Synopsis of Indian Genera.

A. Teeth large, flattened, tessellated.
Fins on head meet in the form of a soft appendage in front of snout. Teeth in several series, the middle being the broadest ..... 1. MYLIOBATIS.
Only one series of very broad teeth ..... 2. AËTOBATIS.
Fins on either side of snout form a lobe ..... 3. RHINOPTERA.
B. Teeth small; cephalic fins forming an appendage on either side of snout.
Teeth in both jaws ..... 4. DICEROBATIS.

1. Genus **MYLIOBATIS**, Cuvier.

Head distinct from disk; snout with a soft prolongation, internally supported by fin-rays; nasal valves coalescent, forming a quadrangular flap. Teeth hexagonal, flat, the central broader than long; the external rows narrow *. Tail very long and whip-like, having a dorsal fin near its base, and usually a serrated spine posterior to the fin. Body smooth or tuberculated above.

Geographical Distribution. Tropical and temperate seas.

Synopsis of Indian Species.

Body smooth. The young with five blue cross bands on the upper surface, disappearing with age ..... 1. *M. nieuhofii*, p. 58.
A row of small tubercles in the median line of the scapular region. Ocelli with brown margins in the posterior half of the upper surface of disk ..... 2. *M. maculata*, p. 59.

63. (1.) **Myliobatis nieuhofii.**

Raja nieuhofii, *Bl. Schn. Syst. Ich.* p. 364.
Myliobatis nieuhofii, *Day, Fish. India*, p. 742 (see synon.).

Tuppa koollee or *Chuppa tirike*, Tamil; *Mookarah tenkee*, Tel.

Disk about twice as broad as long; tail about three times as long as disk. Fleshy prolongation of snout short; no horn on orbit. Body smooth. *Fins*—dorsal situated at commencement of base of tail, opposite the end of the insertion of the ventrals; no spines posterior to it. *Colour*—olive superiorly, tinged externally with a reddish hue and a dark outer margin to the disk. The young have about seven blue bands across the disk and two more between or close to the eyes. As the fish increases in size, first the bands on the head disappear and finally those on the body.

Hab. Seas of India to the Malay Archipelago and Japan.

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* In the young the rows of teeth are of equal size and regularly hexagonal.

64. (2.) Myliobatis maculata *.

Myliobatis maculata, *Gray & Hardw. Ill. Ind. Zool.* ii, pl. 101; *Day, Fish. India*, p. 742 (see synon.).

Disk about twice as wide as long; tail more than three times as long as the disk. Fleshy prolongation of snout short, no horn on orbit. Body with a row of small tubercles along the median line of the back in the scapular region. *Fins*—dorsal situated at the commencement of the base of the tail, behind the end of the insertion of the ventrals; no spine posterior to it. *Colour*—greenish brown, with round blue spots in the posterior half of the disk. Tail white with black rings.

Hab. Seas of India to the Malay Archipelago.

2. Genus AËTOBATIS, Müll. & Henle.

Syn. *Stoasodon*, Cantor.

Head distinct from disk; snout with a soft prolongation, internally supported by fin-rays. Nasal valves usually distinct, each forming a long flap, or they may be united into one quadrangular flap. Teeth in a single row, hexagonal, broad, flat, with the lower dental laminæ projecting beyond the upper. Tail very long and whip-like; dorsal fin present near its base, and a serrated spine posterior to the fin.

Geographical Distribution. Seas of the tropics.

65. (1.) Aëtobatis narinari. (Fig. 24.)

Raja narinari, *Euphrasen, Vet.-Ak. Nya Handl.* 1790, xi, p. 217.
Aëtobatis narinari, *Day, Fish. India*, p. 743, pl. cxciv, fig. 4 (see synon.).

Eel-tenkee, Tel; *Currooway tiriki*, Tam.; *Ra-ta-charm-dah*, Andam.

The comparative proportions of this fish vary greatly with age; the distance from the mouth to the anus equals about half the width of the disk. Nasal valves in some examples separate, each as a long flap; in other examples the valves unite and form a quadrangular flap the lower edge of which is fringed; the spiracle wider than the orbit. *Teeth*—broad, flat, and in a single row, those in the lower jaw may be angularly bent or nearly straight; the lower dental plate projects beyond that in the upper jaw. *Fins*—the dorsal arises opposite the base or centre of the ventral,

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* Myliobatis vespertilio, Bleeker.

Disk at least twice as broad as long; snout somewhat produced; no horn on orbit. No tubercles on back. *Fins*—dorsal begins close to the end of ventrals, beyond which it does not extend. *Colour*—a network of black lines on the back and root of the pectoral fin.

Hab. Red Sea and the Malay Archipelago; therefore probably exists off the coast of India.

the latter fin being about three times as long as broad. Tail three or four times as long as the body, triangular in shape as far as the spine, which is serrated and situated just behind the termination

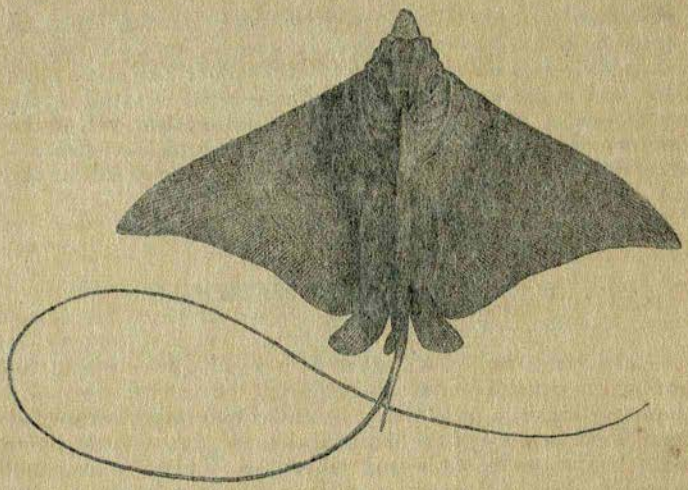

Fig. 24.—*Aëtobatis narinari.*

of the dorsal fin; beyond the spine the tail is compressed; in this, as well as in some other species, there is occasionally a second spine on the tail a little behind the root of the first. Body smooth. *Colour*—greyish olive, sometimes greenish olive or leaden grey above, and usually covered from beyond the occiput with numerous dirty-white or bluish spots edged with black; abdominal surface white; tail black. Iris golden green, teeth greenish yellow. In the immature the back is of a deep leaden colour, and the spots hardly apparent.

