FAUNA OF THE CHILKA LAKE.

FISH.

PART II.

By B. L. CHAUDHURI, *D.Sc.* (*Edin.*), *F.R.S.E.*, *F.L.S.*

(With 8 text-figures.)

CONTENTS.

FISH. (*PART II.*)

By B. L. CHAUDHURI.

This part contains a systematic treatment of the suborders Apodes, Haplomi and Catosteomi of the Order Teleostei. The total number of specimens examined and recorded is 245. They belong to only nine species. Of these one (*Ophichthus chilkensis*) is new to science, while one (*Hippocampus brachyrhynchus*) has recently been described in the *Records of the Indian Museum*. The nine species fall into seven genera and five families.

Suborder *APODES.*

Family ANGUILLIDAE.

Genus **MURAENESOX**, M'Clelland.

Muraenesox cinereus (Forskål).

1775. *Muraena (Toto) cinerea*, Forskål, *Descrip. Anim.*, pp. x, 22.
1801. *Muraena arabica*, Bloch and Schneider, *Syst. Ichthyol.*, p. 488.
1803. *Muraena sp.* [*Taloopaum*], Russel, *Fish. Vizag.*, I, No. 36, p. 25.
1822. *Muraena bagio*, Hamilton Buchanan, *Fish. Gang.*, pp. 24, 364.
1843. *Muraenesox tricuspidata*, M'Clelland, *Cal. Journ. Nat. Hist.*, IV, p. 409, pl. xxiv, fig. 1.
1844. *Congrus tricuspidatus*, Richardson, *Ichthyol. Voy. Sulphur*, p. 105, pl. li, fig. 2.
1845. *Muraenesox hamiltoniae*, M'Clelland, *Cal. Journ. Nat. Hist.*, V, p. 182, pl. viii, fig. 3.
1845. *Muraenesox bengalensis*, M'Clelland, *ibid.*, V, p. 182.
1846. *Conger hamo*, Temminck and Schlegel, *Faun. Jap. Poiss.*, p. 262, pl. cxiv, fig. 2.
1849. *Conger bagio*, Cantor, *Journ. Asiat. Soc. Bengal*, 1849, p. 1298.
1856. *Muraenesox bagio*, Kaup, *Cat. Apod. Fish*, p. 116, pl. xiv, fig. 73.
1870. *Muraenesox cinereus*, Günther, *Brit. Mus. Cat. Fish.*, VIII, p. 45.
1878. *Muraenesox cinereus*, Day, *Fish. Ind.*, p. 662, pl. clxviii, fig. 4.
1889. *Muraenesox cinereus*, Day, *Faun. Brit. Ind. Fish.*, I, p. 91.
1909. *Muraenesox cinereus*, Günther, *Fisch. Sudsee*, III, p. 395.

There is one specimen in the collection. It was obtained in the lake at the end of July, 1913. It measures two feet and nine inches in length. The specimen is of a somewhat "shining golden colour" as described by Russel, though some of the later writers disputed the correctness of his description.

Hamilton Buchanan's specimen was probably a young one—hence his conclusion that the fish grew only to eighteen inches or two feet in length, the difference of colour being probably also due to difference in age. Other slight inaccuracies in his description were due to his not having his original drawings with him at the time of writing. He had left them behind in India along with others. Plate XXIX of the one

hundred and forty-four coloured figures of the manuscript volume of his drawings, now in possession of the Asiatic Society of Bengal, is the original drawing of this species.[1] The name first written on the plate was "*Ophisuroides.*" This was afterwards altered by Buchanan in his own handwriting to *Muraenophis bagi*. There is an indifferent reproduction of this plate by M'Clelland in which all the proportions are inaccurate and the apertures of the nostrils are incorrectly copied.

Measurements of the specimen from the Chilka Lake are given below:—

Length of head	135 mm.
Distance from snout to vent.	370 ,,
Distance from vent to end of tail	480 ,,
Length of snout	36 ,,
Length of pectoral fin	45 ,,

The dorsal fin begins 27 mm. in front of the branchial opening.

This fish is probably only a stray visitor to the lake; a curious fact, however, is that in the present instance the specimen was found in water that was almost fresh.

Distribution:—Coasts of Arabia and Africa, and seas and estuaries of India, the Malay Archipelago, Australia, China and Japan.

Family MURAENIDAE.

Genus **RHABDURA**, Ogilby.

Rhabdura macrura (Bleeker).

1854. *Muraena macrurus*, Bleeker, *Ichth. Bant. Nat. T Ned. Ind.*, VII, p. 324.
1856. *Thyrsoidea longissima*, Kaup, *Cat. Apod. Fish*, p. 82.
1864 *Thyrsoidea macrurus*, Bleeker, *Atl. Ich.*, IV, p. 111, t. clxvi, f. 2.
1878. *Muraena macrura*, Day, *Fish. Ind.*, p. 672, pl. clxx, fig. 5.
1889. *Muraena macrura*, Day. *Faun. Brit. Ind. Fish.*, I, p. 81, fig. 32.
1907. *Rhabdura macrura*, Ogilby, *Proc. Roy. Soc. Queensland*, XX, p. 13.
1909. *Muraena macrurus*, Günther, *Fisch. Sudsee*, III, p. 421.
1910. *Evenchelys macrurus*, Jordan and Richardson, *Mem. Carneg. Mus.*, IV, p. 175.

There is one specimen in the collection. It was secured near Satpara in the month of March, 1914. The specimen measures nearly four and a half feet in length.

The word "twenty" in Kaup's description, stating that the length of the head is contained twenty times in the length, is probably a mistake for "ten." The species, however, is exceedingly elongate and the tail is more than double the length of the trunk. The colour is uniformly blackish brown. The lateral line runs higher up than the middle line and commences in this specimen about 50 mm. anterior to the gill-slits. It consists of a series of detached elongated dashes on each side. The following measurements of the specimen are of interest:—

[1] This volume of manuscript drawings of Dr. Buchanan (afterwards Hamilton), consisting of 144 coloured figures of fishes executed by Indian painters under his supervision, was deposited in the library of the Royal Botanic Gardens at Sibpur in 1815. It was transferred from there to the library of the Asiatic Society of Bengal by Mr. W. Griffith in 1843. This drawing (plate xxix) of the fish is therefore the earliest figure of the species extant.

