

FAUNA OF THE CHILKA LAKE.

FISH

PART V.

By SUNDER LAL HORA, *D.Sc.*

(With 14 text-figures.)

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FISH (PART V).

By SUNDER LAL HORA.

This part contains a systematic treatment of the divisions Gobiiformes, Zeorhombi, Scombriformes, Jugulares and Scleroparei of the suborder Acanthopterygii and of the suborder Opisthomi. I have also added a summary of the whole report on the fish of the Chilka Lake.

To the division Gobiiformes are referred 22 species, of which 16 belong to the sub-family Gobiinae, 4 to Eleotrinae, and one each to Periophthalminae and Gobioidinae. I have erected a new genus, closely allied to *Apocryptes*, to accommodate the minute transparent Gobies of the lake and in other genera have found as many as six species hitherto undescribed. I have refrained from naming a species of the genus *Eleotris*, represented by a single, probably immature, specimen. Most of the new species belong to the genus *Ctenogobius*; others are distributed among the genera *Glossogobius*, *Micrapocryptes* (gen. nov.), and *Taenioides*. The only general feature of the Chilka fish of this family is their small size. Most of the new species hardly exceed a couple of inches in length, while forms like *Ctenogobius minima* and *Micrapocryptes fragilis* are among the smallest known vertebrates.

Belonging to the division Zeorhombi, there are three species representing three families—Bothidae, Cynoglossidae and Soleidae. Of the three species *Cynoglossus brevis* Günther is widely distributed in the lake area and is represented by a large number of specimens. Of the other two, *Pseudorhombus arsius* (Ham. Buch.) and *Synaptura orientalis* (Bl. and Schn.), a few specimens were found in the outer channel or in its immediate neighbourhood, and the species thus appear to be occasional visitors to the lake.

The Scombriformes are represented by two species, *Caranx carangus* (Bloch) and *Equula edentata* (Bloch). The former was found all over the lake, the latter in the main area only. Both are probably permanent residents in the lake.

A single species of Blenny (Jugulares) was found abundantly in different parts of the lake, in which it apparently is endemic. It has already been described by Dr. Chaudhuri¹ under the name *Petroscirtes bhattacharyae*, while Mr. D. R. Bhattacharya² has described post-larval stages in its development.

The Scleroparei are represented only by *Platycephalus insidiator*, a common species in Indian seas. A few specimens were taken in the outer channel, to which this species is evidently an occasional visitor.

Mastacembelus armatus was the only species of Opisthomi. It is an occasional immigrant from fresh water in the rainy season.

In preparing my report on these fishes I am greatly indebted to Dr. B. L. Chaudhuri, who had made a preliminary investigation of the specimens before I examined them and had

¹ Chaudhuri, *Rec. Ind. Mus.* XII, p. 107 (1916).

² Bhattacharya, *Mem. Ind. Mus.* V, p. 385 (1916).

separated them into their genera and in some cases into their species. I have to thank Dr. Annandale for suggesting new names and for revising my manuscript.

Family GOBIIDAE.

Sub-family GOBIINAE.

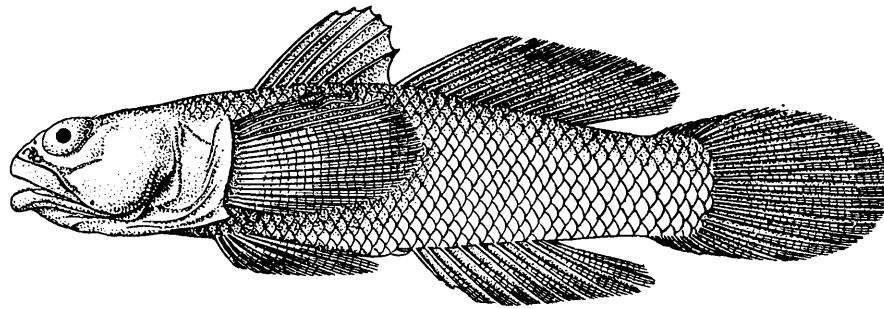
Genus GOBIUS Linnæus.

Gobius ostreicola Chaudhuri.

1916. *Gobius ostreicola*, Chaudhuri, *Rec. Ind. Mus.*, XII, p. 105.

1916. *Gobius ostreicola*, Bhattacharya, *Mem. Ind. Mus.*, V, p. 383 (larval stages).

There are altogether six specimens in the collection. They were collected in the months of September and December, 1914, near Manikpatna in the oyster-beds.



TEXT-FIG. 22.—*Gobius ostreicola* Chaudhuri: $\times 2$.

Gobius albopunctatus Cuv. and Val.

1876. *Gobius albopunctatus*, Day, *Fish. India* I, p. 294, pl. lxiii, fig. 7.

Fifteen specimens of this species were collected on the oyster-beds near Manikpatna in December, 1914. The species differs from the others included in the genus in the possession of a distinct emargination at the anterior extremity of the tongue. The emargination is not so deep as it is in the species of *Glossogobius*, from which genus the species can be readily distinguished by the presence of free rays to the pectoral fin.

The emargination of the tongue has been considered to be a character of generic importance but I refrain at present from erecting a new genus for *G. albopunctatus*, because the Indian species that have hitherto been referred to the genus *Gobius* are in need of revision.

Distribution.—The seas of India to the Fiji Islands and Port Essington, Australia.

Genus GLOSSOGOBIUS Gill.

Gill¹ defined this genus as follows: "*Glossogobius* has a depressed head, protruding lower jaw, an anteriorly free and deeply emarginate tongue, and several rows of stout teeth in each jaw, the outer of which are hooked backwards." Quite recently the definition has been amplified by Jordon and Snyder,² and also by McCulloch and Ogilby.³ The ampli-

¹ Gill, *Ann. Lyc. Nat. Hist. N. York*, p. 46 (1859).

² Jordon and Snyder, *Proc. U. S. Nat. Mus.* XXIV, p. 74 (1902).

³ McCulloch and Ogilby, *Rec. Austr. Mus.* XII, p. 235 (1919).

fication has been made to include the peculiar structure of the mouth, which is very wide and of the gill-openings, which extend further forwards than in *Gobius*, rendering the isthmus narrow. All these characters are well-marked in the four old species, *G. platycephalus* (Richardson), *G. giuris* (Ham. Buch.), *G. biocellatus* (Cuv. and Val.) and *G. brunneus* (Schlegel), that have been included in this genus. Of the species that have been recently described, the tongue of *G. campbellianus* (Jordan and Snyder)¹ is stated to be "notched" and the "lower jaw slightly projecting." This species has been referred to *Glossogobius* because it possesses "the large mouth, notched tongue and narrow isthmus." It is open to question whether a species which does not possess "protruding lower jaw, an anteriorly free and deeply emarginate tongue" can be included in *Glossogobius*. The remaining species, *G. aglestes* (Jordan and Seale),² *G. abacopus* (Jordan and Richardson)³ and *G. mas.* sp. nov. show typical *Glossogobius* characters.

Glossogobius giuris (Ham. Buch.).

1919. *Glossogobius giuris*, McCulloch & Ogilby, *Rec. Austr. Mus.*, XII, p. 236.

This is one of the most widely distributed species of the genus and is represented by a large number of individuals from different localities in the Chilka Lake. The outline of the tongue is liable to considerable variation. In some individuals a large parasitic Isopod was found inside the mouth cavity and in such examples the tongue was found to be abnormal in that it was swollen and the emargination was feebly indicated.

The following statement shows the different localities whence the specimens were collected and their number :—

5 specimens	...	...	Satpara	...	...	10 November 1914.
3	"	...	Chilka Lake, Orissa	...	...	31 July 1913.
2	"	...	Barkul	...	...	10 September 1914.
4	"	...	Satpara	...	...	March 1914.
4	"	...	Rambha Bay	...	...	February 1914.
1 specimen	...	...	Main channel W. of Satpara Island	...	...	16 March 1914.
2 specimens	...	...	W. of Satpara	...	...	20 March 1914.
1 specimen	...	...	Channel between Satpara and Barnikuda.	...	...	4 September 1914.
1	"	...	About 1 mile off N.E. of Nalbano Island	...	...	25 November 1914.

Distribution.—The range of this species extends from the East Coast of Africa, through the seas and fresh waters of India to Malay Archipelago, Australia and beyond.

Glossogobius biocellatus (Cuv. and Val.).

1919. *Glossogobius biocellatus*, McCulloch & Ogilby, *Rec. Austr. Mus.*, XII, p. 237.

There are three specimens in the collection. All of these were collected in the neighbourhood of Barnikuda in early September, 1914. This species occurs near the coasts of India and the range extends to the Malay Archipelago and Australia.

¹ Jordan and Snyder, *Proc. U. S. Nat. Mus.* XXXIII, p. 542, fig. 2 (1908).

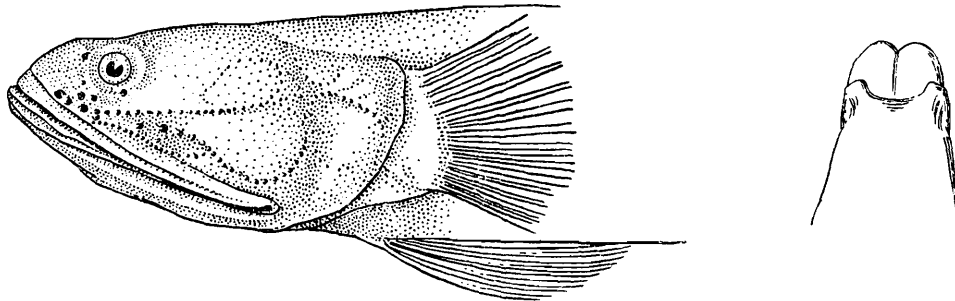
² Jordan and Seale, *Proc. U. S. Nat. Mus.* XXVIII, p. 799, fig. 16 (1903).

³ Jordan and Richardson, *Mem. Carnegie Mus.* IV, p. 200, pl. lxxiv (1909).

Glossogobius mas, sp. nov.D. VI $\frac{1}{7}$. A. 7.

To this species I assign six specimens, 4 females and 2 males. There are some differences between the two sexes and I, therefore, propose to describe them separately. The species does not grow more than an inch and a half long.

Male.—The male is thin and slender, with a greatly flattened head. The profiles are slightly arched and the body tapers towards both ends. The head is flat and broad posteriorly, while anteriorly it is constricted and rounded. The snout is bluntly pointed and is slightly longer than the horizontal diameter of the eye. The head is contained 2·7 times

TEXT-FIG. 23.—*Glossogobius mas*, sp. nov.a. Lateral view of head of a male specimen: $\times 6$.b. Tongue of same: $\times 8$.

in the length of the fish without the caudal fin; its depth at the occiput is contained 1·8 times and its breadth 1·6 times in its length. The eyes are small and are situated on the dorsal surface; they are invisible from below; their diameter is contained 5·2 times in the length of the head, 1·1 times in length of the snout and 0·9 times in the inter-orbital distance. The depth of the body near the anterior origin of the first dorsal fin is almost half the length of the head.