Hab. Red Sea, seas and estuaries of India to the Malay Archipelago, and beyond. Eaten by the natives. Is captured to upwards of 6 feet in width.

3. Genus **RHINOPTERA**, Kuhl.

Syn. *Mylorina* and *Micromesus*, Gill.

Head distinct from the disk, but with a pair of rayed appendages

Fig. 25.—Teeth of *Rhinoptera javanica.*

on the lower edge of the snout. Nasal valves confluent, forming

a broad flap. Teeth broad, flat, in five or more rows, the central being the broadest. Tail whip-like, having a dorsal fin armed with a serrated spine.

Geographical Distribution. Tropical and contiguous seas.

Synopsis of Indian Species.

Nine series of teeth in upper jaw, and seven in the lower ..... 1. *R. adspersa*, p. 61.
Seven rows of teeth in each jaw, the three central series being much the longest ..... 2. *R. javanica*, p. 61.

66. (1.) Rhinoptera adspersa.

Rhinoptera adspersa, *Müll. & Henle, Plagios.* p. 183; *Day, Fish. India*, p. 744 (see synon.).

Mutta tiriki or *Kurivi tiriki*, Tamil.

Disk about twice as wide as long; tail about three times as long as disk. Notch on snout shallow. *Teeth*—nine rows in the upper and seven in the lower jaw, the teeth in the central row of the upper jaw 2½ to 3 times wider from side to side than from back to front, but not so wide as those in the next row. *Fins*—dorsal, situated at the base of the tail, and immediately behind it a strong serrated spine. Upper surface of body covered with fine stellate tubercles. *Colour*—greenish brown superiorly, becoming lighter at the edges of the disk.

Hab. Seas of India.

67. (2.) Rhinoptera javanica. (Fig. 25, teeth *.)

Rhinoptera javanica, *Müller & Henle, Plagios.* p. 182, t. lviii; *Day, Fish. India*, p. 744, pl. cxcv, fig. 4 (teeth).

Disk from about 1⅔ to twice as broad as long; tail nearly twice as long as disk. Notch on snout shallow. *Teeth*—seven rows in both jaws, those in the central row being four or five times wider than long (in the antero-posterior direction), and rather more than twice as wide as the row on either side. The outer rows are hexagonal and narrow; those in the lower jaw rather narrower than those in the upper. *Fins*—dorsal situated at the base of the tail, and immediately behind it a serrated spine. *Colour*—greenish superiorly, white beneath.

Hab. Seas of India to the Malay Archipelago.

4. Genus DICEROBATIS, Blainville.

Syn. *Cephaloptera* and *Mobula*, A. Duméril.

Pectoral fin not extended on to the sides of the head, which latter is truncated in front, whilst on either side is a forwardly-

* Mr. A. S. Woodward (Ann. Mag. Nat. Hist. 1888, i. p. 281) has shown that the dentition of these fishes may be abnormally altered.

pointing horn-like projection, which is internally supported by fin-rays. Nostrils not confluent. Teeth in jaws very small, flat, or tuberculated, and in many rows. Tail whip-like, with a dorsal fin situated above and between the ventrals, armed with or destitute of a serrated spine.

The designation *Sea-devils* has been given by some authors to fishes belonging to this genus; it is also frequently applied to several other forms of armed rays and fishes which inflict dangerous wounds.

Geographical Distribution. Tropical and temperate seas.

Synopsis of Indian Species.

Teeth numerous in both jaws ..... 1. *D. eregoodoo*, p. 62.
Teeth $\frac{24-38}{34-38}$ ..... 2. *D. kuhlii*, p. 63.

68. (1.) Dicerobatis eregoodoo. (Fig. 26.)

Eregoodoo tenkee, *Russell, Fish. Vizag.* i, pl. ix.; *Cuvier, Règne Anim.* ed. 2, 1829, ii, p. 442, note.

Dicerobatis eregoodoo, *Cantor, Cat. Mal. Fish.* p. 438; *Day, Fish. India*, p. 744, pl. cxciii, fig. 1 (see synon.).

Eregoodoo tenkee, Tel.; *Shing pâkat*, Marâthi; *Yeliki* or *Konun tiriki*, Tam.