Length of head	130 mm.
Distance between end of snout and vent	525 ,,
Distance between vent and end of tail (tail)	850 ,,
Length of snout	13 ,,
Long diameter of the eye	6 ,,
Interorbital space	11 ,,
Length of upper jaw	44 ,,
Length of lower jaw	46 ,,

The fish is a casual visitor to the outer channel of the lake during the period of maximum salinity.

Distribution:—Indian Ocean, seas of India, Ceylon and the Malay Archipelago. Also reported from Natal, Australia and Formosa.

Family OPHICHTHYIDAE.

Genus **OPHICHTHUS**, Ahl.

Ophichthus chilkensis, sp. nov.

(Text-figures 12, 13.)

The length of the head is 17·7 % of the distance between the end of the snout and the vent, the length of the snout is 2·5 %, the diameter of the eye is 1·25 %, the length of the upper jaw is 5·6 %, the length of the lower jaw is 3·3 %, the depth (*i.e.* the height of the body) at the gill openings is 5 %, the length of the pectoral fin is 4·6 %, the girth behind the pectoral fins is 11·4 %, the free portion of the caudal extremity is 2·5 % of the same distance, which is nearly half (*viz.* $\frac{10}{19}$) the length of the tail (*i.e.* the length of the fish behind the vent), and nearly one-third of the total length.

The fish is round, long, and scaleless; the end of the tail projects beyond the dorsal and the anal fins; this free portion is without even a rudiment of a caudal fin. The head is slightly depressed, but the rest of the profile is even.

The length of the head is comparatively small and is contained five and half times in the distance between the end of the snout and the vent. The upper jaw is much the longer, being one and a half times as long as the lower. The anterior tubular nostrils are placed on the upper lip, directed downwards and are thus placed on the inferior side of the end of the snout; the posterior nasal openings, which are patent, are placed right in front of the eyes. The eyes are very small; they are lateral though somewhat superior; the diameter of the eye is contained twice in the length of the snout; the interorbital distance, which is slightly convex, is equal to the length of the snout; the opening of the mouth is horizontal and the angle of the jaws is one diameter of the eye behind the postorbital vertical. The teeth on the vomer are globular and those on the jaw are granular; in the maxilla they are arranged in two rows on each side, the innermost row being serrated; they

[1] The text-figures are numbered in continuation of those that appeared in Part I of the paper.

are in two rows also in the mandible; there are no canine teeth (text-fig. 13). The lips are not fringed. The tongue is fully adnate to the floor of the mouth.

The gill-openings are low down and are oblique slits, wide apart anteriorly; the posterior ends of these slits are somewhat closer; the opercular flaps (*i.e.* margins of the slits) are slightly concave; the length of these slits is equal to the length of the snout. The opercular covering becomes continuous with the loose and the swollen integument over the accessory branchial cavity. The pectoral fin is slightly elongated and fan-shaped and is supported by fourteen branching rays; the length of this fin almost equals that of the upper jaw. The dorsal fin is rather low, though it is higher than the anal fin; it begins behind the opening of the gill-slits at a distance of one-third of the length of the head and continues the whole length of the back, stopping short only at the free end of the caudal extremity, and is thus not continuous with the anal fin. The anal fin is slightly lower than the dorsal fin above and commences close behind the vent at a distance of one diameter of the eye; it continues along the

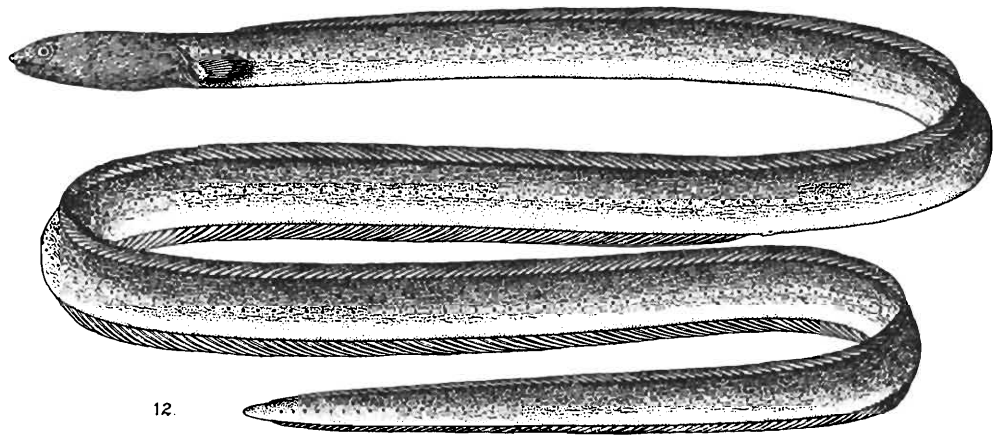


FIG. 12.—*Ophichthus chilkensis*, Chaudhuri × $\frac{2}{3}$.

mid-ventral line to the free caudal extremity, stopping directly under the end of the dorsal fin above.

The lateral line is well marked throughout the length and appears to be continuous with the system of openings of the muciferous glands on the head; it runs along the side slightly above the middle line.

The colour of the body is dark olive-brown, but it is lighter about the abdomen. The fins are dull white except in the last third of the anal fin, this portion being entirely black.

The generic name *Ophichthus* has priority over *Ophisurus*, which has been used also in other groups. The name *Ophichthys* is of course the more correct form philologically and this corrected spelling was first introduced by Bleeker, who has been followed by recent authors generally. Priority however demands the restoration of the generic name in its original spelling as used by Ahl in 1789.