The mouth is oblique and very wide; the maxilla reaches as far back as the lower margin of the operculum. The tongue is deeply notched.

The scales are deciduous and as a rule only their basal membranes are present in specimens. There are 24 to 26 scales in a longitudinal series between the angle of the operculum and the base of the caudal fin. The scale is rectangular in outline and is markedly ctenoid. There are a large number of radii proceeding from an eccentric nucleus to the apex. The circular striae are not well-developed and are greatly interrupted in their course.

The second dorsal and the anal fins are small and contain about seven rays each. The pectorals are almost as long as the ventrals and are shorter than the length of the head. The caudal fin is pointed in the middle.

Female.—All the 4 female specimens are full of eggs and consequently the body is deeper and stouter. The chief point of difference from the male is that the mouth is not so wide and the maxillae extend to just behind the posterior margin of the orbit. In all other respects the female agrees with the male.

The colour is rather characteristic. It is reddish brown all over; the centre of the scales is whitish, while their edges are dotted with black. The under surface of head and body is whitish. The fins have no markings.

Gobius melanosticta Day, a small Goby from the backwaters of Madras, shows great similarity to the female of the new species. The two can, however, be readily distinguished by the number of their fin-rays, their proportions and colouration.

The dissection of a male specimen has not revealed the ripe testes. Possibly the two sexes will ultimately have to be regarded as separate species but I have refrained from describing them as such because the number of specimens at present available is very small.

The following statement gives the number of individuals, their localities and sex:—

4 specimens	...	Off Samal Island	...	22 September 1913	3 ♀ & 1 ♂.
1 specimen	...	Rambha Bay	...	4 September 1919	♂
1	„	Off Barkul	...	2 November 1914	♀

Measurements in hundredths of total length without caudal.

				♂	♀
Total length without caudal	...	...	...	21 mm.	25 mm.
Length of head	...	...	...	37.1	33.2
Depth of head at occiput	...	...	...	20.0	20.4
Breadth of head	...	...	...	25.7	23.6
Length of snout	...	...	...	8.1	8.0
Diameter of eye	...	...	...	7.1	7.2
Interorbital width	...	...	...	6.1	6.4
Depth of body near origin of first dorsal	...	...	...	19.5	32.0
Length of caudal peduncle	...	...	...	28.5	31.2
Height of caudal peduncle	...	...	...	12.3	14.4
Length of caudal fin	...	...	...	26.6	14.0
Length of pectoral fin	...	...	...	29.5	24.0
Length of ventral fin	...	...	...	28.5	16.0
Longest ray of dorsal fin.	...	...	...	22.3	18.0
Longest ray of anal fin	...	...	...	27.6	20.0

Genus **CTENOGOBIUS** Gill.

The genus *Ctenogobius* is well represented in the fauna of the Chilka Lake, for there are as many as seven species in the collection. Four are described here for the first time. With the exception of two species, all are very small and may, therefore, have been overlooked elsewhere by collectors. Some of the species which I now assign to this genus have previously been referred to the genus *Gobius*, from which *Ctenogobius* can be distinguished by the absence of “silk-like free tips to the upper rays of the pectorals”¹ and by their smaller size and totally “different physiognomy.”

Ctenogobius acutipinnis (Cuv. & Val.).

1876. *Gobius acutipinnis*, Day, *Fish. India* I, p. 291, pl. lxi, fig. 2.

There are four specimens in the collection, one from Rambha Bay, one from Barkul and the other two from Serua Naddi (September, 1914). The largest specimen is from Rambha Bay and is 41 mm. in length without the caudal.

Distribution.—The seas of India.

¹ Jordan and Snyder, *Proc. U.S. Nat. Mus.*, XXIV, p. 54 (1902).

Ctenogobius chilkinsis (JENKINS).

1910. *Gobius chilkinsis*, Jenkins, *Rec. Ind. Mus.* V, p. 137, pl. vi, fig. 2.

There are eighty specimens of this species in the Chilka Survey Collection. Most of them were obtained from the neighbourhood of Nalbano Island. The largest is 35 mm. in length.

This species is only known from the Chilka Lake. Jenkins obtained his specimens from near Gopkuda Island.

Ctenogobius alcocki (Annandale).

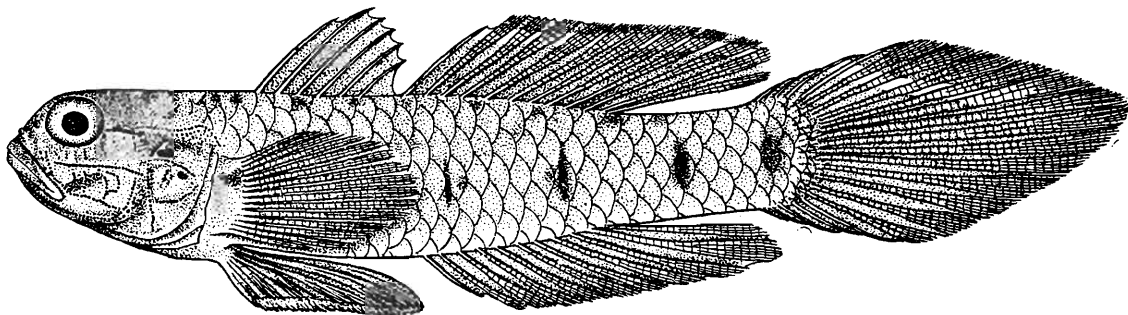
1906. *Gobius alcockii*, Annandale, *Journ. As. Soc. Bengal*, (n.s.) II, p. 201, fig. 1.

This small Gobiid fish was first described from Port Canning and Calcutta by Annandale. It is very common all over the Chilka Lake and is represented by a large number of specimens. There are six spines in the first dorsal fin instead of five, the number given in Annandale's description and figure. A large number of individuals was netted near Barku and specimens were also collected at various other localities in the Lake.

Ctenogobius globiceps, sp. nov.

D. VI|1/11. A. 1/10.

In this new species the body is somewhat compressed from side to side, and the head is almost globular. The dorsal profile is straight and horizontal; the ventral rises towards both ends from below the middle of the base of the pectoral fin. The head is almost as high as the greatest depth of the body and its length is contained 4 times in the length without the caudal fin. The eyes are big and are situated near the dorsal surface; they are hardly visible from below. The diameter of the eye is contained 3.3 times in the length of the head. The snout is short and rounded. The anterior pair of nostrils are tubular and are separated from the posterior pair by a short distance. The mouth is small and oblique; the maxilla reaches to below the anterior $\frac{1}{4}$ of the orbit. The sides of the head are covered by a large number of mucous glands, which are arranged in definite rows.



TEXT-FIG. 2A.—*Ctenogobius globiceps*, sp. nov. : $\times 4$.

The anterior dorsal commences immediately above the origin of the pectoral fin and contains six spines; its commencement is almost equidistant from the anterior origin of the second dorsal and the posterior margin of the orbit. The second dorsal is composed of one spine and eleven rays; its anterior origin is midway between the base of the caudal and the tip of the snout. The ninth branched ray is the longest and its length is greater than the greatest depth of the body. The pectoral fin is as long as the ventral and is slightly shorter than the head. The anal fin is long and originates behind the commencement of

the second dorsal. The penultimate ray is the longest and is longer than the longest ray of the second dorsal. The caudal fin is sharp and pointed in the middle; its length is contained 2.5 times in the length of the fish with the caudal.

The teeth are small and conical and there are several rows of them both in the upper and the lower jaw; those of the outer rows are slightly the longer. The tongue is slightly emarginated.

There are 26 to 27 scales along the lateral line and $5\frac{1}{2}$ series of longitudinal scales between the anterior origin of the second dorsal and the anal fins. The scales are feebly ctenoid.

In spirit the colour is yellowish with 4 or 5 short vertical black bands on the sides of the body. There are a few small black spots on the body above the lateral line. The pelvic fins are blackish, while the others are slightly dusky. There is a white band marking off the tip of the second dorsal fin and obliquely continued on the upper half of the caudal fin. The colour pattern is, on the whole, very characteristic of the species.

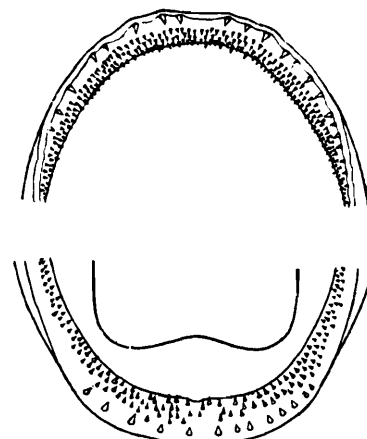
This species is widely distributed in the Chilka Lake and a large number of specimens were obtained from the following localities:—

Off Samal I.; Rambha Bay; Satpara; between Cherriakuda and the mainland; Serua Nadi; Mahosa, Barhampur Island; off Balugaon; off Nalbano; off Barkul bungalow; South of Kalidai.

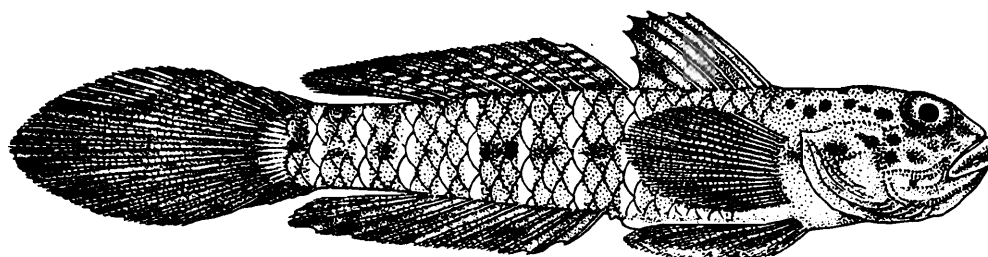
Ctenogobius cylindriceps, sp. nov.

D. VI|1/9. A. 1/9.

The new species is very common in the Chilka Lake and is represented by a large number of specimens in the collection. It does not grow to more than an inch and a half in length. The dorsal profile is almost straight or slopes gradually down to the base of the caudal fin from the anterior origin of the first dorsal. The head is sub-cylindrical and the body somewhat flattened from side to side. The length of the head is contained 3.7 times in the total



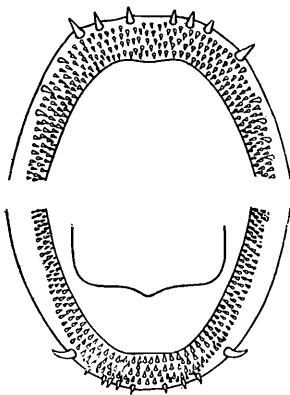
TEXT-FIG. 25.—Tooth-bands and tongue of *Ctenogobius globiceps*, sp. nov. : $\times 20$.



