Discocera laticornis 1851. Dallas, Catalogue p. 78.
- - 1867. Walker, Catalogue I. p. 114.
- - 1870. Stål, prt. l. c. (außer Guarayos).
- - 1893. Lethierry-Séverin, prt. l. c.
- - 1907. Schouteden, prt. l. c.
- - 1909. Kirkaldy, prt. l. c.

Im Berliner Museum 3 ♀♀ Bahia (Rolle).

Verbreitung anscheinend Nordost- und Ostbrasilien.

2) Oberseite gelbbraun. Die Medianlinie über Pronotum und Scutellum fast orangegelb, stark in der Färbung abstechend.

7. *D. laticornis* Blanch.

D. laticornis Blanchard 1843 in d'Orbigny, Voyage América merid. V. p. 220. VI. Pl. 30. fig. 9.

D. laticornis Stål 1870. l. c. prt. (außer Para).

Im Berliner Museum 1 ♂ Bolivia: Prov. Sara. 750 m (J. Steinbach).

Bisher nur aus Bolivien bekannt (Provinz Guarayos).

4. The Scales of the European Cyprinoid Fishes.

By T. D. A. Cockerell.

With 3 figs.

eingeg. 4. Oktober 1910.

After having spent much time in the study of the scales of American Cyprinidae, I became very anxious to investigate those of the old World genera, especially since the latter appeared to be more primitive, and consequently more likely to throw light on the evolution of the squamation of the family. It was impossible to obtain the necessary material in America, but my opportunity came when I visited the British Museum, where, thanks to Dr. Boulenger, I had access to the very large collections there preserved. Although I did not obtain materials for any complete survey of the scales of the European Cyprinoids, I secured enough to make it seem worth while to present an account of their characters. I also consulted the work of Fatio, published in 1882, in which the scales of the Swiss freshwater fishes are figured. I also, thanks to Dr. A. S. Woodward, was able to examine a considerable series of fossil European Cyprinidae. The scales described, unless the contrary is stated, are all from the vicinity of the lateral line, at about the level of the beginning of the dorsal fin.

Tinca.

Tinca vulgaris Cuvier = *Tinca tinca*. Constantinople (Milligan) Scales about 6 mm long and 2½ broad, with radii all around: nuclear region very near the base. This scale is absolutely unique, so far as my knowledge goes. The fossil species of *Tinca* from Oeningen agree. The American *Algansea tincella* has rather similar but broader and much smaller scales, with the apical circuli very coarse, whereas in *Tinca* they are extremely fine. The *Algansea* scale is only about 2 mm long. *Schizothorax biddulphii* Günther, has an elongate scale, shaped nearly as in *Tinca*, but the circuli are very coarse and the radii are relatively few, only about 13 altogether. In the structure of the apical circuli, *Algansea* is like *Schizothorax* and not like *Tinca*. There is a curious resemblance in pattern, and indeed also in the basal nucleus, between the scales of *Tinca* and those of the Cobitid *Misgurnus fossilis*. The *Misgurnus* scale however, is round, or rather broader than long.

Phoxinus.

Phoxinus phoxinus. Leyn Arenég, Merioneth (H. E. Forrest). Minute scales, much broader than long, the nuclear area subcentral; radii all around. Very different from the scales of *Leuciscus*, and also different from the so-called American *Phoxinus*, which are now referred to *Margariscus*. The American genus *Chrosomus* has scales resembling those of *Phoxinus*, and the fishes of both genera and brightly colored, or at least the males in the breeding season. Whether the various other European and Asiatic species assigned to *Phoxinus* have similar scales I do not know, but those of the North African *Phoxinellus* are quite distinct, with no basal radii. *Leuciscus helveticus* Winkler, from the Miocene of Oeningen, has round scales, the circuli fine and regular, strong; apical radii about seven, wide apart; basal radii separated by an interval from the apical. This is apparently intermediate between *Leuciscus* and *Phoxinus*, but nearer to *Leuciscus*. The scales of *L. oeningensis* Agassiz, as figured, are circular, with characteristic *Phoxinus* sculpture, but on examing a fish so-labelled, I found them similar to those of *L. helveticus*, the basal radii very distinct. Further study of these fossils is desirable.