The new species appears to be intermediate between *Ophichthus boro* (Ham. Buch.)

and *Ophichthus microcephalus* (Day) so far as the length of the head is concerned. The length of the head in the new species is five and a half times in the length from the end of the snout to the vent, whereas in that of *O. boro* it is three and a half to four times and in *O. microcephalus* it is seven and one-third to eight. With respect to the length of the tail the new species approaches *O. microcephalus* rather than *O. boro*.

The new species differs considerably from recently described species of *Ophichthus*, *viz. O. miyamotonis*, Tanaka,[1] *O. asakusae*, Jordan and Snyder[2]; *O. tsuchidae*, Jordan and Snyder[3]; all from Japanese waters. All of these have much longer heads. The new species in this respect somewhat resembles *O.* (*Bascanichthys*) *hemizona*, Ogilby[4] of the Australian seas (Port Jackson), but differs from it in all other proportions and in colouration. It also greatly differs from *O. frontalis* (Garman)[5] and *O. biserialis* (Garman).[6]

In the shortness of its head the new species resembles *Ophicthus rhytidoderma* (Bleeker), which is the same as the *Pisoodonophis rutidermatoides* referred to by Kaup, but differs from it totally in the character of its teeth and in other particulars.

There are two specimens in the collection, measuring twenty-seven and a half inches (type) and thirty-two and a half inches (co-type) in total length. Both are from Rambha Bay. Some of the important measurements of the two specimens are given below:—

	Rambha Bay. 22-vii-14.	Rambha Bay. 11-iv-14.
Length of head (snout to gill-opening)	42 mm.	66 mm.
Snout to vent	237 ,,	345 ,,
Tail	455 ,,	550 ,,
Diameter of eye	3 ,,	5 ,,
Length of snout	6 ,,	10 ,,
Interorbital distance	6 ,,	10 ,,
Gill-opening to origin of dorsal fin	13 ,,	24 ,,
Free portion of tail	6 ,,	8 ,,

The type-specimen, which was collected on 22nd July, 1914, measures 692 mm. in total length and is entered under No. $F\frac{9177}{1}$ in the register of the Indian Museum. The co-type, which was collected on 11th April, 1914, is 895 mm. in total length. The fish is a permanent inhabitant of the main area of the lake, being obtainable during the period when its water is almost fresh as well as in the period of its maximum salinity. It does not however breed in the lake. In fact none of the eels do so, for no Leptocephalus larvae have been collected during the survey though they are plentiful on the Puri coast.

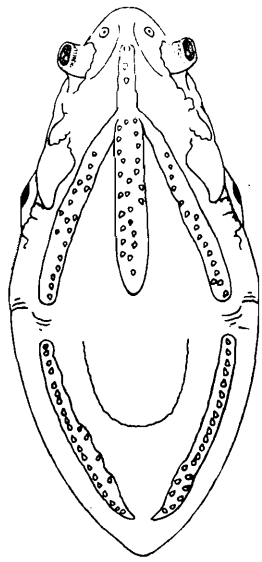
[1] Tanaka, *Fishes of Japan*, XI, p. 195.
[2] *Proc. U. S. Nat. Mus.*, XXIII, p. 872, fig. 18.
[3] *Ibid.*, XXIII, p. 873, fig. 19.
[4] *Proc. Linn. Soc. New South Wales*, XXII, p. 248 (1897).
[5] *Mem. Mus. Comp. Zool. Harvard*, XXIV, p. 309.
[6] *Ibid.*, XXIV, p. 311.

Ophichthus hijala (Hamilton Buchanan).

(Text-figure 14.)

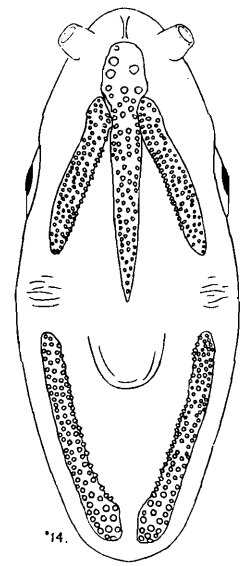
1822. *Ophisurus hijala*, Hamilton Buchanan, *Fish. Gang.*, pp. 20, 363, pl. v, fig. 5.
1832. *Ophisurus hyala*, Cuvier, *Reg. Anim. Poiss.*, p. 317.
1845. *Ophisurus rostratus*, M'Clelland, *Cal. Jour. Nat. Hist.*, V, pp. 184, 211.
1845. *Ophisurus vermiformis*, M'Clelland, *ibid.*, V, pp. 184, 212, pl. xii, fig. 2.
1845. *Ophisurus minimus*, M'Clelland, *ibid.*, V, pp. 185, 212, pl. x, fig. 3.
1845. *Ophisurus caudatus*, M'Clelland, *ibid.*, V, p. 185, pl. xii, fig. 3.
1845. *Ophisurus hijala*, M'Clelland, *ibid.*, V, p. 211.
1849. *Ophisurus grandoculis*, Cantor, *Jour. Asiat. Soc. Bengal*, 1849, p. 1306, pl. v, fig. 3.
1856. *Pisoodonophis boro* (in part), Kaup, *Cat. Apod. Fish Brit. Mus.*, p. 17.
1870. *Ophichthys hyala*, Günther, *Cat. Fish. Brit. Mus.*, VIII, p. 60.
1878. *Ophichthys boro* (in part), Day, *Fish. Ind.*, 664.
1889. *Ophichthys boro* (in part), Day, *Faun. Brit. Ind. Fish.*, I, p. 95.

There is only one specimen in the collection, secured on the 31st August, 1913, at Balugaon. It is twenty-two inches in length. The round dark grey blotches



13.

FIG. 13.—*Ophichthus chilkensis*, Chaudhuri.
Teeth of upper jaw, palate and lower jaw.



14.

FIG. 14.—*Ophichthus hijala* (Ham. Buch.).
Teeth of upper jaw, palate and lower jaw.