TEXT-FIG. 26.—*Ctenogobius cylindriceps*, sp. nov. : $\times 4$.

length without the caudal and its height at the occiput is almost equal to the greatest height of the body. The eyes are situated near the dorsal surface and are not visible from below; their diameter is slightly greater than the length of the snout and is contained about 3.3 times in the length of the head.

The commencement of the first dorsal fin is almost equidistant from the posterior limit of the orbit and the anterior origin of the second dorsal. The length of the base of the second dorsal is almost equal to the length of the head and it commences immediately behind the membranous base of the first dorsal. The last divided ray is the longest and is as high as the greatest depth of the body. The anal fin originates slightly behind the anterior commencement of the second dorsal and its base is shorter than the length of the head. The last ray of the anal is the longest and is slightly greater than the greatest height of the body. The pectoral fin is short and rounded and is considerably shorter than the length of the head. The pelvic fins are as long as the pectoral and are separated from the anal by a short distance. The caudal fin is contained 2.4 times in the total length without the caudal; it is bluntly pointed behind.

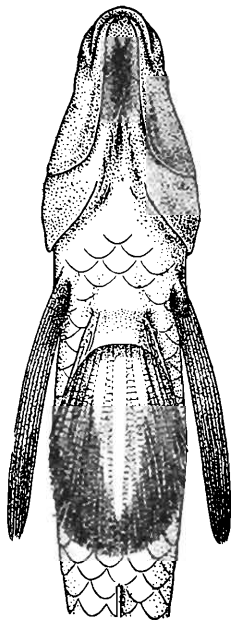


TEXT-FIG. 27.—Tooth-bands and tongue of *Ctenogobius cylindriceps*, sp. nov. : $\times 20$.

The mouth is small, with a somewhat oblique opening; the maxilla just reaches to below the anterior margin of the orbit. There are several rows of minute teeth in both jaws; those of the outer row in the upper jaw and two teeth, one on each side, of the lower jaw are enlarged. The latter have the appearance of canines. The tongue is pointed in the middle.

The scales are comparatively large and firmly set on the body. There are about 25 between the angle of the operculum and the base of the caudal fin. Between the anterior origin of the second dorsal and the anal there are five rows of longitudinal scales. The scales are feebly pectinated. The cheeks and the opercula are naked.

The colouration is very characteristic. In alcohol the sides are dusky with 7 to 11 vertical, narrow, yellowish bands. The upper surface of the head is also dusky, but its lower surface and the under surface of the body are yellowish. The anterior dorsal is covered with minute black spots and there is also a deep black marking on the membrane between the 4th and the 5th spine. The second dorsal is variegated with black and white and the anal is dusky. The pectoral is almost colourless and the pelvic is dark. The upper rim of the caudal is variegated with black and white, while the remaining portion is light grey. There are usually a number of black spots along the lateral line and the last component of the series near the base of the caudal fin is somewhat deeper in colour. There are several rounded black spots on the top and sides of the head. The colour fades in some specimens and the fish assumes a uniform yellow tinge.



TEXT-FIG. 28.—Under surface of head and body of *Ctenogobius cylindriceps*, sp. nov. $\times 5\frac{1}{2}$.

The new species can be readily distinguished by its characteristic colouration, especially deep black pelvic fins and by its small size. The dentition and the tongue are quite different from those of the preceding species.

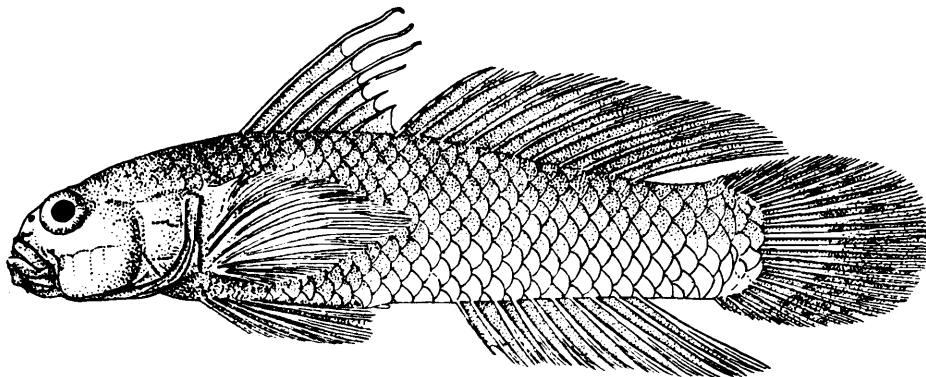
The following statement gives the localities whence the specimens were obtained, and their number :—

9 specimens ...	...	Cherria Island ...	...	12 February 1914.
26 ,, ...	...	Rambha Bay ...	...	14 February 1914.
3 ,, ...	...	Off Rambha Bay ...	...	14 February 1914.
6 ,, ...	...	East side of Rambha Bay ...	...	15 February 1914.
2 ,, ...	...	Off Domkuda towards Samal I.	...	17 February 1914.
4 ,, ...	...	Off North side of Samal I. ...	...	24 February 1914.
1 specimen ...	...	East of Barkul ...	...	2 March 1914.
1 ,, ...	...	Off Barkul Bungalow ...	...	4 March 1914.
20 specimens ...	...	Main Channel, W. of Satpara Island ...	...	16 March 1914.
7 ,, ...	...	Main Channel between Satpara and Barnikuda. ...	...	17 March 1914.
2 ,, ...	...	Between Mahosa and Satpara ...	...	18 March 1914.
12 ,, ...	...	Channel between Satpara and Barhampur Islands. ...	...	22 March 1914.
10 ,, ...	...	Between Cherria and Mainland ...	...	20 July 1914.
15 ,, ...	...	Serua Nadi ...	...	4 September 1914.
18 ,, ...	...	Channel off Barhampur Island ...	...	9 September 1914.
3 ,, ...	...	Kalidai W. part of Samalkuda ...	...	22 November 1914.
3 ,, ...	...	Near Nalbano Island ...	...	25 November 1914.
1 specimen ...	...	East of Barkul ...	...	29 November 1914.
21 specimens ...	...	About half mile from Parikudh Island ...	...	29 November 1914.

Ctenogobius dentifer, sp. nov.

D. VI|1/10. A. 9—10.

There are eight specimens of this species in the collection. Of these six were obtained in Rambha Bay in February 1914, while the remaining two were collected near Satpara and Barnikuda. The fish does not grow to more than two and a half inches in length.



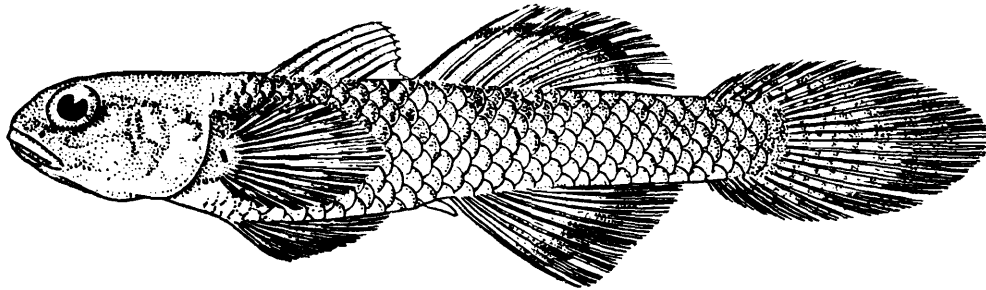
TEXT-FIG. 29.—*Ctenogobius dentifer*, sp. nov. : $\times 2\frac{1}{2}$.

The dorsal profile is slightly arched and the ventral is almost straight and horizontal throughout. The head is flat and somewhat depressed ; the body is compressed from side to side. The length of the head is contained 3.6 times in the total length without the caudal fin. The width of the head is contained 1.2 times and its height 1.5 times in its length. The greatest depth of the body is one-fifth of the total length without the caudal. The

Ctenogobius minima, sp. nov.

D. VI|1/7. A. 1/7-8.

This species, the smallest of the Chilka Gobies, is represented by a large number of specimens in the collection. It does not exceed 20 mm. in total length without the caudal fin.

TEXT-FIG. 30.—*Ctenogobius minima* sp. nov. : ×6.

The form is very characteristic ; the dorsal profile is straight and horizontal throughout and the ventral profile bulges most near the base of the pelvic fin. The body is deepest between the bases of the first dorsal and the pelvic ; the chest bulges outwards. The head is broad posteriorly and narrows anteriorly from side to side. The snout is shorter than the diameter of the eye and is rounded at the tip. The length of the head is contained 3.7 times in the length of the body without the caudal fin. The eyes are placed dorso-laterally and are hardly visible from below ; the horizontal diameter of the eye is contained 3.5 times in the length of the head. The mouth is small, with a slightly oblique opening ; the lower jaw is somewhat shorter than the upper. The teeth are minute and the tongue is grooved anteriorly and pointed in the middle. The gill-openings are restricted to the sides and do not extend beyond the base of the pectoral fin. There are four well-marked branchiostegal rays.

The commencement of the first dorsal fin is equidistant from the tip of the snout and the posterior limit of the base of the caudal fin. The anterior origin of the second dorsal is nearer the base of the caudal than the tip of the snout. It contains one spine and seven branched rays ; the fourth or fifth branched ray is the longest, and is almost as high as the greatest depth of the body. The anal fin begins posterior to the commencement of the second dorsal and contains one spine and seven to eight branched rays. The pectoral fin is rounded and is as long as the longest ray of the second dorsal. The pelvic is slightly longer than the pectoral. The caudal is rounded, with a sharp point in the middle.

The body is covered with ctenoid scales, which are firmly set. There are about 25 or 26 between the angle of the operculum and the base of the caudal fin, and six series of longitudinal rows between the bases of the second dorsal and the anal near their anterior origin. The scales are markedly ctenoid, with a large number of radii to the base.

The colour of the body in spirit is light olivaceous ; the margins of the scales in the upper half of the trunk are speckled with minute black dots. The head is also marked with clusters of black dots. In the female the caudal and the dorsal fins are marked with minute dots. The colouration of the male is somewhat different. The edges of the scales and of

the head are comparatively darker but the most characteristic feature is the presence of a couple of black bands, one near the margin of the second dorsal and the other near the margin of the anal. The caudal fin is somewhat dusky.

The following statement gives the localities whence the specimens were obtained, their number and sex.