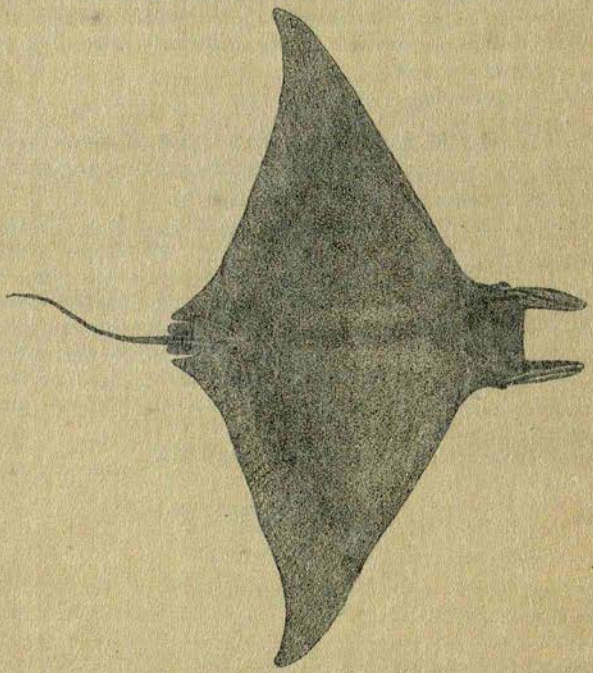

Fig. 26.—*Dicerobatis eregoodoo.*

Disk about twice as broad as long; tail in the young $1\frac{1}{2}$ times the length of the body, but in adults only a little more than half the same length. Body smooth. The horns or cephalic portion of the pectoral fin have a convoluted appearance, and "are used by the animal to draw its prey into its mouth, which opens like a huge cavern between them. The fishermen say they see them swimming slowly along with their mouth open and flapping these great sails inwards, drawing in the smaller crustacea on which they feed" (Sir W. Elliot, MS.). *Teeth*—small, like flattened, quadrangular tubercles as broad as wide in adults, twice as broad in the young, with a backwardly directed point; $\frac{240}{360}$, in a jaw twelve inches across the gape taken from an example upwards of eighteen feet across the disk, and $\frac{23}{23}$ vertical rows opposite the symphysis. In a pair of jaws four inches across, from an example captured at Kurrachee, there are $\frac{240}{244}$. Cantor found in an example thirty inches across the disk $\frac{80}{95}$, and six or seven vertical rows. It may therefore be supposed that the number increases with age, and perhaps alters in shape. The band of teeth reaches nearly to the angle of the mouth. *Fins*—no spine on the tail posterior to the dorsal fin. *Colour*—of a deep purplish superiorly; white beneath.

Hab. Seas of India to the Malay Archipelago; attaining to 18 feet and upwards across the disk.

69. (2.) Dicerobatis kuhlii.

Cephaloptera kuhlii, *Müller & Henle, Plagios.* p. 185, t. lix, fig. 1.
Dicerobatis kuhlii, *Day, Fish. India*, p. 745 (see synon.).

Disk more than twice as wide as long; tail not so long as the disk. Body and tail smooth. *Teeth*—wider than broad; $\frac{34-38}{34-38}$ series, the band ceasing some distance from the angle of the mouth. *Colour*—brown or greenish.

Hab. From the east coast of Africa, through the seas of India to the Malay Archipelago.

Subclass **TELEOSTEI.**

Skeleton osseous. Skull with cranial sutures. Vertebræ completely separated, and the posterior extremity of the vertebral column bony, or having bony plates. Branchiæ free, and the water discharged through a single aperture on each side, protected by a bony gill-cover or opercle; branchiostegal rays present. A non-contractile bulbus arteriosus, having a pair of valves at its commencement. Optic nerves decussating.

The fishes which compose this subclass form the great bulk of those existing at the present day, and are popularly known as the "true fishes." In geological sequence they appeared subsequently to the Chondropterygii, their first traces being found in the Cretaceous period towards the close of the Mesozoic epoch.

Synopsis of Orders amongst Indian Teleostei.*

All the fin-rays articulated, with the exception of the first in the dorsal and pectoral which sometimes are more or less ossified. Ventral fins, when present, abdominal and spineless. Air-bladder, if existing, having a pneumatic duct (except in *Scombresocidæ*) .	1. *PHYSOSTOMI.*
A portion of the dorsal, anal, and ventral fins unarticulated, forming spines †. Air-bladder, when present, completely closed in adults, not possessing a pneumatic duct.....	2. *ACANTHOPTERYGII.*
All the rays of the vertical and ventral fins articulated; the latter, when present, being jugular and thoracic	3. *ANACANTHINI.*

* The above Orders are given in accordance with commonly received views or those of Müller somewhat modified; but they are of very different values, and must be largely altered when the developmental and general anatomy of fishes becomes better known.

† There are some genera in which the fins can hardly be said to possess any true spines, as amongst the *Trachinidæ*, *Aulostoma*, &c.

A dermal segmental skeleton; the opercular pieces reduced to a single plate. Gill-openings small. Gills consisting of small rounded tufts, attached to the branchial arches. Muscular system very slightly developed..... 4. *LOPHOBRANCHII.*

The bones of the head completely ossified, those in the remainder of the body incompletely. Vertebræ few. Gill-openings small, situated in front of the pectoral fins. Gills pectinate. Mouth narrow; the bones of the upper jaw mostly united, sometimes produced into the form of a beak. There may be a single soft-rayed dorsal fin, belonging to the caudal portion of the vertebral column, and situated opposite the anal; in some a rudimental spinous dorsal is also present: the ventrals, when existing, have the form of spines. Skin either smooth, with rough scales, or ossified in the form of plates or spines. Air-bladder destitute of a pneumatic duct..... 5. *PLECTOGNATHI.*

Order I. PHYSOSTOMI, Müller.

All the fin-rays articulated with the exception of the first in the dorsal and pectoral, which are frequently more or less ossified. Ventral fins, when present, abdominal and spineless. Air-vessel, if existing, having a pneumatic duct (except in the family *Scombresocidæ*).

This order contains the largest proportion of the freshwater fishes of India. The family *Siluridæ* or sheat-fishes are destitute of scales; the carps, *Cyprinidæ*, have scaled bodies but no teeth in the jaws; while the herrings, *Clupeidæ*, are likewise scaled, and have some teeth in the jaws and a carinate abdominal edge.

Synopsis of Indian Families.

I. Fishes with eel-like bodies. Margin of upper jaw formed of the premaxillaries, the maxillaries being internal and parallel to them. Vertical fins rudimentary, and no paired fins. Gill-openings in the form of a single slit. Scales, if present, minute. Accessory breathing-organs may be present. No air-bladder. Stomach without a blind sac; no pyloric cæca. Ovaries with oviducts. **Symbranchidæ.**

II. Fishes with eel-like bodies. Margin of upper jaw formed anteriorly by the premaxillaries and laterally by the maxillaries. Pectoral fins present or absent; no ventrals. No accessory breathing-organs. Stomach with a blind sac; no pyloric cæca. Ovaries without oviducts .. **Muræniдæ.**

III. Subopercle absent. Margin of upper jaw formed by the premaxillaries. Skin scaleless and smooth, or covered with osseous plates or scattered tubercles. Adipose dorsal usually present. **Siluridæ.**

IV. Pseudobranchiæ, when present, glandular. Margin of the upper jaw formed by the premaxillaries. Opercular pieces complete. Mouth toothless, teeth in lower pharyngeals. Head scaleless; body scaled or scaleless, never covered by osseous plates. Air-bladder present or absent. **Cyprinidæ.**

V. Pseudobranchiæ absent. Margin of upper jaw formed by the premaxillaries and maxillaries, which are toothed. Opercular pieces complete. No barbels. Dorsal fin in caudal portion of body. Stomach with blind sac; intestinal canal short, and furnished with spiral folds. No pyloric cæca. An air-bladder..... **Chirocentridæ.**

VI. Pseudobranchiæ usually well developed. Margin of the upper jaw formed by premaxillaries and maxillaries. Opercular pieces complete.