(larger than the eyes) on the anterior portion of the lateral line, which are characteristic markings of the species, are very conspicuous along the lateral lines; they begin a little in front of the gill-opening and continue to the region of the vent, and are twenty-four in number.[1] These markings are not found in *O. boro* (Ham. Buch.) in any stage of development. The position of the eyes is lateral in the specimen, but

[1] Similar ovate or elliptical spots, twenty-six in number, have been noticed in a recently described species belonging to the genus, *i.e. Ophicthus biserialis* (Garman) from Chatham Island, Galapagos. The spots are placed above and along the lateral line. This species, however, differs from *O. hijala* (Ham. Buch.) in almost all other particulars (*Mem. Mus. Comp. Zool. Harvard*, XXVI, p. 311).

they are visible from below and not when looked at from above, not as in *O. boro*, in which the eyes are superior. The teeth in *O. hijala* are pointed and not granular or globular as in *O. boro*. Kaup thought that "*O. hijala* (H. B.) was the young fish with less-developed teeth" (p. 17). The full grown specimen in the collection falsifies this contention. Hamilton Buchanan thought "*O. hijala* did not grow above eighteen inches in length." The present specimen which is longer by four inches than the stated average length cannot therefore be said to be young. Day sunk the specific name *hijala* (which he spells as "*hyala*" after Cuvier) in the synonymy for *O. boro*, though in the body of his description of the fish under *O. boro* he admits the distinctive character of the teeth in *O. hijala* by saying that the "teeth are conical in the young, which character may be retained in the adult age as in *O. hiyala*." It should also be noted that in Hamilton Buchanan's work (*Fishes of the Ganges*) the description of *O. hijala* precedes that of *O. boro* and is supported by a figure in the published plates, whereas *O. boro* follows *O. hijala* and is not supported by any figure. If therefore these two names of Hamilton Buchanan stand for one and the same species, the name *O. boro* should lapse and not *O. hijala*. However, as has been shown above, *O. hijala* is quite a distinct species.

Hamilton Buchanan's published figure of *O. hijala* is however defective (Plate V, fig. 5). The pair of tubular nostrils (the tag-like organs on the snout) are shown to be attached on the superior surface of the snout and are directed upwards in the figure, whereas they are on the underside of the snout, are lateral and inferior and are directed downwards. The eyes are shown to be above the angle of the jaw, whereas they are actually situated about the middle of the opening of the mouth.

There is a figure of this snake-eel in Hamilton Buchanan's manuscript drawings (p. 443 *ante*) on plate No. 27 of the set. The name on the back of the plate in Hamilton Buchanan's own handwriting is *Ophisurus rostrata*. This is the original and perhaps the only source of the name and description of "*Ophisurus rostratus*" of M'Clelland in volume V of the *Calcutta Journal of Natural History*, pp. 184 and 211. Hamilton Buchanan chose to alter his manuscript name "*rostrata*" to "*hijala*" in his published work "*The Fishes of the Ganges*." It is this rejected manuscript name of Hamilton Buchanan that was restored by M'Clelland through mistake. He says "I have not met with this species."

The following measurements of this unique specimen are of interest:—

Length of head	52 mm.
Length of snout	7 ,,
Diameter of eye	5 ,,
Interorbital space	7 ,,
Length of upper jaw	11 ,,
Length of lower jaw	9 ,,
Snout to vent	215 ,,
Tail	350 ,,
Free portion of tail	4 ,,
Distance between gill-openings and the origin of dorsal fin	32 ,,
Length of pectoral fin	12 ,,

This snake-eel is probably a permanent inhabitant of the main area, only going out to the sea to breed.

Distribution:—Estuaries of Bengal and the sea of Penang.

Ophichthus boro (Hamilton Buchanan).

1822. *Ophisurus boro*, Hamilton Buchanan, *Fish. Gang.*, pp. 20, 363.
1822. *Ophisurus harancha*, Hamilton Buchanan, *ibid.*, pp. 21, 363.
1845. *Ophisurus boro*, M'Clelland, *Cal. Jonrn. Nat. Hist.*, V, p. 211, pl. xii, fig. 4.
1845. *Ophisurus caudatus*, M'Clelland, *ibid.*, V, p. 185, pl. xii, fig. 3.
1849. *Ophisurus boro*, Cantor, *Journ. Asiat. Soc. Bengal*, 1849, p. 1304, pl. v, fig. 2.
1856. *Pisoodonophis potamophelus*, Kaup, *Cat. Apod. Fish Brit. Mus.*, p. 20.
1856. *Pisoodonophis boro* (in part), Kaup, *ibid.*, p. 17.
1865. *Pisoodonophis boro*, Day, *Fish. Malabar*, p. 248.
1870. *Ophichthvs boro*, Günther, *Cat. Fish. Brit. Mus.*, VIII, p. 77.
1878. *Ophichthys boro* (in part), Day, *Fish. Ind.*, p. 664, pl. clxxi, fig. 2.
1889. *Ophichthys boro* (in part), Day, *Faun. Brit. Ind. Fish.*, I, p. 94, fig. 41.

There are four specimens of different sizes in the collection varying from sixteen inches to twenty-five inches, all from the main area of the lake.

Hamilton Buchanan had three drawings made of the snake-eels of the Bengal estuaries and they are all preserved in the set of his manuscript drawings (plates xxvi to xxviii) which he had to leave behind him in India (p. 443, *ante*). He however was able to publish the figure of *O. hijala* (corresponding to pl. xxvii of the MSS. Drawings). Of the remaining two, *viz. O. boro* and *O. harancha*, reproductions were published in the year 1834 by Gray,[1] but that of *O. hijala* (pl. xxvii of the MSS. Drawings named thereon as *O. rostrata* in ink) was omitted as it had been already published as fig. 5 of pl. v, in the *Fishes of the Ganges*. The published copies of these illustrations were, however, more widely circulated and became better known than the *Fishes of the Ganges*. *O. harancha*, however, is the same as *O. boro*, as was, in a manner, admitted by Hamilton Buchanan,[2] and subsequently also pointed out by Kaup.[3] This was perhaps not fully realized by Gray, who reproduced both the drawings thinking them to be distinct species. In the *Fishes of Malabar*, Day, following Kaup, sunk *O. harancha* in the synonymy of *O. boro*. It is evident from Day's account of *O. boro* in this work that he then believed *O. hijala* to be quite a distinct species. Günther and others also regarded it as such. In the *Fishes of India*, however, Day, again following Kaup, stated that *O. hijala*, *O. boro* and *O. harancha* were all one and the same species. In doing this he erroneously sunk the prior name *O. hijala* for the later name, evidently being misled by Kaup, who mentioned the two names of Hamilton Buchanan in the reverse order—(probably for the sake of euphony), *i.e.* "*Ophisurus boro* et *hijala*, Ham., *Gang. Fish*, pp. 20, 21, 363"—in his note. This reverse order in his note led Kaup also to mistake the later name for the