9 specimens ...	...	Nalbano Island ...	...	6 January 1915.♂
2 ,, ...	...	Rambha Bay ...	...	September, 1914.♂
1 specimen ...	...	Off Balugaon ...	...	6 March 1914.♂
27 specimens ...	...	Between Cherria I. and main- land. ...	...	20 July 1914.♂
1 specimen ...	...	Off Kalidai ...	...	5 March 1914.♀
1 ,, ...	...	N.E. of Nalbano ...	...	9 March 1914.♂
2 specimens ...	...	Near Manikpatna ...	...	7 September 1914.♂
1 specimen ...	...	Serua Nadi ...	...	8 September 1914.♂
10 specimens ...	...	Domkuda and Samal Islands ...	...	18 June 1914.♀
5 ,, ...	...	Near Nalbano ...	...	11 September 1914.♀
7 ,, ...	...	Off Balugaon ...	...	6 March 1914.♀
1 specimen ...	...	W. of Satpara ...	...	20 March 1914.♀
1 ,, ...	...	Mahosa, Barhampur Island ...	...	20 March 1914.♀
3 specimens ...	...	Serua Nadi ...	...	8 September 1914.♀
1 specimen ...	...	Barkul point ...	...	2 March 1914.♀

Genus **OXYURICHTHYS** Bleeker.

Oxyurichthys tentacularis (Cuv. and Val.)

1876. *Gobius tentacularis*, Day, *Fish. India* I, p. 291, pl. lxiv, fig. 4.

This species is represented by a large number of specimens in the Chilka Survey collection. The following statement gives the different localities whence the specimens were collected, and their number.

8 specimens ...	...	Channel off Barhampur I. ...	...	2 September 1914.
4 ,, ...	...	Manikpatna Island ...	...	21 March 1914.
6 ,, ...	...	Main channel between Sat- para and Barnikuda ...	...	17 March 1914.
10 ,, ...	...	Main Channel W. of Satpara Island ...	...	16 March 1914.
1 specimen ...	...	Between Cherria I. and main- land ...	...	20 July 1914.
27 specimens ...	...	Channel between Satpara and Barhampur Islands ...	...	2 September 1914.
3 ,, ...	...	Channel S. of Satpara Island ...	...	5 September 1914.
6 ,, ...	...	Serua Nadi ...	...	8 September 1914.

The largest specimen is 65 mm. in length without the caudal.

Distribution.—This species is found in the seas of India and its range extends to the Malay Archipelago.

Genus **APOCRYPTES** Cuv. and Val.**Apocryptes rictuosus** (Cuv. & Val.).

1876. *Apocryptes rictuosus*, Day, *Fish. India*, I, p. 300.

There are four specimens in the collection, the largest of which is 69 mm. in length. The species is readily distinguished by the presence of a well-marked black ocellus on the last few dorsal rays. The caudal fin is marked with a number of faint brownish bands.

The following statement gives the different localities whence the specimens were collected and their number and size :—

1 specimen	...	Main channel west of Satpara Island	...	16 March 1914	...	62 mm.
2 specimens	...	Channel between Satpara and Barhampur Islands.	...	...	...	69 & 56 mm.
1 specimen	...	Barkul	...	...	...	18 September 1914 45 mm.

Distribution.—The seas and estuaries of India.

Apocryptes lanceolatus (Bl. & Schn.).

1876. *Apocryptes lanceolatus*, Day, *Fish. India*, I, p. 301, pl. lxiv, fig. 5.

This species is represented by a single specimen in the collection. The specimen was obtained in the South Bay of the lake and is 168 mm. in length.

Distribution.—The seas of India, extending to the Malay Archipelago.

Genus **MICRAPOCRYPTES**, nov.

The new genus resembles *Apocryptes* Cuv. and Val. in the structure of the teeth, at any rate in the adult male, but exhibits sexual dimorphism in this respect. It is chiefly distinguished by the small size and hyaline tissues of the fish and by the moderately compressed and elongate form. The tongue is notched in the middle and the scales are feebly ctenoid.

The type-species is *Micrapocryptes fragilis*, sp. nov. from the Chilka Lake and the Gangetic delta.

To this genus I refer *Apocryptes brachypterus* Bleeker¹ from Java. It is said to occur in the lake Grati (Province of Pasuruan). Günther² was of opinion that this species had more affinity to his genus *Latrunculus* than to the typical species of *Apocryptes*. *Micrapocryptes* differs from *Latrunculus* in the possession of feebly ctenoid scales, which are firmly set on the body, in its small size and the small mouth-opening. The dentition is also different in the two genera.

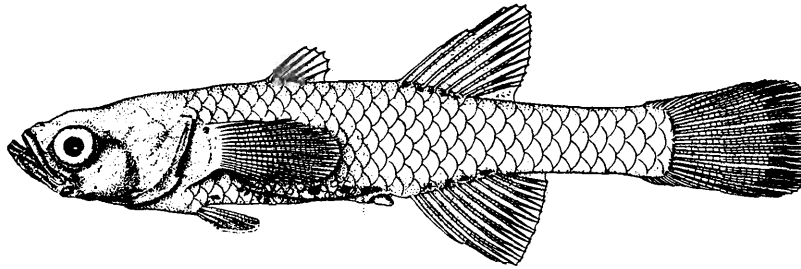
Micrapocryptes fragilis, sp. nov.

The species consists of small transparent Gobies, in which the body is but moderately elongated and the form is compressed from side to side. The dorsal profile is slightly arched and the ventral rises to the base of the caudal fin from just below the beginning of the dorsal. The head is elongated and bluntly pointed. The caudal peduncle is somewhat constricted and in this region both the dorsal and the ventral profiles are almost straight and parallel.

¹ Bleeker, *Nat. Tijdschr. Ned. Ind.* IX, p. 401 (1885).

² Günther, *Cat. Brit. Mus. Fish.* III, p. 80 (1861).

The measurements in hundredths of the length without the caudal fin are as follows : the length of head 25.3—27.6%, the depth of the body 19.6—22.2%, the length of the



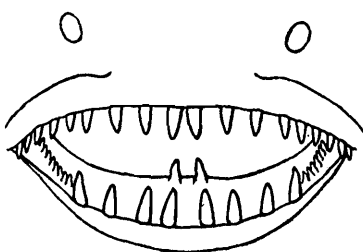
TEXT-FIG. 31.—*Micrapocryptes fragilis*, gen. et sp. nov. : $\times 4$.

snout 4.4—5.5%, the horizontal diameter of the eye 5.5—6.8%, the length of the pectoral fin 19.5—21.6%, the length of the pelvic fin 9.5—11.1%, the length of the caudal fin 17.6—20.4%, the least height of the caudal peduncle 10.4—13.8%, the length of the caudal peduncle 24—27.6%, the width of head 17.6—18.1% and the depth of head at occiput 17.6—18.1%.

The distance between the anterior origin of the first dorsal fin and the tip of the snout is equal to the distance between the anterior origin of the second dorsal and the base of the caudal. The distance between the anterior origin of the first dorsal and the anterior origin of the second dorsal is almost equal to twice the depth of the caudal peduncle. The anterior origin of the anal, which is situated slightly behind the origin of the second dorsal, is almost midway between the tip of the snout and the posterior margin of the caudal. The distance between the origin of the pelvic and the tip of the snout is equal to the distance between the last ray of the second dorsal and the base of the caudal. The base of the anal is longer than the base of the second dorsal and is almost equal to twice the diameter of the eye. The least height of the caudal peduncle is equal to the length of the pelvic and is half the depth of the body below the anterior origin of the first dorsal fin.

The eyes are prominent and are situated on the sides ; they bulge outwards and are visible from above as well as from below. The postorbital region of the head is almost equal in length to the remaining portion, and is twice the horizontal diameter of the eye. The snout is shorter than the diameter of the eye. The mouth is oblique and is turned upwards ; the lower jaw is longer than the upper. The gape of the mouth reaches to below the anterior margin of the orbit.

The teeth show considerable variation with the sex and the age of the individuals.



TEXT-FIG. 32.—Tooth-bands of *Micrapocryptes fragilis*, gen. et sp. nov. : $\times 18$.

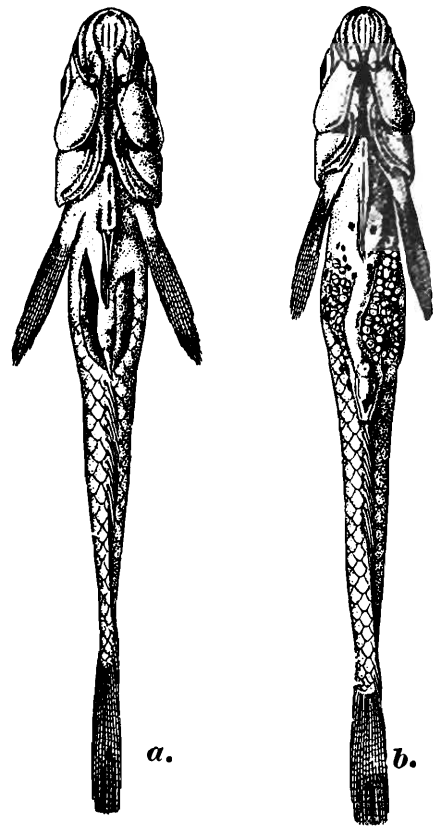
The structure of teeth is exactly alike in the young of both sexes. In both jaws there are a number of small conical teeth. They are minute and closely fitted together and their number is rather difficult to determine. They project very little beyond the jaws and, indeed, to the naked eye the jaws appear edentulous. The teeth are developed in very young specimens but it is only with great difficulty that the two canines on the mandibular symphysis can be made out. As the sexes mature, the teeth of the female do not undergo any appreciable change and continue to be just as in the young condition. In a ripe male, however, the dentition is absolutely different. Instead of

the minute set of teeth, there are developed in both jaws a number of comparatively large conical teeth, which are distinctly visible to the naked eye. In the upper jaw there are about nine teeth on each side and they diminish in size as they recede from the middle of the jaw towards the angle of the mouth. In the lower jaw the big teeth are developed only in the middle and there are usually four of these of almost equal length on each side. The big teeth in both the jaws are separated from each other. Near the angles of the mouth on each side in the lower jaw are a number of minute, closely set teeth. These probably represent the dentition of the young individual. The canines become very conspicuous and are curved near their extremities.

In the development and structure of the teeth the Indian transparent Goby runs almost the same course as has been described by Collett¹ for the two European transparent Gobies (*Aphia pellucidus* and *Crystallogobius nilssoni*). I have not, however, been able to determine in this new form all those points which have been so ably discussed by Collett for the European genera.

The first dorsal fin consists of five weak spines none of which is longer than the diameter of the eye. The second dorsal consists of a spine and from seven to eight branched rays. The second branched ray is the longest and its height is greater than the depth of the body. The spine is as high as the length of the base of the second dorsal. The anal consists of one spine and from ten to eleven branched rays; the second branched ray is the longest and is equal in length to the depth of the body immediately below the first branched ray of the second dorsal. The pectoral is as long as the longest ray in the second dorsal; it usually contains thirteen to fourteen rays and its posterior extremity is rounded. The pelvic is situated on a raised area and begins immediately below the base of the pectoral. The fins are united for a considerable length and form a regular funnel-shaped tube. The caudal is truncate and consists of thirteen rays besides a number of smaller rays on the sides.