Rhodeus.

Rhodeus amarus. I do not possess the scales of this species, but they are figured by Fatio. They are very much broader than long, except those on the caudal peduncle, which are oval. The basal radii are absent.

Spirlinus bipunctatus, as figured by Fatio, is of the same general type, with no basal radii, but has only about eight apical radii, *Rhodeus* having about twice as many. I have scales of *Acanthorhodeus taenianalis* from Shanghai (Swinhoe), and these are very broad and short like those of *Rhodeus*. The middle apical radii are wavy or zigzag, and this peculiarity is also seen in the radii of *Paracheilognathus rhombea* (Schleg.) from Japan.

Alburnus.

Alburnus lucidus Heck. Lake Wenern, Sweden. Scales about $3^1/_2$ mm long and $5^1/_2$ broad, thus well distinguished by their shape from those of all *Leuciscus*, *Abramis* (except *ballerus*) and *Barbus*. On account of the broad form, they may be compared with *Rhodeus*, but I do not think any real affinity is indicated. The nucleus is subcentral, the circuli are rather coarse, and the radii are rather poorly developed; there are about five to eight apical radii, and only indistinct traces of basal ones.

Alburnus filippii Kessl. Souj Boulak (N. T. Günther). Scales about 3 mm long, and a little over 3 broad, subtriangular in form, the corners broadly rounded. Circuli coarse; apical radii well developed, about 9 to 12; basal radii feeble and more or less broken, yet evident and rather numerous. The nucleus, while basad of the middle, is not nearly so much so as in *Gobio*. This is readily distinguishable from *A. lucidus*; it strongly approaches *Chondrostoma*.

Chondrostoma.

I have discussed this genus in Proc. Biological Soc. Washington, XXII, p. 210. The scales vary on the same fish from subquadrate to subtriangular, always with the apex broadly rounded. The number of apical radii also varies greatly on the same fish, as has been pointed out to me (in *C. soetta*) by Mr. Regan. In general terms, the *Chondrostoma* scale may described as about as broad as long, with evident (rarely evanescent) laterobasal angles, strong apical radii and irregular but evident basal ones, no lateral radii, apical circuli very coarse. The last character is especially distinctive. The specific differences (five species examined) are rather feeble. Some *Barbus*, as *B. callensis* from Algiers, have very *Chondrostoma*-like scales.

Gobio.

Gobio fluviatilis = *vulgaris* = *gobio*. River Neckar near Canstatt. Scales about 4 mm long and 5 broad, inclined to be subtriangular; nucleus very near the base; no basal radii; numerous (about 25) apical radii; lateral circuli coarse and well defined; apical circuli wanting,

but between the radii are transverse marks representing lines of growth. A very distinct and characteristic scale, not to be confused with any other European type. Fatio figures a system of jointed longitudinal apical circuli (apparently), like those of the Acanthopterygians. I can

Fig. 1.

Fig. 2.

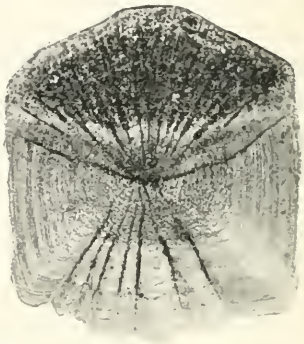

Fig. 1. *Pseudogobio esocinus.* Goto Island, Japan (Gordon Smith). A scale of the *Gobio* type, with the circuli lacking in the apical field.
Fig. 2. *Cyprinus kollarii.* Thetford, Norfolk (Lord Walsingham).

find nothing of the kind. In the asiatic *Saurogobio dumerilii* the circuli also disappear in the apical field, which is covered with very fine and more or less wavy radii; the basal radii also are absent. In *Saurogobio* however, the nucleus is not far basad as it is in *Gobio*.

Fig. 3. *Abramis elongatus.* Würm See, Bavaria (Prof. v. Siebold.)