[1] *Illustrations of Indian Zoology from the collection of Major-General Hardwicke* by J. E. Gray, Vol. I, pl. xcv, figs. 1 and 2.

[2] *The Fishes of the Ganges*, p. 21.

[3] *Catalogue of Apodal Fishes in the collection of the British Museum*, pp. 20, 21.

species. Day evidently followed Kaup when, by so doing, he found that he could use the more popular name—the *O. boro* of Gray and the *P. boro* of his own *Fishes of Malabar*. Thus *O. boro*, as understood by Day after 1865 and by Kaup from 1856, includes also *O. hijala* of Hamilton Buchanan, and *O. boro* of Kaup and Day represents, in part only, *O. boro* of Hamilton Buchanan.

The Chilka collection comprises specimens of *O. boro* of different sizes, none of which show any of the characters believed to be specific in *O. hijala*.

The following list gives the distribution of *O. boro* in the Lake.

1 specimen	Rambha Bay	——	measuring 400 mm.	in length
1 ,,	Balugaon	.. 31-viii-13	,, 410 ,,	,,
2 specimens	Barkul	Sept., 1914...	,, 540 ,,	and 610 mm

The fish appears to be a permanent inhabitant of the lake in the main area, but it does not breed there.

Distribution:—Seas and estuaries of India and the Malay Archipelago, ascending large rivers above tidal reach; also in the river of the Sambas.

Suborder *HAPLOMI.*

Family CYPRINODONTIDAE.

Subfamily APLOCHEILINAE.[1]

Genus **PANCHAX**, Cuvier and Valenciennes.

Panchax panchax (Hamilton Buchanan).

(Text-figures 15, 17.)

1822. *Esox panchax*, Hamilton Buchanan, *Fish. Gang.*, pp. 211, 380, pl. iii, fig. 69.
1839. *Aplocheilus chrysostigma*, M'Clelland, *Asiat. Research*, XIX, pt. 2, pp. 301, 426, pl. xlii, figs. 2*a*, 2*b*.
1839. *Aplocheilus panchax*, M'Clelland, *ibid.*, XIX, pt. 2, p. 302.
1846. *Panchax buchanani*, Cuvier and Valenciennes, *Hist. Nat. Poiss.*, XVIII, p. 383.
1846. *Panchax kuhlie*, Cuvier and Valenciennes, *ibid.*, XVIII, p. 384.
1849. *Panchax panchax*, Cantor, *Journ. Asiat. Soc. Bengal*, 1849, p. 1234.
1853. *Panchax buchanani*, Bleeker, *Nalez. Ichthyol. Beng. Hind.*, p. 144.
1859. *Panchax buchanani*, Blyth, *Journ. Asiat. Soc. Bengal*, XXVII, p. 288 (1858).
1863. *Panchax buchanani*, Bleeker, *Atl. Ich. Ind. Orient. Neerland.*, III, p. 141, tab. cxliv, fig. 3.
1866. *Haplochilus panchax*, Günther, *Cat. Fish. Brit. Mus.*, VI, p. 311.
1873. *Haplochilus panchax*, Day, *Rep. Fr. Fish. Ind. Burma*, p. cclxxvi.
1878. *Haplochilus panchax*, Day, *Fish. Ind.*, p. 523, pl. cxxi, fig. 3.
1889. *Haplochilus panchax*, Day, *Faun. Brit. Ind. Fish.*, I, p. 427.
1895. *Haplochilus panchax*, Garman, *Mem. Mus. Comp. Zool. Harvard*, XIX, p. 124, pl. iii, fig. 7 (teeth).
1912. *Haplochilus panchax*, Sewell and Chaudhuri, *Ind. Fish. Mos. Dest.*, p. 3, fig. 2.

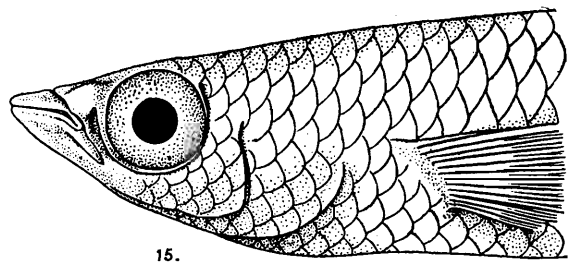
There are altogether sixteen specimens in the collection, all from the main area of the lake. The list given below will show the time and place of their occurrence in the lake.

---

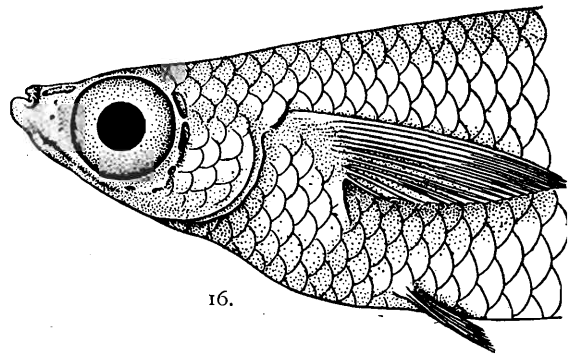
[1] Bleeker, *Atl. Ichth. Ind. Orient. Neerland.*, III, p. 140.