The scales are of moderate size; but they are extremely thin and are hardly distinguishable with the naked eye. There are 27 between the angle of the operculum and the base of the caudal fin. There are seven in an oblique line between the anterior origin of the anal fin and the base of the second dorsal. The scales are firmly set together. Under the microscope a series of small spines is seen along the posterior border of every scale, but I have not been able to make out any definite striae in the central portion. In a microscopic prepara-



TEXT-FIG. 33.—Under surface of male and female of *Micrapocryptes fragilis*, gen. et sp. nov.

a. Male : $\times 5\frac{1}{2}$. b. Female : $\times 4$.

¹ Collett, *Proc. Zool. Soc. London*, pp. 318—339 (1878).

tion the muscle fibres are seen running longitudinally underneath the scales. Except for these and certain other irregular interrupted markings I have not been able to make out any special structure.

The gill-openings extend for only a short distance on the under surface and the isthmus is of moderate width.

The anus is situated a short distance in front of the anal fin and this distance is almost equal to the diameter of the eye. In both sexes a prominent anal papilla is present and the gonads can be seen through the tissues of the body-wall. These facts are apt to give a wrong impression that the male carries eggs in its brood-pouch.

In the living condition the fish is transparent with a yellowish tinge. In the region of the heart and the main blood vessels the colour appears to be reddish owing to the transparent skin and body muscles. There are a series of black spots along the back and on the under surface from the origin of the anal to the base of the caudal. There are a few black spots irregularly scattered on the sides of the body as well. In alcohol the fish becomes opaque and takes on a light olivaceous tinge; the black spots are distributed as before. In the ripe females the skin in the region of the ovaries becomes deeply pigmented with a black colour. The tip of the lower jaw on the under surface is dark brown.

The new species closely resembles *Apocryptes brachypterus* Bleeker¹ from the Grati Lake in the province of Pasuruan, Java. I have not been able to consult the original description of this species and, therefore, I refer for relationships to Günther's² description of *A. brachypterus*. The Indian form differs from the Java species in the following characters:—

- (i) The number of anal fin rays in the Indian form never exceeds 12, while in *M. brachypterus* it is stated to be 13.
- (ii) In the new species the number of scales along the lateral line is 27, while in *M. brachypterus* it is 25.
- (iii) The eyes in *M. fragilis* are more than one-fourth of the length of the head, whereas in the Javanese species the diameter of the eye is contained four times in the length of the head.
- (iv) In *M. brachypterus* there are only sixteen teeth in the upper jaw whereas in the new species they are eighteen.
- (v) The structure and arrangement of teeth on the lower jaw is totally different in the two species.

The following statement gives the different localities whence the specimens were collected and their number:—

Numerous ...	...	Baliaghata Canal, outskirts of	...	...	17 July 1916.
specimens		Calcutta	...	...
1 specimen ...	...	1.9 miles N.E. of Kalidai	...	...	8 March 1914.
1 „ ...	...	Off Balugaon	...	...	6 March 1914.
4 specimens ...	...	East of Barkul	...	...	29 November 1914.

¹ Bleeker, *Nat. Tijdschr. Ned. Ind.* IX, p. 401 (1855).

² Günther, *Cat. Brit. Mus. Fish.* III, p. 84 (1861).

Measurements in hundredths of total length without caudal fin.

	♂	♀
Total length (without caudal fin)	18 mm.	22.1 mm.
Length of head	27.6	25.3
Depth of body	22.2	19.6
Length of snout	4.4	5.5
Depth of head at occiput	17.6	18.1
Width of head	17.6	18.1
From tip of snout to anterior limit of second dorsal fin ...	51.1	59.5
Length of pectoral fin	21.6	19.5
Length of pelvic fin	11.1	9.5
Length of caudal fin	17.6	20.4
Diameter of eye	5.5	6.8
Length of caudal peduncle	27.6	24.0
Height of caudal peduncle	13.8	10.4

Sub-family *ELEOTRINAE*.Genus **ELEOTRIS** Gronovius.**Eleotris cavifrons** Blyth.

1860. *Eleotris cavifrons*, Blyth, *Journ. As. Soc. Bengal* XXIX, p. 145.

1876. *Elotris cavifrons*, Day, *Fish. India* I, p. 313, pl. lxxv, fig. 6.

This species is represented in the Chilka Survey Collection by a single specimen, which was collected near Satpara. The species has so far been known from the Andamans, where it is said to grow to 4 inches in length. The Chilka Lake specimen is 37 mm. in total length without the caudal.

Eleotris fusca (Bl. & Schn.).

1876. *Eleotris fusca*, Day, *Fish. India* I, p. 313, pl. lxxv, fig. 7.

Of this species there are four specimens in the collection. The largest example is about 7 cm. in total length including the caudal. Two of these were obtained near Satpara, one near Barkul and the other one from near Mahosa.

Eleotris fusca is found all along the Indian Coast and its range extends to the Malay Archipelago. It is also met with along the African coast and is stated to ascend rivers for a considerable distance.

Eleotris sp.

There is a small specimen of the genus *Eleotris*, from Mahosa near Barhampur Island, which I have not been able to refer to any known species of the genus. I have refrained from naming it on account of the immaturity of the specimen. A short description of it is given below to facilitate reference in future.

The specimen is 23.5 mm. in total length without the caudal. The head is broad posteriorly but tapers towards the anterior end and the snout is almost sharp and pointed. The length of the head is contained about 3 times in the total length without the caudal. The

horizontal diameter of the eye is shorter than the length of the snout and is contained 4·3 times in the length of the head. The eyes are situated in the anterior half of the head and are not visible from below. The mouth is small and the maxilla just reaches to below the anterior margin of the orbit. The lower jaw is slightly the longer and is turned upwards. The gill-openings extend on the under surface for a short distance. The preopercular spine is curved and is turned downwards and forwards. There are 9 weak rays in the second dorsal and 10 in the anal.

In spirit the colour is reddish yellow with a large number of minute black dots scattered all over the body. These dots are aggregated near the upper margin of the base of the pectoral fin and on the whole of the caudal fin, rendering them dusky. The under surface of the head and belly is somewhat whitish.

Measurements in hundredths of the total length without the caudal fin.

Total length excluding length of caudal	...	...	...	23·5 mm.
Length of head ...	...	...	...	33·1
Height of head near occiput	...	...	...	18·2
Width of head ...	...	...	...	22·1
Length of snout	...	...	...	8·5
Diameter of eye	...	...	...	7·6
Interorbital width	...	...	...	5·5
Length of caudal peduncle ...	...	...	...	30·6
Height of caudal peduncle ...	...	...	...	13·6
Longest ray of dorsal fin ...	...	...	...	14·8
Longest ray of anal fin ...	...	...	...	15·3
Length of pectoral fin ...	...	...	...	26·4
Length of pelvic fin ...	...	...	...	17·1
Length of caudal fin ...	...	...	...	22·1

Genus **BUTIS** Bleeker.

Butis butis (Ham. Buch.).

1876. *Eleotris butis*, Day, *Fish. India* I, p. 315, pl. lxxvii, fig. 3.

This species is represented by a single specimen in the Chilka Survey Collection. It is 52 mm. in length without the caudal. It is known to occur in the seas and estuaries of India and its range extends to the Malay Archipelago.

Sub-family *PERIOPHTHALMINAE*.

Genus **PERIOPHTHALMUS** Bloch & Schneider.

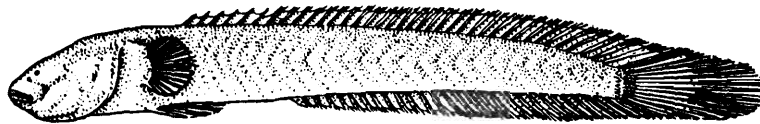
Periophthalmus koelreuteri (Pallas).

There is only one specimen of this species, obtained near Manikpatna Island in March, 1914. It is 43 mm. in length without the caudal. The species is common on the coasts of India and in estuaries and is said to ascend tidal rivers.

Sub-family *GOBIOIDINAE*.Genus **TAENIOIDES** Lacépède.**Taenioides chilkensis**, sp. nov.

This new species is represented by a large number of individuals from various localities in the Chilka Lake. It does not grow to a very large size, hardly exceeding $2\frac{1}{2}$ inches in length without the caudal fin.

The body is compressed from side to side and both the dorsal and the ventral profiles slope gradually down to the base of the caudal fin. In most cases the head is deeper than the body. The eyes are minute but distinguishable and are situated in the anterior third of the length of the head. The mouth is small and is turned upwards. The lower jaw is longer than the upper.



TEXT-FIG. 34.—*Taenioides chilkensis*, sp. nov.: $\times 1\frac{1}{2}$.

The length of the head is contained 5.4 times in the total length of the fish without the caudal and the height of body from 6.6 to 7.5 times. The head is 1.2 times as long as broad and 1.3 times as long as high. The snout is a little over one fourth of the length of the head.

The vertical fins are continuous; the dorsal fin commences immediately behind the pectoral and contains 6 spines and 31 or 32 rays. The anal fin is also very long and contains 27 to 29 rays. The pectoral fins are short and are provided with strong muscular bases. The pelvic fins are much longer than the pectorals. The caudal fin is longer than the head and contains about 15 rays; it is greatly produced in the middle.

There are several rows of sharp minute teeth both in the upper and the lower jaws. No scales are seen on the body even with the help of a lens.

The colour in spirit is dull olivaceous gray all over with the exception of the fins, which are whitish. There are no special markings on the body.

The following statement gives the localities whence the specimens were obtained and their number :—

5 specimens ...	...	Satpara	...	...	September 1913.
1 specimen ...	...	Channel off Barhampur Island			2 September 1914.
4 specimens ...	...	Main channel between Satpara and Barnikuda	...	...	17 March 1914.
5	„	...	Main Channel west of Satpara.	16	„ 1914.
11	„	...	Channel between Satpara and Barhampur Islands	...	22 „ 1914.
14	„	...	Serua Nadi	...	4 September 1914.

Measurements in millimetres.

Total length excluding length of caudal	...	...	52	49
Length of head ...	...	...	9.5	9
Height of head near occiput	...	...	7	7
Width of head ...	...	...	8	8.2
Length of snout ...	...	...	2.5	2.7
Length of caudal fin	...	...	10.5	9
Length of pectoral fin	...	...	3.8	3.8
Length of pelvic fin	...	...	5	5
Greatest height of body	...	...	7.8	6.5

The new species differs from all the other known Indian species of the genus in its small size, in the fewer number of rays in the vertical fins and in having different proportions.

Family BOTHIDAE.

Genus **PSEUDORHOMBUS** Bleeker.**Pseudorhombus arsius** (Ham. Buch.).

1878. *Pseudorhombus arsius*, Day, *Fish. India* II, p. 423, pl. xci, fig. 5.