The Chinese *Leucogobio* I have not seen. *Dangila kuhlii* from Sumatra has a gobiiform scale, while that of *Pseudogobio esocinus* from Japan is altogether of the *Gobio* type.

Abramis.

I have discussed this genus in Proc. Biological Soc. Washington, XXII, p. 211. The so-called American *Abramis* belong to a distinct genus, *Notemigonus*.

Barbus.

I have given a general account of this genus in Proc. Biol. Soc. Washington, XXIII, p. 145. There is much more to be said, but it may be left for a future paper treating of the genus as represented in all parts of its range. Very few species have scales resembling those of the type of the genus. There is a curiously close resemblance between the scales of *Barbus callensis* from Algiers (Playfair) and those of *Pogonichthys macrolepidotus* from San Francisco, California (Dr. W. O. Ayres). Seen without a lens, the scales of the two look exactly alike, except that those of the *Pogonichthys* are somewhat larger. Upon closer comparison, the *Pogonichthys* scales differ by the absence of basal radii, and the denser circuli. *Pogonichthys* is an isolated genus in the American fauna; it has been compared with *Semotilus* of the eastern states, but the apical circuli are not angled as in *Semotilus*. I think it must be a remnant of the miocene invasion from Asia. It is with scales of the *Barbus callensis* type that we find a meeting-place (so far as squamation goes) for *Barbus*, *Leuciscus* and *Chondrostoma*.

Leusciscus.

For several species, see Proc. Biol. Soc. Washington, XXII, p. 215. The following palaearctic species are additional.

L. pyrenaicus. Mountain rivers near Gibraltar (Lt. Col. Irby). Scale about as broad as long, with strong laterobasal angles; apical radii about six entire, others only developed in the submarginal region; basal radii few. Resembles *L. vulgaris*.

L. alburnoides. Mertola, Guadiana (Gadow). Differs conspicuously from *L. pyrenaicus* by having about 12 very well develeped apical radii, basal radii better developed, and the apical circuli very coarse and distinct. The scale is longer than broad, and the nucleus is distinctly basad of the middle. The scale is altogether quite chondrostomoid.

L. illyricus. River Tadro, Dalmatia (Dr. Werner). Scale like that of *L. alburnoides*, but smaller, with rather fewer apical radii. If shown the scale alone, I should take it for that of a *Chondrostoma*.

L. friesii = *meidingeri*. Lake of Derkos, Constantinople (Milligan). Scale quite large; apical radii irregular; basal radii very many. Much like *L. cephalus*.

L. intermedius. Lake Issik kul, Turkestan (Chaffanjon). Scales broad, the broadest scales of true *Leuciscus* known to me; nucleus far based of middle; apical circuli coarse; apical radii about seven; basal radii about 2 to 5.

Cyprinus.

Cyprinus carpio. N. E. Mongolia (C. W. Campbell). Scale 18 mm long, 13 wide, parallel-sided, nucleus $9^1/_2$ mm from base; circuli very fine; apical radii many but incomplete; basal radii exceedingly numerous and close together, numbering over 70; no lateral radii.

C. kollarii (*Cyprinus* × *Carassius* hybrid). Thetford, Norfolk (Lord Walsingham). Scale shorter and broader, being about 12 mm long and 11 broad; apical radii very many (about 26), with very coarse circuli between them; basal radii few, about seven; one or two radii, below the apical, which may be called lateral. This shows the *Carassius* characters very plainly, and also has the dusky-spotted *Carassius* skin. However in *Carassius* (both *vulgaris* and *auratus*) the very coarse apical circuli, except those close to the nucleus, are practically longitudinal, meeting at an angle in the middle; but in *C. kollarii* they are transverse, following *Cyprinus*. *Carassius* has very few basal radii, and the apical radii are reduced to a few strong ones, the most persistent being practically lateral. *Carassius*, therefore, approaches the alestiform type of scale, which is not at all the case with *Cyprinus*.

C. priscus H. v. Mey. Miocene fossil. Unterkirchberg, near Ulm, Württemberg. I could not see the base of the scale; the apical radii were about four; circuli normal.

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