8 specimens	..	Off Barkul	..	..	9—13-xi-12	..	measuring	18 mm.	to	38 mm.
2 ,,	..	Barkul Point	..	..	2-iii-14	..	,,	25 ,,	and	34 ,,
2 ,,	..	Off mouth of Barkul Bay		..	18-ix-14	..	,,	27 ,,	,,	29 ,,
2 ,,	..	Nalbano Island	..	..	25-xi-14	..	,,	36 ,,	,,	41 ,,
1 ,,	..	Rambha Bay	..	..	xii-13	..	,,	25 ,,		
1 ,,	..	Rambha	..	..	ii-14	..	,,	24 ,,		

The jaws are subequal, the upper one is slightly longer and protractile (text-fig. 15). The mouth is large and its opening horizontal; the contour of the opening is convex in front and extends beyond the breadth of the upper jaw to nearly half the



15.



16.

FIG. 15.—*Panchax panchax* (Ham. Buch.).
Side view of the head and a portion of the trunk, showing the lateral and horizontal opening of the mouth and the position of the pectoral fin.

FIG. 16.—*Aplocheilus melastigma*, M'Clell.
Side view of the anterior part of the fish, showing the small and terminal opening of the mouth and the position of the pectoral fin

length of the snout (text-figs. 15 and 17). The teeth in the upper jaw are villiform and are distinctly banded; in the lower jaw they are in two to three rows and also villiform and banded. In both the jaws there are an outer and a more or less distinct inner series of enlarged teeth. In most specimens the vomerine teeth are present. The margin of both the jaws is coloured dark brown. The white occipital spot is very conspicuous in some specimens, in others it is indistinct and in rare cases wanting. The presence or absence of this spot appears to have no reference to age, locality, or time of the year when the specimen was collected. The black blotch at the root of the dorsal fin, which is well marked in all the specimens, is in some surrounded by a white halo. In some of the larger specimens the margin of the anal fin and in

some cases that of the caudal fin is coloured black with a yellow band inside. Most of the specimens have twenty-six scales from the end of the snout to the origin of the dorsal fin, and five scales between the post-orbital line and the origin of the pectoral fin. Generally there are three to four scales from the top of the pectoral fin to the mid-dorsal line of scales, and three scales also between the lower margin of the root of the pectoral fin and the mid-ventral line (text-fig. 15). The ventral fins cover the vent and almost reach the anal papila, which is thin. In adult specimens, collected in November, mature eggs of one millimeter in diameter were found.

The species occurs near the edge everywhere in the main area of the lake, but appears to be entirely absent from the outer channel. It breeds freely in the main area.

Distribution :—Fresh waters (extending to estuaries) in Bengal, Behar, Orissa, Assam, Burma, Siam, the Malay Peninsula and Archipelago and the Andamans. The species has also been reported from Sind, Cutch and the Central Provinces of India.

Genus **APLOCHEILUS** M'Clelland.

Aplocheilus melastigma, M'Clelland.

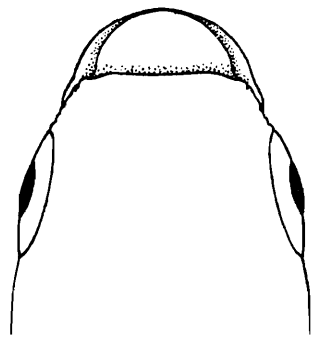
(Text-figures 16, 18.)

1839. *Aplocheilus melastigma*, M'Clelland, *Asiat. Research.*, XIX, pt. 2, pp. 301, 427, pl. xlii, fig. 3.
1839. *Aplocheilus* sp., M'Clelland, *ibid.*, XIX, pt. 2, p. 302, pl. lv, fig. 4.
1846. *Poecilia latipes*, Temminck and Schlegel, *Faun. Japon. Pisc.*, p. 224, pl. cii, fig. 5.
1849. *Aplocheilus carnaticus*, Jerdon, *Madras Journ. Lit. Sc.*, XV, p. 331.
1854. *Aplocheilus macclellandi*, Bleeker, *Nat. Tijd. Ned. Ind.*, VII, p. 323.
1858. *Panchax cyanophthalma*, Blyth, *Journ. Asiat. Soc. Bengal*, XXVII, p. 288.
1860. *Panchax cyanophthalma*, *id.*, *ibid.*, XXIX, p. 111.
1860. *Aplocheilus latipes*, Bleeker, *Act. Soc. Sc. Indo-Neerl.* VII, Japan, VI, p. 99.
1866. *Haplochilus latipes*, Günther, *Cat. Fish. Brit. Mus.*, VI, p. 311.
1866. *Haplochilus cyanophthalmus*, Günther, *ibid.*, VI, p. 312.
1867. *Panchax argenteus*, Day, *Proc. Zool. Soc.*, p. 706.
1873. *Haplochilus argenteus*, *id.*, *Rep. Fr. Fish. Ind. Burma*, p. cclxxvi.
1878. *Haplochilus melastigma*, *id.*, *Fish. Ind.*, p. 522, pl. cxxi, fig. 4.
1889. *Haplochilus melanostigma*, *id.*, *Faun. Brit. Ind. Fish.*, I, p. 415.
1895. *Haplochilus melastigma*, Garman, *Mem. Mus. Comp. Zool. Harvard*, XIX, p. 127.
1895. *Haplochilus latipes*, *id.*, *ibid.*, XIX, p. 128.
1901. *Aplocheilus latipes*, Jordan and Snyder, *Proc. U. S. Nat. Mus.*, XXIII, p. 350.
1907. *Oryzias latipes*, *id.*, *ibid.*, XXXI, p. 289, text-fig. (p. 290).
1912. *Haplochilus melastigma*, Sewell and Chaudhuri, *Ind. Fish. Mos. Dest.*, p. 4.
1913. *Oryzias latipes*, Jordan, Tanaka and Snyder, *Journ. Coll. Sc. Univ. Tokyo*, XXXIII, p. 91, fig. 67.
1913. *Oryzias latipes*, Jordan and Metz, *Mem. Carnegie Mus.*, VI, p. 24, fig. 21.
1916. *Haplochilus melanostigma*, Sundara Raj, *Rec. Ind. Mus.*, XII, p. 293, pl. xxv, figs. 1 and 10.