The four specimens of this species were collected from three localities, one from Parikudh, two in Serua Nadi and the remaining one in the channel between Barnikuda and Satpara. The largest specimen is 24 cm. in length including the length of the caudal fin.

There has always been a certain amount of confusion between this species and *Pseudorhombus russelli* (Gray), which was figured as *Platessa russelli* in the *Illustrations of Indian Zoology* on plate 94 without any description. Subsequently Günther¹ described it from the type and several other specimens from China, the East Indian Archipelago, Bengal and other places. Day,² who had previously regarded *P. russelli* as distinct from *P. arsius*, in his later work (*op. cit.*) considered the former to be synonymous with the latter. Several ichthyologists such as Castelnau,³ Macleay,⁴ Klunzinger,⁵ Boulenger⁶ and Sauvage,⁷ who came after Day, recorded *P. russelli* from widely different localities without comment and without any reference to *P. arsius*. I have carefully compared Günther's description of *P. russelli* with an original manuscript drawing of Buchanan's *P. arsius*. I am of opinion that the two are identical, the latter representing an immature specimen, while the former is based on an adult. Day has already shown the variation which the members of this species exhibit as regards the number of fin-rays and scales along the lateral line.

¹ Günther, *Cat. Brit. Mus. Fish.* IV, p. 424 (1862).

² Day, *Proc. Zool. Soc. London*, p. 287 (1865); *ibid.*, p. 523 (1869); *ibid.*, p. 698 (1870).

³ Castelnau, *Proc. Linn. Soc. N. S. Wales* III, p. 391 (1878).

⁴ Macleay, *ibid.* II, p. 362 (1878).

⁵ Klunzinger, *Sitzungsb. K. Acad. Wiss. Wien* LXXX, p. 406 (1880).

⁶ Boulenger, *Proc. Zool. Soc. London*, p. 665 (1887).

⁷ Sauvage, in Grandidier's *Hist. Nat. Madagascar* XVI, p. 473 (1891).

The following are the measurements and the number of fin-rays in the manuscript drawing of Hamilton Buchanan's *P. arsius*, now preserved in the library of the Asiatic Society of Bengal :—

Total length, including length of caudal fin	...	...	...	68.5 mm.
Length of caudal fin	...	...	...	13.0 „
Length of head	...	...	...	17.0 „
Greatest depth of body	...	...	...	27.7 „
Length of pectoral fin of left side	...	...	...	8.6 „
Length of pectoral fin of right side	...	...	...	5.9 „
Length of ventral fin	...	...	...	5.8 „
Longest diameter of upper eye	...	...	...	3.3 „
Longest ray of dorsal	...	...	...	8.8 „
Longest ray of anal	...	...	...	6.5 „
No. of rays in dorsal	...	...	...	86
No. of rays in anal	...	...	...	55
No. of rays in caudal	...	...	...	15
No. of rays in ventral	...	...	...	5

Pseudorhombus arsius extends from the east coast of Africa, through the seas and estuaries of India, to Australia and China.

Family SOLEIDAE.

Genus **SYNAPTURA** Cantor.

Synaptura orientalis (Bl. & Schn.).

1878. *Synaptura orientalis*, Day, *Fish. India* II, p. 429, pl. xciii, fig. 4 ; pl. xciv, fig. 2.

In the collection from the lake there is only one specimen about 17.6 cm. in length including the caudal fin. It was collected near Parikudh.

There are 67 rays in the dorsal fin and 51 in the anal. The number of scales along the lateral line is 91. The depth of the body is contained about two and a half times and the length of the head five and a half times in the total length including the length of the caudal fin. The scales in the anterior part of the head on the blind side and also those along the gill-openings on both sides have their ctenoid processes greatly produced and the body surface in that region appears as if covered with soft cutaneous filaments. The scales of this type have already been figured by Gilchrist¹ for his species, *Synaptura ciliata*. In *S. orientalis* the processes are much longer than those figured for *S. ciliata*. In addition to these there are tufts of black hair-like filaments coming out from between the scales on the coloured side.

S. orientalis is found in the seas of India and China.

The following are the measurements of the Chilka Lake specimen in millimetres.

Total length, including length of caudal	...	...	...	176.0
Length of caudal	...	...	...	23.5
Length of head	...	...	...	31.2

¹ Gilchrist, *Mar. Invest. South Africa* III, p. 14, pl. xxxiv (1905).

Diameter of lower eye	...	...	...	...	...	4.5
Length of pectoral fin of right side	...	...	...	...	...	12.0
Length of pectoral fin of left side	...	...	...	...	...	9.0
Longest ray of dorsal	...	...	...	...	...	14.0
Longest ray of anal	...	...	...	...	...	13.5
Greatest depth of body	...	...	...	...	...	71.0
Length of pelvic fin	...	...	...	...	...	8.5

Family CYNOGLOSSIDAE.

Genus **CYNOGLOSSUS** Hamilton Buchanan.**Cynoglossus brevis** Günther.

1862. *Cynoglossus brevis*, Günther, *Cat. Brit. Mus. Fish.* IV, p. 500.

1878. *Cynoglossus brevis*, Day, *Fish. India* II, p. 437, pl. xcvii, fig. 2.

There are sixty specimens of this species in the collection. It has so far been known from the river Hughli at Calcutta and is mainly a brackish water form. There is, however, one specimen in the old collection of the Indian Museum obtained by the Marine Survey from along the Orissa Coast (off Chilka Lake).

The colour varies greatly with age. In the young there are several short black bands on the body, which with the growth of the fish become thinner and more numerous and ultimately produce a reticulum in the adult. There is one very characteristic feature of the species, that several rays of the vertical fins at intervals are dark in colour.

The longest specimen is about 14.5 cm. in length including the caudal fin.

The list given below shows the place and time of occurrence of the species in the lake :—

1 specimen	...	Gopkuda Bay	...	14 February 1914.
1 „	...	Off Barkuda I.	...	17 February 1914.
1 „	...	South of Kalidai	...	21 February 1914.
1 „	...	Chirria I. Bay	...	23 February 1914.
1 „	...	¼ mile off Kalidai	...	1 March 1914.
3 specimens	...	1 mile South of Kalidai	...	1 March 1914.
3 „	...	Off Barkul Bay	...	1 March 1914.
4 „	...	Salari to Gantasila	...	3 March 1914.
4 young	...	West of Satpara I.	...	20 March 1914.
3 „	...	Shore of Mahosa	...	20 March 1914.
13 specimens	...	Channel between Satpara and Barhampur I.	...	2 September 1914.
5 „	...	Channel off Satpara	...	2 September 1914.
14 „	...	Channel off Barhampur I.	...	2 September 1914.
24 „	...	Channel between Satpara and Barnikuda	...	4 September 1914.
1 young	...	Island near Manikpatna	...	7 September 1914.
1 specimen	...	Serua Nadi	...	8 September 1914.
1 „	...	About 8 miles South-East of Kalupara	...	16 September 1914.
1 „	...	Mouth of Rambha Bay	...	17 November 1914.

Family CARANGIDAE.

Genus **CARANX** Lacépède.**Caranx carangus** (Bloch).

1876. *Caranx carangus*, Day, *Fish. India* I, p. 215, pl. 1, fig. 4.

The species is fairly common in the lake and is found both in the main area and the outer channel. It appears to be a permanent inhabitant of the lake.

The largest specimen is 12.6 cm. in length and was obtained in Rambha Bay in February, 1914.

Distribution.—The seas of India, the Malay Archipelago and the Atlantic coasts of tropical America.

Genus **EQUULA** Cuv. and Val.**Equula edentula** (Bloch).

1876. *Equula edentula*, Day, *Fish. India* I, p. 238, pl. lii, fig. 1.

The species is represented by 14 specimens, of which 12 were collected in the main area, while the remaining two were obtained near Satpara. The species appears to be a permanent inhabitant of the lake.

Distribution.—The Red Sea, the seas of India, the Malay Archipelago and beyond.

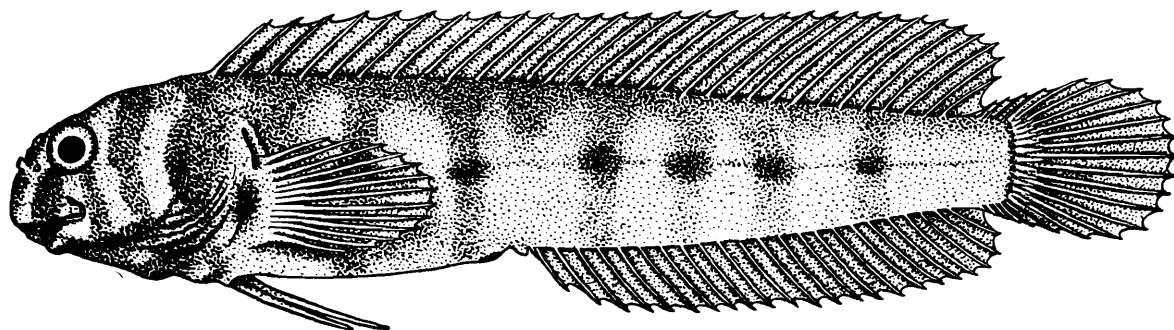
Family BLENNIIDAE.

Genus **PETROSCIRTES** Rüppell.**Petroscirtes bhattacharyae** Chaudhuri.

1916. *Petroscirtes bhattacharyae*, Chaudhuri, *Rec. Ind. Mus.* XII, p. 107.

1916. *Petroscirtes bhattacharyae*, Bhattacharya, *Mem. Ind. Mus.* V, p. 385, pl. xvii, figs. 8-11 (young stages).

The species occurs in the lake throughout the year and breeds in it. The specimens were collected both in the main area and the outer channel.



TEXT-FIG. 35.—*Petroscirtes bhattacharyae* Chaudhuri: $\times 3$.

The fish has so far been found only in the Chilka Lake.

Family PLATYCEPHALIDAE.

Genus **PLATYCEPHALUS** Bl. & Schn.**Platycephalus insidiator** (Forskål).1876. *Platycephalus insidiator*, Day, *Fish. India*, I, p. 276.

A few specimens of this species were taken in the outer channel, to which it is evidently an occasional visitor.

Distribution.—The Red Sea, east coast of Africa, the seas of India, the Malay Archipelago and beyond.

Sub-order OPISTHOMI.

Family MASTACEMBELIDAE.

Genus **MASTACEMBELUS** Cuv. and Val.**Mastacembelus armatus** (Lacépède).1878. *Mastacembelus armatus*, Day, *Fish. India*, II, p. 340, pl. lxxiii, fig. 2.

The species is represented by two specimens captured near Patsahanipur. The largest is about a foot and half in length.

The fish is probably an occasional immigrant from fresh waters in the rainy season.

Distribution.—The fish occurs in the fresh and brackish waters of India, Ceylon and Burma. Its range extends as far as China.

SUMMARY OF THE REPORT ON THE FISH OF THE CHILKA LAKE.