Abdomen usually keeled. No adipose dorsal. Scales on body, none on head. Pyloric appendages numerous ..... **Clupeidæ.**

VII. No pseudobranchiæ. Margin of upper jaw mostly formed by premaxillaries, behind and parallel to which are the maxillaries. No scales or barbels. Abdomen rounded. Dorsal opposite anal. No adipose fin. Few pyloric cæca; large air-bladder. The ova fall into the abdominal cavity before exclusion ..... **Galaxidæ.**

VIII. Pseudobranchiæ absent. Margin of upper jaw formed by premaxillaries and maxillaries. Opercular apparatus incomplete; a parieto-mastoid cavity on either side, leading into the interior of the skull. A single rayed dorsal fin; a long anal. Head and body scaled. Two pyloric appendages..... **Notopteridæ.**

IX. Pseudobranchiæ well developed. Margin of upper jaw formed by premaxillaries. Opercular pieces sometimes incomplete. No barbels. Gill-openings very wide. Scales present or absent. Adipose dorsal present ..... **Scopelidæ.**

X. Pseudobranchiæ absent. Margin of upper jaw formed by premaxillaries. Barbels absent. Teeth in both jaws, and in superior and inferior pharyngeals. One spineless dorsal in posterior half of body. Air-bladder simple..... **Cyprinodontidæ.**

XI. Pseudobranchiæ glandular. Margin of upper jaw formed by premaxillaries and maxillaries. Lower pharyngeals united. No adipose dorsal. Scales present. Air-bladder, when present, destitute of pneumatic duct..... **Scombresocidæ.**

Family I. SYMBRANCHIDÆ.

Gill-openings confluent into a single slit, which is situated on the abdominal surface. Gills well developed or rudimentary. Body elongated. The humeral arch may or may not be attached to the skull. Margin of the upper jaw formed by the premaxillaries, the maxillaries being internal and parallel to them. Barbels absent. Palatine teeth, when present, in a single row or a narrow band. Vertical fins rudimentary, in the form of mere folds of skin, and no paired fins. Scales, if present, minute. Vent far behind the head. An accessory breathing-sac present or absent. Air-bladder absent. Ribs present. Stomach destitute of a blind sac. No pyloric appendages. Ovaries with oviducts.

The families *Symbranchidæ* and *Muræniдæ* belong to the *Apodes* of many authors. The first is fairly represented in the fresh waters on the continent of India, whereas the latter is more numerous in

the seas than in the fresh waters. Among the Apodes the spined freshwater eels (*Rhynchobdellidæ*) and the *Notacanthidæ*, Günther, have been placed.

Geographical Distribution. Fresh and brackish waters of tropical Asia and America; also Western Australia and Van Diemen's land.

Synopsis of Indian Genera.

First group. AMPHIPNINA.

Humeral arch not attached to the skull; an accessory breathing-apparatus. Scales present.

Palatine teeth in a single row..... 1. AMPHIPNOUS.

Second group. SYMBRANCHINA.

Humeral arch attached to the skull. No accessory breathing-apparatus. Scales absent.

Gills rudimentary..... 2. MONOPTERUS.
Gills well developed..... 3. SYMBRANCHUS.

First group. AMPHIPNINA.

1. Genus **AMPHIPNOUS**, Müller.

Syn. *Pneumabranchus*, McClelland.

Branchiostegals six. Gill-membranes almost entirely grown to the isthmus, and having a single transverse opening. Three branchial arches with the laminæ rudimentary, divided by narrow slits. A respiratory air-sac exists on the neck behind the head and communicates with the gill-cavity. Palatine teeth in a single, well-developed row. Scales present and arranged in longitudinal rows.

This amphibious fish, when kept in an aquarium, may be observed constantly rising to the surface for the purpose of respiring atmospheric air direct. It usually remains with its snout close to the surface, and in like manner lies in the grassy sides of ponds and stagnant pieces of water, so that without trouble it may obtain access to air.

In *Amphipnous cuchia* we find that "of all the arches, the second alone possesses laminæ for the purposes of breathing; and these consist merely of a few long fibrils attached to the middle of the arch, and occupying but a very small extent of its surface; the third supports, in the place of laminæ, a thick and semi-transparent tissue, which in large individuals of the species possesses a fringed or denticulated appearance at its edge; whilst the first and fourth are bare, having only the membrane that fills up the space between

the arches reflected over them. The principal organs of respiration are two small bladders, which the animal has the power of filling with air, immediately derived from the atmosphere. They are placed behind the head, one on each side of the neck, above the superior or vertebral extremities of the branchial arches, and are covered over by the common integuments, presenting externally, when distended with air, two protuberances of a round shape. . . . They present, when separated from their surrounding attachments and inflated with air, thin, semi-transparent, membranous parietes, resembling the posterior portions of the lungs of serpents. . . . Of the whole volume of blood contained in the branchial artery, one-third passes through the gills and respiratory bladders, whilst the other two-thirds are conveyed directly from the heart to the aorta without being exposed to the action of the air."—*Taylor*, Gleanings in Science, ii, p. 173, and Edinb. Journ. of Sc. v, 1831, p. 33; *Hyrtl*, Denk. Ak. Wiss. Wien, 1858, xiv, p. 39, c. tab.

70. (1.) Amphipnous cuchia. (Fig. 27.)

Unibranchapertura cuchia, *Ham. Buch. Fish. Ganges*, pp. 16, 363 pl. 16, fig. 4.