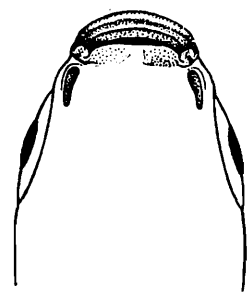
There are altogether one hundred and eighty-four specimens in the collection. This fish has been found near the edge all over the lake including the outer channel. The following table gives the distribution of the species in the lake.

21	specimens	Barkul	.9—13-xi-12	measuring from	10	mm.	to 20 mm.
12	,,	Barkul Point	2-iii-14 ..	,,	11	,,	to 22 ,,
2	,,	Balugaon	6-iii-14	,,	14	,,	and 17 ,,
37	,,	Chiriya Island	13-ii-14	,,	6	,,	to 17 ,,
35		Maludaikuda	24-xi-14	,,	8	,,	to 22 ,,
1	specimen	Manikpatna (Long Island)	7-ix-14	,,	17	,,	
27	specimens	Nalbano	25-xi-14	,,	15	,,	to 26 mm.
2	,,	Nalbano Channel	11-ix-14	,,	17	,,	and 19 ,,
9	,,	Rambha Bay (Breakfast Island)	xi-14	,,	12	,,	to 24 ,,
15	,,	Satpara	ix-13	,,	15	,,	to 25 ,,
13	,,	Do.	x-13	,,	12	,,	to 24 ,,

As Blyth observed, this species is less of a surface-fish than *Panchax panchax* (Ham. Buch.). The following peculiarities should be noted. The opening of the mouth is very small, horizontal and transverse, and is not broader than the end



17.



18.

FIG. 17.—*Panchax panchax* (Ham. Buch.).
Anterior part of the head seen from above, showing the form of the snout with premaxillary.

FIG. 18.—*Aplocheilus melastigma*, M'Clell.
Anterior part of the head showing the small and somewhat superior opening of mouth.

of the upper jaw. Its contour is like a much flattened ellipse; the lower jaw, however, is slightly longer and broader and this makes the mouth appear to be somewhat superior and round (text-figs. 17 and 18.) The mouth is not protractile. The teeth are simple and pointed and are in two rows in the jaws, but those in the posterior row are very minute and often difficult to detect. There are no vomerine teeth. The eyes are lateral and their superior borders bulge out slightly on the surface of the head. There are three to four scales between the upper border of the pectoral fin and the mid-dorsal line; there are nearly seven scales between the inferior border of the root of the pectoral and the mid-ventral line (text-fig. 16); the number of scales in front of the dorsal fin is twenty-eight only; there are three scales between the post-orbital line and the root of the pectoral fin. The base of the pectoral fin is very muscular and swollen. The caudal fin is truncated and square-cut. In some specimens there are two black lines about the middle of the anal fin running parallel to its edge, besides the black lines running along the middle of the fish and along the border of the anal fin. In some specimens there are numerous black spots over the

upper corner of the base of the pectoral fin, over parts of the operculum and on the sides of the abdomen. Many of the bigger specimens are full of mature eggs. One specimen collected from the edge of the lake at Satpara in the month of September, measuring twenty-five millimeters in length, had a cluster of about forty eggs with growing embryos inside most of them. This egg-cluster was attached between the ends of the ventral fins and the beginning of the anal fin. There are numerous hooklets round each of the capsules of the eggs, which give them a characteristic appearance somewhat like a miniature model of the fruits of the well-known *Datura*. The anal papila is flat, thick and leaf-like, with a notch in the middle.

As Tate Regan has conclusively shown (*Ann. Mag. Nat. Hist.*, (8), VII, p. 324) the genus *Oryzias* of Jordan and Snyder is a synonym of *Aplocheilus*, M'Clelland, afterwards definitely restricted by Bleeker to the group to which it is now applied. Examination of a large number of *A. melastigma* has led me to suspect that *A. latipes* (Temminck and Schlegel), the type of the genus *Oryzias* of Jordan and Snyder, is in all probability identical with *A. melastigma*. This suspicion has been confirmed by the same species being found among a collection of small fish made by Dr. N. Annandale, in September 1915, in the outskirts of Shanghai. Günther, in a manner, long ago comprehended the identity of these two species. Though he omitted *A. melastigma*, M'Clelland, from his *Catalogue of Fishes in the British Museum* as a doubtful species, he adopted its synonym *H. cyanophthalmus*, Blyth, as a valid one. The collection, on the examination of which he based his identification of Blyth's species, came from Calcutta, but his difficulty was that the fin had nineteen anal rays only as in *A. latipes* and not twenty-two. Though most of the Chilka specimens have twenty-two anal rays, I find that some have eighteen, twenty or twenty-one. In other respects they are almost alike. Recently this Museum has received a valuable collection of representative fish from Lake Biwa, Japan, in excellent condition, from the Rinko Zikkensho of Otsu. In this collection there is one specimen labelled *Oryzias latipes* (Temm. and Schleg.) which appears to us to be a perfectly typical example of *A. melastigma*, M'Clelland. The acquisition of specimens from Lake Biwa and Shanghai has given us an opportunity to institute a close comparison between the Japanese specimen and those from Shanghai and the Chilka Lake. The result of this examination is tabulated below :—

	Lake Biwa. Japan.	Shanghai.		Chilka Collection.		
		A.	B.	Rambha Bay.	Nalbano Island.	Barkul Point.
Number of rays in the anal fin	18	20	19	22	18	21
Number of scales along the lateral line	31	30	31	30	29	30
Number of scales along the mid-transverse line.	9	9	9	9	9	9
Length of head	6 mm.	5 mm.	5 mm.	7 mm.	6 mm.	5 mm.
Depth of body	5·5 mm.	4·5 mm.	4·5 mm.	7 mm.	5·5 mm.	4·7 mm.
Number of scales above the pectoral fin	4	3	4	4	4	4
Number of scales below the pectoral fin.	7	6	7	7	7	7

The proportion between the length of the head and the depth of the fish varies slightly according to sex, as well as in individuals during the breeding season and also owing to other causes; no very great value, therefore, should be attached to slight differences in the depth. Jordan and Snyder appear to have ignored the generic character of *Aplocheilus* (*s. s.*) in instituting their genus and do not allude to the fact that in *A. javanicus*, Bleeker, the anal fin is even longer than in the specimens of the species they examined, having twenty-five rays.