The fish-fauna of the Chilka Lake comprises in all 118 species, of which 13 have been found to be new. Most of the new species, as many as seven, belong to the family Gobiidae, while the remaining six are distributed among the families Clupeidae, Siluridae, Ophichthyidae and Sphyrænidæ. A new genus, *Micrapocryptes*, has been erected in the family Gobiidæ to accommodate the small transparent Gobies of the lake and the Gangetic Delta. In the genus *Eleotris* a specimen is recorded without any specific name. It probably represents a species hitherto undescribed but I have refrained from naming it on account of the immaturity of the single specimen.

Of the 118 species, 49 were taken in the main area only, 24 in the outer channel only and 39 from all over the lake. The distribution of the remaining six species in the lake is not known because they appear to have been purchased from local fishermen from time to time.

The most noteworthy feature in the physical environment of the fauna of the lake is the great periodic change in salinity. This has been fully discussed in the introduction to this volume by Annandale and Kemp (pp. 6—10) and also by Sewell in his paper on Rambha Bay (pp. 680-690). Most of the fishes inhabiting the lake are known from the estuarine waters of India and the Malay Archipelago, but certain forms such as *Pseudorhombus arsius*, *Gerres punctatus*, *G. öyena* and *Gobius albopunctatus*, which have hitherto

been known from sea water, were only captured in the outer channel when the water was quite fresh. Other sea fishes such as *Eleotris fusca*, *Therapon puta*, *Priopis gymnocephalus*, *Tetrodon reticularis*, *Mugil cunnesius*, *Dorosoma nasus* and *Trygon uarnak*, have been found to live in salinities varying from fresh water to water as saline as that of the Bay of Bengal. Several species immigrate into the lake at a certain period. Purely freshwater fishes such as *Mastacembelus armatus* and *Ophiocephalus punctatus* visit the main area during the rains, while forms like *Periophthalmus koelreuteri* and *Rhabdura macrura* are found in the outer channel during a period of drought when the water is as salt as that of the sea outside.

I hope to have an opportunity shortly of comparing the fish-fauna of the Chilka Lake with that of the Talé Sap, a somewhat similar lagoon connected with the Gulf of Siam, and to publish a paper in vol. VI of the *Memoirs of the Asiatic Society of Bengal*.

In the following table the species are arranged in the order in which they have been treated in the report, with a statement as to the specific gravity of the water in which they were taken, their distribution in the lake and their geographical range.

Species.	Specific gravity of water in which specimens were taken.	DISTRIBUTION IN LAKE.		Further distribution.
		Main area.	Outer channel.	
PLAGIOSTOMI.				
SELACHII				
CARCHARINIDAE.				
<i>Physodon mulleri</i> Müller and Henle .	1·01075	X	...	Bengal and China.
<i>Carcharinus gangeticus</i> (Müller and Henle).	1·01075—1·02375	X	...	Seas and estuaries of India, Japan and Fiji.
„ <i>melanopterus</i> (Quoy and Gaimard).	1·00325	...	X	Seas of India and Malay Archipelago.
BATOIDEI				
PRISTIDAE.				
<i>Pristis pectinatus</i> Latham	1·0010	X	...	Tropical and temperate seas.
TRYGONIDAE.				
<i>Trygon uarnak</i> (Forskål)	1·000—1·0260	...	X	Red Sea, Indian Ocean, Gulf of Siam and East Indies.
„ <i>pareh</i> Bleeker	1·000—1·0020	X	...	River Hughli, Bay of Bengal and Malay Archipelago.
„ <i>imbricata</i> (Schneider)	1·00750—1·02375	X	X	East Indies.
<i>Hypolophus sephen</i> (Forskål)	1·00750—1·02375	X	X	Red Sea, Indian Ocean and East Indies.
MYLIOBATIDAE.				
<i>Aetobatis flagellum</i> (Schneider)	?	X	X	Tropical and semi-tropical waters of the world.
„ <i>guttata</i> (Bloch and Schneider)	?	X	...	Tropical parts of Indian Ocean.
<i>Aetomylaeus nichofii</i> (Schneider)	1·0110	X	...	Seas of India, East Indies and Japan.
TELEOSTEI.				
MALACOPTERYGII.				
ELOPSIDAE.				
<i>Elops indicus</i> Swainson	1·00750—1·01050	X	...	Arabian Sea and Bay of Bengal, entering estuaries.
<i>Megalops cyprinoides</i> (Broussonet)	1·00725	X	...	Indian and Pacific Oceans and their estuaries.

Species.	Specific gravity of water in which specimens were taken.	DISTRIBUTION IN LAKE.		Further distribution.
		Main area.	Outer channel.	
TELEOSTEI—contd.				
MALACOPTERYGII—contd.				
CHANIDAE.				
<i>Chanos chanos</i> (Forskål)	1·000—1·0075	X	...	Red Sea, East Coast of Africa, Indian and Pacific Oceans and their estuaries.
CLUPEIDAE.				
DOROSOMATINAE.				
<i>Dorosoma nasus</i> (Bloch)	1·000—1·02650	X	X	South Arabia and Socotra, seas of India to Malay Archipelago, Philippines, Formosa and China.
„ <i>indicus</i> (Russel)	1·000—1·0030	?	?	Seas and estuaries of India, Siam, Malay Archipelago and Philippines.
ENGRAULINAE.				
<i>Engraulis annandalei</i> , sp. nov.	1·000	X	...	
„ <i>kempi</i> , sp. nov.	1·00750—1·00775	X	...	
„ <i>rambhae</i> , sp. nov.	1·00750—1·00800	X	...	
„ <i>purava</i> (Hamilton Buchanan).	1·00750—1·02650	X	X	Seas and estuaries of India, Malay Peninsula and Archipelago.
„ <i>mystax</i> (Bloch and Schneider).	1·00750	X	...	Seas and estuaries of India, Malaysia and China.
<i>Stolephorus indicus</i> (v. Hasselt)	1·000—1·00750	X	...	Seas of India and Malay Archipelago, Philippines, Formosa, Japan, Samoa and Tahiti.
„ <i>commersonii</i> Lacépède	1·00750	X	...	Madagascar, seas of India, Malay Archipelago and Philippines.
„ <i>tri</i> Bleeker	1·00750	?	?	Seas and estuaries of India, Malay Archipelago and Philippines.
CLUPEINAE.				
<i>Clupeoides lile</i> (Cuvier and Valenciennes).	1·00750	X	...	West coast of India, Ceylon, Burma, Siam and Malay Archipelago.
„ <i>ilisha</i> (Hamilton Buchanan.)	1·000—1·02650	X	X	Persian Gulf, coasts and estuaries of India and Siam.
OSTARIOPHYSI				
SILURIDAE.				
CLARIINAE.				
<i>Plotosus canius</i> Hamilton Buchanan	1·000—1·02650	X	X	Seas, estuaries and rivers of India and the Malay Archipelago.
SILURINAE.				
<i>Wallago attu</i> (Bloch and Schneider)	1·0020	X	...	Rivers and estuaries of India and the Malay Archipelago.
<i>Callichrous bimaculatus</i> (Bloch)	1·0020	X	...	Ditto.
<i>Pangasius pangasius</i> (Cuvier and Valenciennes).	1·000	X	...	Ditto.
<i>Osteogeneiosus militaris</i> (Linnaeus)	1·000—1·0020	X	...	Ditto.
BAGARINAE.				
<i>Arius salparanus</i> , sp. nov.	1·000	...	X	
„ <i>arius</i> (Hamilton Buchanan)	1·000	...	X	Estuaries of Orissa, Bengal and Burma.

Species.	Specific gravity of water in which specimens were taken.	DISTRIBUTION IN LAKE.		Further distribution.
		Main area.	Outer channel.	
TELEOSTEI—contd.				
OSTARIOPHYSI—contd.				
RAGARINAE—contd.				
<i>Arus caelatus</i> (Cuvier and Valenciennes).	1.0020—1.0070	X	...	Seas, brackish waters and rivers of India, Siam and the Malay Archipelago.
„ <i>jalcaarius</i> Richardson	1.0060	X	...	Seas of East Africa, India and China.
<i>Macrones cavasius</i> (Hamilton Buchanan).	1.0020	X	...	Fresh waters of India and Burma.
„ <i>gulio</i> (Hamilton Buchanan).	1.0020—1.0260	X	X	Seas and estuaries of India and the Malay Archipelago.
„ <i>vittatus</i> (Bloch)	1.000—1.0020	X	...	Fresh water of Tranquebar, India and Siam.
CYPRINIDAE.				
CYPRININAE.				
<i>Cirrhina latia</i> (Hamilton Buchanan)	1.0080	X	...	Fresh waters of India.
<i>Barbus sophore</i> (Hamilton Buchanan)	1.000—1.0110	X	...	Fresh waters of India, also found within tidal influence.
„ <i>ticto</i> (Hamilton Buchanan)	1.000—1.0110	X	...	Fresh waters of India and Ceylon, also occurring in brackish waters.
<i>vittatus</i> Day	1.0260	...	X	Cutch, Madras and Ceylon.
APODES				
ANGUILLIDAE.				
<i>Muraenesox cinereus</i> (Forskål)	?	?	?	Coasts of Africa and Arabia ; seas and estuaries of India, Malay Archipelago, Australia, Japan and China.
MURAENIDAE.				
<i>Rhabdura macrura</i> (Bleeker)	1.0260	...	X	Natal, seas of India, Malay Archipelago, Australia and Formosa.
OPHICHTHYIDAE.				
<i>Ophichthis chilkenis</i> , sp. nov. .	1.0060—1.0110	X	...	
„ <i>hijala</i> (Hamilton Buchanan).	1.000	X	...	Estuaries of Bengal and the sea of Penang.
„ <i>boro</i> (Hamilton Buchanan)	1.000—1.0020	X	...	Seas and estuaries of India and the Malay Archipelago.
HAPLOMI				
CYPRINODONTIDAE.				
APLOCHEILINAE.				
<i>Panchax panchax</i> (Hamilton Buchanan).	1.0020—1.0110	X	...	Fresh waters and estuaries of India, Andamans, Siam, Malay Peninsula and Archipelago.
<i>Aplocheilus melastigma</i> McClelland	1.000—1.0080	X	X	India, Formosa, Korea, Japan and Kiangsú in China.
CATOSTEOMI				
SYNGNATHIDAE.				
<i>Ichthyocampus carce</i> (Hamilton Buchanan).	1.0080	X	X	Seas, estuaries and fresh waters of India and the Malay Archipelago.
<i>Hippocampus brachyrhynchus</i> , Dunker	1.000—1.0110	X	X	Mekran Coast (Arabian Sea).