Amphipnous cuchia, *Day, Fish. India*, p. 656, pl. clxvii, fig. 1 (see synon.).

Cuchia, Ooriah and Beng.; *Nga-sheen*, Burmese; *Dondoo paum*, Tel.

Length of head (from gill-opening) contained 6 to 8 times in the distance between the snout and the anus; length of tail 4 to 4½ in the entire length. *Eyes*—two to three diameters from end of snout and situated in the anterior one fourth or one fifth of the length

Fig. 27.—*Amphipnous cuchia* and its upper teeth.

of the head, about midway between the end of the snout and the posterior extremity of the jaws; a valved nostril opens above the orbit; a second, round and patent, in front of the snout. Upper jaw slightly the longer; lips fleshy. *Teeth*—a single row of small ones in the premaxillaries, except opposite the symphysis; a single band of large, curved, compressed and backwardly directed ones on either palatine; and a single row of moderately large ones on either ramus of the mandible. *Fins*—a rudimentary dorsal commences slightly before a vertical line drawn through the anus. *Scales*—distinct and longitudinally arranged. *Gill-*

openings—inferior, the membrane adherent to the isthmus. Vertebræ 106/65. *Colour*—greenish, or of a chestnut-brown, becoming lighter on the abdomen; numerous black spots over the body; occasionally individuals are flesh-coloured.

"Natives reject it as food and imagine that its bite is fatal to cattle, although less powerful on the human kind—a supposition highly improbable." (*Ham. Buch.*)

Hab. Fresh and brackish waters of the Punjab, Bengal, Orissa, Assam and Burma; attaining at least two feet in length.

Second group. SYMBRANCHINA.

2. Genus **MONOPTERUS**, Lacépède.

Syn. *Fluta*, Bl. Schn.; *Ophicardia*, McClelland; *Apterigia*, Basilewski.

Branchiostegals five or six. Gill-membranes almost entirely attached to the isthmus, having a single transverse opening. Three branchial arches separated by moderately wide intermediate slits, with the laminæ rudimentary or absent. Palatine teeth in a narrow band. Scales absent. No accessory breathing-sac.

Dareste observed a complete absence of branchial laminæ in three examples of *Monopterus javanensis*.

71. (1.) **Monopterus javanensis.** (Fig. 28.)

Monopterus javanensis, *Lacépède, H. N. Poiss.* ii, p. 139; *Day, Fish. India*, p. 656, pl. clxix, fig. 1 (see synon.).

Length of head contained 9 to 12 times in the distance between the end of the snout and the vent: length of body about four or five times that of the tail. *Eyes*—situated about midway between

Fig. 28.—*Monopterus javanensis* and upper teeth.

angle of mouth and end of snout, diameter one eighth of length of head, 2 diameters from end of snout and 1 to 1½ apart. Greatest diameter of fish at the occiput. Profile of upper surface of head descending somewhat suddenly from above the eyes to the snout, which last is pointed and somewhat compressed. Extent of cleft of mouth equal to about one third the distance between end of snout and gill-opening. Tail narrow and tapering to a point. *Teeth*—conical, and in a band tapering towards the angle of the mouth;

the palatine band resembles that in the jaw. *Fins*—dorsal commencing above or a little before the vertical from the vent. *Colour*—light greenish, with or without dark spots; or else the whole body nearly black.

"This eel is numerous at Chusan, in streamlets, canals, and estuaries. As it is a favourite article of food it is kept by the inhabitants of Chusan in large jars, with fresh water. But it is capable of living a considerable time out of water. It is of voracious habits, feeding on smaller fishes, and it takes hooks baited with earthworms." (*Cantor, l. c.*)

Hab. This fish is confined to the fresh or brackish waters of Burmah, the Malay Archipelago, and China.

3. Genus **SYMBRANCHUS**, Bloch.

Syn. *Unibranchapertura*, Lacépède; *Pneumabranchus* and *Ophisternon*, McClelland; *Tetrabranchus*, Bleeker.

Branchiostegals six. Gill-membranes not attached to the isthmus, having a single transverse opening. Four branchial arches with well-developed gills. Palatine teeth in a band. Scales absent. No accessory breathing-sac.

Geographical Distribution. Fresh and brackish waters of India to the Malay Archipelago and Australia: also tropical America.

72. (1.) **Symbranchus bengalensis.** (Fig. 29.)

Ophisternon bengalensis, *McClelland, Calc. Jour. N. H.* v, pp. 197, 220, pl. xi, figs. 1, 2.

Symbranchus bengalensis, *Day, Fish. India*, p. 657, pl. clxvii, fig. 2 (see synon.).

Length of head contained 9 to 12 times in the distance between end of snout and anus. *Eyes*—diameter about one twentieth of

Fig. 29.—*Symbranchus bengalensis* and upper teeth.

length of head. The girth of the body is equal to about three times its height. Snout anteriorly rounded, lips fleshy, the upper jaw rather the longer; cleft of mouth extending to some distance behind the orbits. *Teeth*—in upper jaw fine and pointed, not continuous at the symphysis; those on either side terminating in

a triangular patch, with a narrow edentulous interspace; those in the lower jaw rather larger, with a narrow edentulous interspace between those of each side, laterally they are in a single row: palatine teeth in a band. *Fins*—the dorsal commences before the anal, which is situated in the last fourth or fifth of the total length, the caudal is hardly conspicuous: all the fins are low. *Lateral line*—conspicuous. *Colour*—a dull dirty brownish red in estuaries, lightest on the abdomen. In clearer water this fish is greenish or blackish green, the abdomen being paler.

Hab. Estuaries and fresh waters within the influence of the tides along the coasts of India and the Malay Archipelago, to the Philippines: attaining to several feet in length. Apparently more common in Bengal than in Malabar.

Family II. MURÆNIDÆ.