The species occurs all round the edge of the lake including the outer channel. It is a permanent inhabitant and breeds freely in the lake.

Distribution:—Madras, Orissa, Bengal, Burma, the Kiangsú Province of China, Formosa, Korea and Japan.

Suborder *CATOSTEOMI.*

Family SYNGNATHIDAE.

Genus **ICHTHYOCAMPUS**, Kaup.

Ichthyocampus carce (Hamilton Buchanan).

1822. *Syngnathus carce*, Hamilton Buchanan, *Fish Gang.*, pp. 13 and 362.
1832. *Syngnathus carce*, Gray, *Illust. Ind. Zool. Hardwicke*, I, pl. lxxxi, fig. 1.
1853. *Syngnathus carce*, Bleeker, *Nalez. Ichth. Faun. Beng. Hindost.*, p. 161.
1856. *Ichthyocampus carce*, Kaup, *Cat. Lophob. Fish Brit. Mus.*, p. 30.

1856. *Ichthyocampus ponticerianus, id., ibid.*, p. 31.
1865. *Ichthyocampus ponticerianus*, Day, *Fish. Malabar*, p. 263.
1870. *Ichthyocampus carce*, Günther, *Cat. Fish. Brit. Mus.*, VIII, p. 176.
1878. *Ichthyocampus carce*, Day, *Fish. Ind.*, p. 670, pl. clxxiv, fig. 2.
1889. *Ichthyocampus carce*, Day, *Faun. Brit. Ind. Fish.*, II, p. 464.

There are altogether fifteen specimens in the collection, of which nine are males and six females. In all the female fish, on the inferior side of the rostrum, there are two longitudinal series of black dots, one on each side of the middle line and running parallel to it. The following list gives the distribution of the species in the lake.

Female specimens.

1 specimen	Off Barkul	..	25-i-14	measuring	120 mm.
1 ,,	Domkuda	..	18-vii-14	,,	100 ,,
3 ,,	Off Samal Island	..	22-ix-13	,,	100, 110 and 115 mm.
1 ,,	Satpara	..	..	,,	100 mm.

Male specimens.

1 specimen	Between Chiriya Island and mainland	28-vii-14	measuring	95 mm.	Pouch full of fertilized eggs but no free embryo.
1 ,,	Eight miles off Kalupara Ghat	16-ix-14	,,	95 mm.	Pouch empty.
1 ,,	Ten miles east of Patsahanipur	10-iii-14	,,	130 mm.	Pouch empty.
2 ,,	Patsahanipur	8-iii-14	,,	40 and 58 mm.	Pouch not fully developed.
1 ,,	Rambha Bay	22-vii-14	,,	61 mm.	Pouch not fully developed.
1 ,,	Satpara	——	,,	117 mm.	Pouch full of developing embryos.
2 ,,	Chilka Lake	——	,,	95 and 120 mm.	Pouch full of developing eggs and a few free embryos.

Distribution:—Seas, estuaries and fresh waters of India and the Malay Archipelago.

Genus HIPPOCAMPUS, Rafinesque.

Hippocampus brachyrhynchus, Duncker.

(Text-figure 19.)

1914. *Hippocampus brachyrhynchus*, Duncker, *Rec. Ind. Mus.*, X, p. 295.

The number of abdominal truncal rings (annuli) is eleven and that of the caudal rings varies from thirty-three to thirty-seven. The number of rings below the dorsal fin (annuli subdorsalis) is $2(-3)+1$. The number of rays in the dorsal fin varies from seventeen to nineteen and that in the pectoral fin from thirteen to fifteen. The number of rays in the anal fin is four. The number of rings in the region of the brood pouch varies from six to eight.

The rings are provided with blunt spines which are nearly uniform, except on the seventh truncal ring and also on the fourth, the seventh, the eleventh and the fourteenth caudal rings, where they are dorsally a little enlarged. The abdominal crista are prominent, in the males they are provided with a black cutaneous fringe (dewlap). There are no cutaneous appendages, except the simple papillae on the breeding-pouch, which are more closely arranged in the posterior half of the pouch. The coronet is scarcely developed. The rostrum is very short and is half to three-fourths in the post-orbital length of the head and up to one and a half times in the orbital diameter. The colour is uniformly dark; there are light radiating stripes from the eye. Total length up to 70 mm.

Fig. 19.—*Hippocampus brachyrhynchus*, Duncker, × 2.

Types:—There were altogether nine specimens from Rambha Bay in the series that Dr. George Duncker examined in describing the species, five males and the remaining four females. The type male specimen is registered under No. F $\frac{8508}{1}$ and the type female under No. F $\frac{8509}{1}$ in the register of the Indian Museum.

Besides these nine specimens, there are in the collection twelve more specimens of the species from different parts of the lake, as follows:—

1	specimen	..	♂	..	Domkuda	..	18-vii-14	measuring 45 mm.
1	,,	..	♂	..	Mahosa	..	10-ix-14	,, 38 ,,
1	,,		♂		Rambha		15-ii-14	,, 70 ,,
3	,,		♀		Rambha		15-ii-14	,, 55, 65 and 72 mm.
5	,,	..	(young)		Rambha	..	14-ii-14	,, 10, 12, 16, 18 and 23 mm.
1	,,		♀		Seruanaddi	..	8-ix-14	,, 43 mm.

The species is a permanent inhabitant of the lake and breeds in it.

Duncker records it from the Mekran coast (Arabian Sea) as well as the Chilka Lake.