording scientific investigations was in helping my father (the late Professor P. Martin Duncan, F.R.S.) in his works on the Fossil and Recent Corals and Echinoderms. Although in many cases a single photograph or a series of photographs will, to a greater or less degree, demonstrate the appearance or phenomena under investigation, I have always felt in zoological work, particularly in studying the movements and habits of animal and insect life, that ordinary photography left much to be desired. Although a long series of photographs will give us an animal in various positions, very often the one most characteristic position desired is not obtained, and the point, therefore, missed. This is particularly the case in dealing with the mode of seeking and capturing prey by the Carnivora; and when I brought my photographic efforts to bear upon work relating to the habits of wild animals in their natural environment, when seeking and seizing their food, I found the ordinary series of snap-shots failed lamentably to give a graphic idea of the facial expressions and characteristic movements of the animal.

It was this want which led me primarily to consider the advisability of applying Animated Photography to Zoological study. As a lecturer and teacher of Zoology and Botany, I felt at once that if it were possible to place before my audience or class "living pictures" of animal, insect, and vegetable life, I should have a very