Body elongated, cylindrical, or band-shaped: the humeral arch not attached to the skull. The branchial openings in the pharynx may be narrow or wide slits. Margin of upper jaw constituted anteriorly by the premaxillaries, which are more or less coalescent with the vomer and ethmoid, while the sides of the upper jaw are formed by the maxillaries, which are furnished with teeth. Vertical fins, when present, confluent or separated by a projecting tail: pectorals present or absent: ventrals absent. Scales, when present, rudimentary. The vent may be situated close to the root of the pectoral fins, or a long distance posterior to the head. The heart may be situated just, or a long distance, behind the gills. Stomach with a blind sac. No pyloric appendages. Ovaries destitute of oviducts.

Eels (*Anguilla*) are not, as sometimes supposed, hermaphrodites, but they breed in salt water. Large sterile females are found in rivers.

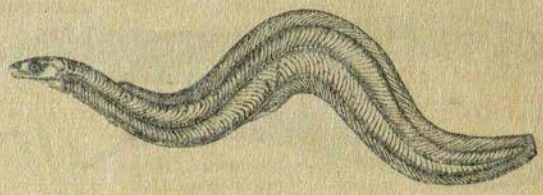

Fig. 30.—The above figure, from Sir W. Elliot's drawing, is a common *Leptocephalus* of some muræenoid form.

A number of larval fishes have been termed *Leptocephali*, or "glass eels" (fig. 30). The development of some of them, it has been suggested, may have been arrested at an early age, the fishes dying before attaining their perfect state. *L. spallanzanii* is said by Dareste to be a young conger: and Delage in 1886 (Compt. Rend.

ciii, p. 698) traced the development of one of these fishes into a conger; but some cannot be the offspring of murænoid fishes. "*Stomiasunculus*, Kaup, is the young of *Stomias*; *Porobronchus*, Kaup, the young of *Fierasfer acus*; and *Esunculus*, Kaup, probably that of *Alepocephalus*." (*Günther.*)

Eels are generally known as *Velangoo* or *Pamboo meen* in Tamil (snake fish).

Synopsis of Indian Genera.

First group. MURÆNIDÆ ENGYSCHISTÆ.

A. Branchial openings in the pharynx are narrow slits.

Pectorals absent; vertical fins well developed. Posterior nostril a round and patent opening ..... 1. MURÆNA.

Fins absent, except a rudimentary one round end of tail ..... 2. GYMNOMURÆNA.

Second group. MURÆNIDÆ PLATYSCHISTÆ.

B. Branchial openings in the pharynx are wide slits.

a. Heart close behind gills. Tail longer or scarcely shorter than the trunk. Nostrils lateral or superior. Tongue free. Caudal fin continued round the end of tail; pectorals present or absent. Scales present or absent.

Pectoral fins present; dorsal commences some distance behind the nape. Rudimentary scales ..... 3. ANGUILLA.

Pectoral fins present; dorsal commences above gill-opening. Cleft of mouth reaches to below middle of eye. Large muciferous cavities on skull. Teeth in bands. Scaleless ..... 4. CONGROMURÆNA.

Pectoral fins present; dorsal commences above gill-opening. Cleft of mouth reaches to behind middle of eye. Maxillary teeth biserial; vomerine uniserial. Scaleless. 5. UROCONGER.

b. Heart close to gills. Tail not shorter than trunk. Nostrils lateral or superior. Tongue not free. Caudal fin continued round the end of tail; pectorals present or absent. Scaleless.

Pectoral fins present. Canine teeth in jaws anteriorly; strong teeth on vomer. Posterior nostril opposite upper part or middle of eye ..... 6. MURÆNESOX.

Pectoral fins absent. Posterior nostril lateral and in front of orbit ..... 7. SAURENCHELYS.

c. Heart close to gills. Nostrils labial. Tongue not free. Caudal fin continued round the end of tail; pectorals present or absent. Scaleless.

Pectoral fins absent. Body elongated, vermiform ..... 8. MURÆNICHTHYS.

d. Heart close to gills. Nostrils labial. Tongue not free. End of tail free, being without fin-rays. Pectorals, when present, rudimentary. Scaleless.
Vomerine teeth present ..... 9. OPHICHTHYS.

e. Heart placed a long distance behind the gills. Tail shorter than the trunk. Posterior nostril in front of the eye. Vertical fins little developed; pectorals, if present, rudimentary.
Eyes small. Cleft of mouth narrow. Teeth in a single row..... 10. MORINGUA.

First group. MURÆNIDÆ ENGYSCHISTÆ.

1. Genus **MURÆNA**, Artedi.

Syn. *Gymnothorax*, Bloch; *Murænophis*, Lacép.; *Echidna*, Forst.; *Thærodontis*, *Strophidon*, and *Lycodontis*, McClell.; *Sidera*, *Eurymyctera*, *Thyrsoidea*, *Limamuræna*, *Polyuranodon*, *Pœcilophis*, *Gymnomuræna*, *Priodonophis*, and *Tæniophis*, Kaup; *Pseudomuræna*, Johnson.

Body moderately or exceedingly elongate. Gill-openings narrow. A tubular nostril on either side of the upper surface of the snout; the posterior nostril a round foramen between the eyes or opposite the antero-superior edge of the eye, it may or may not be furnished with a tube. Teeth well developed and acute or molariform; the maxillary teeth may be in one or two rows. Dorsal fin elevated or not so; the end of the tail surrounded by fin, which is occasionally rudimentary. Pectorals absent.

Geographical Distribution. Seas of tropical and temperate regions: a few species ascend tidal rivers.

The dentition in some of these fishes alters considerably with age, whilst in others it is not constant in every individual of the same species.

Synopsis of Indian Species.

A. Teeth pointed. The posterior nostrils not tubular.

a. Tail and trunk of about the same length.

Teeth biserial. Black, with numerous yellow dots ..... 1. *M. meleagris*, p. 76.
Teeth biserial. Brownish yellow, with fine white spots, streaks, or marks, which may be lost in the adult ..... 2. *M. tile*, p. 76.
Teeth biserial. Greenish olive, with silvery dots along the lateral line .... 3. *M. sathete*, p. 77.
Teeth uniserial. Dark purplish, covered with fine white spots ..... 4. *M. punctata*, p. 77.
Teeth uniserial. Yellow, with 18 to 20 dark bands, 3 of which are on the head ..... 5. *M. rueppellii*, p. 77.