Species.	Specific gravity of water in which specimens were taken.	DISTRIBUTION IN LAKE.		Further distribution.
		Main area.	Outer channel.	
TELEOSTEI—contd.				
PERCESOCES				
SCOMBRESOCIDAE.				
<i>Belone strongylura</i> v. Hasselt	1.0030—1.00750	X	...	Coasts and estuaries from Bengal to China.
<i>Hemirhamphus limbatus</i> Cuvier and Valenciennes.	1.000—1.0110	X	...	Indian Ocean and the Sea of Penang.
MUGILIDAE.				
<i>Mugil cephalus</i> Linnaeus	1.000—1.0060	X	...	Mediterranean Sea, West Coast of Africa, Red Sea, Indian Ocean, seas of China and Japan including estuaries, Pacific and Atlantic coasts of America.
„ <i>gymnocephalus</i> Swainson	?	?	?	Seas of India and the Malay Archipelago.
„ <i>cunnesius</i> Cuvier and Valenciennes.	1.000—1.0260	X	X	Abyssinia, Red Sea, seas of India to the Malay Archipelago and beyond.
„ <i>subviridis</i> Cuvier and Valenciennes.	1.0020—1.0260	X	X	Seas of India entering fresh waters.
„ <i>caeruleo-maculatus</i> Lacépède	1.000	...	X	Coasts of Mauritius, through seas of India to the Malay Archipelago.
„ <i>jerdoni</i> Day .	1.0110	X	...	Seas of India.
„ <i>speigleri</i> Bleeker	1.000—1.0080	X	X	Seas of India, Malay Archipelago and Shanghai.
<i>Liza borneensis</i> (Bleeker)	?	...	X	Seas of India, Malay Archipelago and East Indies.
„ <i>corsula</i> (Hamilton Buchanan)	1.000	X	...	Fresh waters and estuaries of India.
„ <i>trocheln</i> (Bleeker)	?	...	X	Seas of India and Indo-Australian Archipelago.
POLYNEMIDAE.				
<i>Eleutheronema tetradactylum</i> (Shaw)	1.000—1.0060	X	...	Seas of India, Indo-Australian Archipelago, North Australia and China.
SPHYRAENIDAE.				
<i>Sphyraena raghava</i> , sp. nov.	?	...	X	
OPHIOCEPHALIDAE.				
<i>Ophiocephalus punctatus</i> Bloch	1.000	X	...	Fresh waters of India, Ceylon and Yunnan.
PLECTOGNATHI				
SCLERODERMI.				
TRICANTHIDAE.				
<i>Triacanthus brevirostris</i> Temm. and Schl.	1.000—1.0070	X	X	Seas of India, Malay Archipelago, Australia, China and Japan.
GYMNODONTES.				
TETRODONTIDAE.				
<i>Tetrodon fluviatilis</i> (Hamilton Buchanan).	1.000—1.0110	X	...	Seas and estuaries of India and Malay Archipelago.
„ <i>oblongus</i> (Bloch)	?	...	X	Seas of India, Malay Archipelago, China and Japan.
„ <i>patoca</i> Hamilton Buchanan	1.0260	...	X	Seas of India to China.
„ <i>reticularis</i> (Bloch and Schneider).	1.000—1.0260	...	X	Seas of India, Malay Archipelago and New Guinea.

Species.	Specific gravity of water in which specimens were taken.	DISTRIBUTION IN LAKE.		Further distribution.
		Main area.	Outer channel.	
TELEOSTEI—contd.				
ACANTHOPTERYGII				
PERCIFORMES.				
LOBOTIDAE.				
<i>Coius quadrifasciatus</i> (Sevastianof)	1.000—1.00750	X	...	Estuaries of the Ganges, rivers of Burma, Siam, the Malay Archipelago and Peninsula.
SERRANIDAE.				
CENTROPOMINAE.				
<i>Lates calcarifer</i> (Bloch)	About 1.0000—1.0260	X	X	Coasts and mouths of rivers of South Eastern Asia from India to Southern China, the Philippines and Australia.
CHANDINAE.				
<i>Chanda ambassis</i> (Lacépède)	About 1.0150	X	...	East coast of Africa, shores of India, Malay Archipelago and North coast of Australia.
<i>Priopis gymnocephalus</i> (Lacépède)	1.000—1.0260	X	X	Coasts of Orissa and Malabar, Seychelles and Sea of Penang.
LUTJANINAE.				
<i>Lutjanus johnii</i> (Bloch)	1.0060	X	...	Coasts of Africa, Red Sea, seas of India, Malay Archipelago, coasts of China and Australia.
<i>Therapon jarbua</i> (Forskål)	1.000—1.0260	...	X	East coast of Africa, Red Sea, seas and estuaries of India, Malay Archipelago, North coast of Australia and Japan.
.. <i>puta</i> Cuvier	1.000—1.0260	X	X	Red Sea, seas of India, Malay Archipelago, coasts of Australia, the Philippines and South Pacific Ocean.
SILLAGINIDAE.				
<i>Sillago sihama</i> (Forskål)	1.000—1.260	X	X	North and East Africa, Red Sea, seas of India, Malay Archipelago, coasts of Queensland, the Philippines, Japan and China.
<i>Sciaena coitor</i> (Hamilton Buchanan)	1.0030	X	...	Seas of India, China and the Philippines.
<i>Limbrina indica</i> (Kuhl and Hasselt)	1.000—1.0110	X	X	Seas of India, Malay Archipelago, the Philippines, Sea of Penang and China.
GERRIDAE.				
<i>Gerres dyena</i> (Forskål)	1.000	...	X	East coast of Africa, Red Sea, seas of India, Malay Archipelago, Fiji, Japan and the Philippines.
.. <i>setifer</i> (Hamilton Buchanan)	1.0070—1.0260	X	X	Seas and coasts of India, Malay Archipelago and China.
.. <i>punctatus</i> Cuvier and Valenciennes.	1.000	...	X	Red Sea, seas of India, Malay Archipelago, China and the Philippines.
<i>Leiognathus equulus</i> (Forskål)	1.000—1.0110	X	X	Ditto
.. <i>blochii</i> (Cuvier and Valenciennes).	1.00750—1.0260	X	X	Seas of India.

Species.	Specific gravity of water in which specimens were taken.	DISTRIBUTION IN LAKE.		Further distribution.
		Main area.	Outer channel.	
TESEOSTEI—contd.				
ACANTHOPTERYGII—contd.				
GERRIDAE—contd.				
<i>Gazza minuta</i> (Bloch)	1.0020	X	...	Zanzibar, Red Sea, East Indian Seas, Malay Archipelago, New Hebrides and the Philippines.
SCORPIDIDAE.				
<i>Monodactylus argenteus</i> (Linnaeus)	?	X	...	East coast of Africa, Red Sea, seas of India, Malay Archipelago and of Australia, Philippines and China.
GOBIFORMES				
GOBIDAE.				
GOBINAE.				
<i>Gobius ostreicola</i> Chaudhuri	1.000	...	X	Seas of India, Australia and Fiji.
„ <i>albopunctatus</i> Cuvier and Valenciennes.	1.000	...	X	
<i>Glossogobius giuris</i> (Hamilton Buchanan).	1.000—1.0260	X	X	East coast of Africa, seas and fresh waters of India, the Malay Archipelago, Australia and beyond.
„ <i>biocellatus</i> (Cuvier and Valenciennes).	?	...	X	Seas and coasts of India, the Malay Archipelago and China.
„ <i>mas</i> , sp. nov.	1.0010—1.0060	X	...	Seas of India.
<i>Ctenogobius acutipinnis</i> (Cuvier and Valenciennes).	1.000—1.0080	X	X	
„ <i>chilkensis</i> (Jenkins)	1.000—1.0080	X	X	Brackish water near Calcutta.
„ <i>alcocki</i> (Annandale)	1.0075—1.028250	X	X	
„ <i>globiceps</i> , sp. nov.	1.000—1.028250	X	X	
„ <i>cylindriceps</i> , sp. nov.	1.000—1.028250	X	X	
„ <i>dentifer</i> , sp. nov.	1.000—1.0110	X	X	
„ <i>minima</i> , sp. nov.	1.000—1.0260	X	X	
<i>Oxyurichthys tentacularis</i> (Cuvier and Valenciennes).	1.000—1.0260	X	X	Seas of India and the Malay Archipelago.
<i>Apocryptes rictuosus</i> (Cuvier and Valenciennes).	1.0020—1.0260	X	X	Seas and estuaries of India.
„ <i>lanceolatus</i> (Bloch and Schneider).	?	X	...	Seas of India and the Malay Archipelago.
<i>Micrapocryptes fragilis</i> , gen. et sp. nov.	1.0020—1.0080	X	...	
ELEOTRINAE.				
<i>Eleotris cavifrons</i> Blyth	?	...	X	Andamans.
„ <i>fusca</i> (Bloch and Schneider)	1.000—1.0260	X	X	East coast of Africa, coasts of India and the Malay Archipelago.
„ sp.	1.0280	...	X	Seas and estuaries of India and the Malay Archipelago.
<i>Butis butis</i> (Hamilton Buchanan)	?	?	?	
PERIOPHTHALMINAE.				
<i>Periophthalmus koelreuteri</i> (Pallas)	1.0280	...	X	Seas and estuaries of India.
GOBIOIDINAE.				
<i>Taenioides chilkensis</i> , sp. nov.	1.000—1.0280	...	X	
ZEORHOMBI				
BOTHIDAE.				
<i>Pseudorhombus arsius</i> (Hamilton Buchanan).	1.000	X	X	East coast of Africa, seas of India to Australia and China.

Species.	Specific gravity of water in which specimens were taken.	DISTRIBUTION IN LAKE.		Further distribution.
		Main area.	Outer channel.	
TELEOSTEI—concl'd.				
ACANTHOPTERYGII—concl'd.				
SOLEIDAE.				
<i>Synaptura orientalis</i> (Bloch and Schneider).	?	X	...	Seas of India and China.
CYNOGLOSSIDAE.				
<i>Cynoglossus brevis</i> Günther	1.000—1.0280	X	X	R. Hughli at Calcutta and along Orissa Coast.
SCOMBRIFORMES.				
CARANGIDAE.				
<i>Caranx carangus</i> (Bloch)	1.000—1.0110	X	X	Seas of India and the Malay Archipelago to Atlantic Coast of Tropical America.
<i>Equula edentula</i> (Bloch)	1.007750—1.0110	X	X	Red Sea, seas of India to the Malay Archipelago and beyond.
JUGULARES.				
BLENNIIDAE.				
<i>Petroscirtes bhattacharyae</i> Chaudhuri	1.000—1.0110	X	X	
SCLEROFARI.				
PLATYCEPHALIDAE.				
<i>Platycephalus insidiator</i> (Forskål)	1.02825	...	X	East Coast of Africa, Red Sea, seas of India to the Malay Archipelago and beyond.
OPISTHOMI				
MASTACEMBELIDAE.				
<i>Mastacembelus armatus</i> (Lacépède)	1.000	X	...	Fresh and brackish waters of India, Ceylon and China.