Teeth uniserial. About 16 dark bands encircle body, none being on the head.. 6. *M. reticularis*, p. 78.

Teeth uniserial. From 28 to 35 more or less complete dark bands; head with dark marks ..... 7. *M. punctatofasciata*, [p. 78.

Teeth uniserial. Dark spots on head, body, and fins, separated by narrow light lines or interspaces..... 8. *M. tessellata*, p. 78.

Teeth uniserial. Olive-brown; a few dark spots on head, and many irregular spots on body and fins ..... 9. *M. fimbriata*, p. 79.

Teeth uniserial. Brown, covered with fine spots on head and body, amongst which are reticulated yellow lines; a black spot usually at the gill-opening..... 10. *M. pseudothyrsoidea*, [p. 79.

Teeth uniserial. Light brown, covered with irregular dark blotches and usually reticulated lines, most distinct in the posterior half of the body ..... 11. *M. undulata*, p. 80.

Teeth uniserial; vomerine band bifurcated in front. Light brown, marbled with darker; gill-opening in a black spot; fins usually with a light outer edge ..... 12. *M. flavimarginata*, [p. 80.

Teeth uniserial. Brownish black or blotched ..... 13. *M. afra*, p. 80.

b. Tail at least twice as long as trunk.

Teeth biserial. Uniform brown; the fins nearly black ..... 14. *M. macrura*, p. 81.

B. Teeth in jaws pointed; globular on vomer.

Teeth biserial. Light brown, covered with closely-set purplish spots and light intermediate lines forming a network; anal fin sometimes with a light outer edge ..... 15. *M. thyrsoidea*, p. 81.

Teeth in jaws uniserial. Grey, with arborescent black markings and marbling..... 16. *M. picta*, p. 82.

C. Teeth generally obtuse or molariform.

Tail one third of the total length. Brown, with from 30 to 100 narrow white or yellow rings ..... 17. *M. zebra*, p. 82.

Tail a little shorter than the trunk. Brown, with from 20 to 25 dark blotches along the side, with some white spots in the centre of each .... 18. *M. nebulosa*, p. 83.

Tail one third longer than the trunk. Brown, with from 25 to 30 narrow, yellow, whole or half bands ..... 19. *M. polyzona*, p. 83.

Tail about as long as trunk. Black .... 20. *M. nigra*, p. 84

73. (1.) Muræna meleagris.

Muræna meleagris, *Shaw, Nat. Misc.* p. 220, *and General Zool.* iv, pt. i, p. 32; *Day, Fish. India*, p. 668 (see synon.).

Length of head contained $3\frac{1}{3}$ to $3\frac{2}{3}$ times in the distance between the end of the snout and the vent; tail rather longer than the trunk. *Eyes*—small, $2\frac{1}{4}$ diameters from the end of the snout; anterior nasal tubes very short. Length of cleft of mouth $2\frac{3}{4}$ in the length of the head. The mouth can be completely closed. Gill-opening narrow. *Teeth*—in two rows, except on the vomer and on the sides of the mandible. Canines rather small. *Colour*—brownish black, covered with numerous yellow dots that are smaller than the eye.

Hab. From the east coast of Africa, the Seychelles, and the Mauritius throughout the seas of India to the Malay Archipelago and the Pacific. This species attains a large size.

74. (2.) Muræna tile. (Fig. 31.)

Murænophis tile, *Ham. Buch. Fish. Ganges*, pp. 18, 363.
Muræna tile, *Day, Fish. India*, p. 668, pl. clxx, fig. 4 (see synon.).

Length of head $3\frac{3}{4}$ to $4\frac{1}{4}$ in the distance between the end of the snout and the vent; tail rather shorter than the trunk, or about the same length. *Eyes*—rather small, about 2 to $2\frac{1}{2}$ diameters from

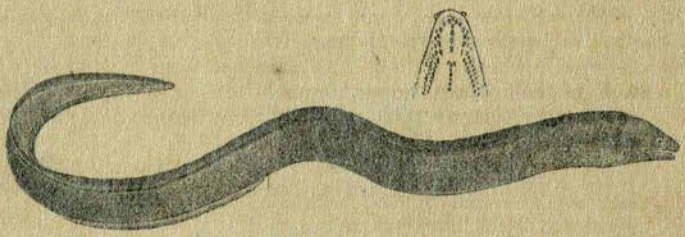

Fig. 31.—*Muræna tile* and upper teeth.

end of snout and situated slightly nearer to the angle of the mouth than to the end of the snout; length of cleft of mouth about $3\frac{1}{3}$ in that of the head; anterior nasal tubes short. Gill-opening about as wide as the eye. *Teeth*—in two rows, except at the sides in the lower jaw; canines small. *Colour*—brownish yellow or greenish, becoming lighter beneath; the body covered with small white spots, specks, or marks, which sometimes have a dark border, or they may be entirely absent in adults.

Hab. Bourbon, seas and estuaries of Bengal to the Malay Archipelago. *M. tile* ascends tidal rivers and is common in the Hooghly at Calcutta, where it attains about 2 feet in length.

75. (3.) Muræna sathete.

Murænophis sathete, *Ham. Buch. Fish. Ganges*, pp. 17, 363.
Muræna sathete, *Day, Fish. India*, p. 668 (see synon.).

Length of head $4\frac{1}{4}$ to 5 in the distance between the end of the snout and the vent; tail rather longer (considerably according to McClelland) than the trunk. *Eyes*—small, $2\frac{1}{4}$ to $2\frac{1}{2}$ diameters from the end of the snout, 2 apart, and midway between the angle of the mouth and the end of the snout. Length of the cleft of the mouth about $3\frac{2}{3}$ times in the length of the head; jaws nearly equal in length anteriorly. *Teeth*—the maxillary, anterior vomerine, and anterior mandibular teeth biserial, the rest uniserial. *Colour*—Head, body, and fins dark greenish olive, becoming of a greenish yellow inferiorly; silvery dots along the lateral line.

Hab. Bay of Bengal, Pinang.

76. (4.) Muræna punctata.

Gymnothorax punctatus, *Bl. Schn. Syst. Ich.* p. 526.
Muræna punctata, *Day, Fish. India*, p. 669, pl. clxxiii, fig. 1 (see synon.).

Calamaia paum, Tel.

Length of head $3\frac{1}{4}$ in the distance between the end of the snout and the vent; tail rather longer than the trunk. *Eyes* of moderate size, situated midway between the angle of the mouth and end of the snout; anterior nasal tubes about half as long as the orbit. Length of cleft of mouth equal to half the length of the head; the mouth can be completely closed. Gill-opening about twice as large as the orbit. *Teeth*—in a single row, from 18 to 22 on each side of the mandible, the anterior longest. Canines of moderate size. *Colour*—purplish black, with black streaks radiating from the eye; the whole of the fish covered with pure white spots each having a dark edge, they are largest posteriorly, but nowhere exceed the size of the pupil of the eye.

Hab. Coromandel coast of India. This fish attains to a large size. Russell observed that it was not eaten, and it was considered to be of a poisonous nature, whilst its flesh smelt very rank even when it was just captured.

77. (5.) Muræna rueppellii.

Dalophis rüpelliæ, *McClelland, Cal. Journ. Nat. Hist.* v, p. 213.
Muræna ruppellii, *Day, Fish. India*, p. 669 (see synon.).

Length of head $3\frac{1}{3}$ to $3\frac{2}{3}$ in the distance between the end of the snout and the vent; tail about one fifth longer than the trunk. *Eyes*—rather above half the length of the snout, and situated nearly midway between angle of mouth and end of snout; anterior nasal tubes scarcely half the length of the eye. Snout slightly compressed; extent of cleft of mouth $2\frac{2}{3}$ in the length of the head. Gill-opening about as wide as the eye. *Teeth*—in a single row (the young may have one or two extra teeth forming an inner maxillary row), from 20 to 23 in each ramus of mandible; canines

of moderate size; the mouth can be completely closed. *Colour*—yellowish, with from 18 to 20 black rings encircling the head and body; they are narrower than the ground-colour; the first three are on the head, the others sometimes become less distinct as age increases.

Hab. Andamans and Malay Archipelago.

78. (6.) Muræna reticularis.

Gymnothorax reticularis, *Bloch, Ausl. Fische*, t. 416.
Muræna reticularis, *Day, Fish. India*, p. 669 (see synon.).

Length of head $3\frac{1}{3}$ in the distance between the end of the snout and the vent; tail a little longer than the trunk. *Eyes*—diameter two thirds of the length of the snout, situated rather nearer angle of mouth than end of snout. Anterior nasal tubes very short; snout short and very slightly compressed. Extent of cleft of mouth one third of the length of the head. Gill-opening of about the same size as the eye. *Teeth*—in a single row, some being slightly serrated; about 13 in each ramus of mandible; the canines small; the mouth can be completely closed. *Colour*—head and back spotted and dotted with brown; about 16 dark cross bands on the body, wider than the ground-colour, and most distinct in the lower half of the body and on the dorsal fin; the first well-marked ventral band is behind the gill-opening.

Hab. Seas of India to China and Japan.

79. (7.) Muræna punctatofasciata.

Gymnothorax punctato-fasciatus, *Bleeker, Gymnoth. Ind. Arch.* p. 167, *and Atl. Ich.* iv, p. 99, pl. clxxv, fig. 4.
Muræna punctato-fasciata, *Day, Fish. India*, p. 669, pl. clxix, fig. 4 (see synon.).

Kilis, Maráthi.

Length of head $3\frac{2}{3}$ to $4\frac{1}{4}$ in the distance between the end of the snout and the vent; tail slightly longer than the trunk. *Eyes*—situated midway between the end of the narrow snout and the angle of the mouth, two thirds the length of the snout. The mouth can be completely closed; the extent of its cleft equals one third of the length of the head. Gill-opening about the same size as the eye. Body rather slender. *Teeth*—pointed and in a single row, without any basal lobe, occasionally there are 2 or 3 teeth forming an inner maxillary row; canines of moderate size; 16 to 17 teeth on each side of the mandible. *Colour*—reddish brown, darkest along the back; from 28 to 35 dark, more or less complete, rings of an irregular character on the body and fins. Head and ground-colour between the rings with blotches, spots, and fine lines.

Hab. Seas of India to the Malay Archipelago.

80. (8.) Muræna tessellata.

Muræna tessellata, *Richardson, Voy. Sulphur, Ich.* p. 109, t. lv, figs. 5–8; *Day, Fish. India*, p. 670, pl. clxxi, fig. 4 (see synon.).

Kyouk nga phayoon, Arracan.

Length of head to gill-opening 3 to 3⅔ in the distance between the end of the snout and the vent; tail slightly longer or shorter than the trunk. Snout compressed. *Eyes*—situated slightly before the middle of the distance between the angle of the mouth and the end of the snout. Length of cleft of mouth 2⅓ to 2½ in the distance between the end of the snout and the gill-opening. Anterior nasal tubes half as long as eye. *Teeth*—large, compressed, pointed, and in the adult in a single row: occasionally in the young there is a short internal row in the maxilla. *Fins*—dorsal commences above the gill-opening. *Colour*—dark polygonal or rounded spots, which are separated by narrow light lines or interspaces on the head, body, and fins; most or all of the spots are wider than the intervening areas.

Hab. From the east coast of Africa and the Mauritius, through the seas of India to the Malay Archipelago, and China.

81. (9.) Muræna fimbriata.

Muræna fimbriata, *Bennett, P. Z. S.* 1831, p. 168; *Day, Fish. India*, p. 670, pl. clxxii, fig. 1 (see synon.).

Chuka pám, Tel.

Length of head 3 to 3¼ in the distance between the end of the snout and the vent; tail one third longer than the trunk. *Eye*—rather nearer the angle of the mouth than the end of the narrow snout, from which last it is distant from 1⅔ to 2 diameters. Extent of cleft of mouth equal to one third of the length of the head. Gill-opening smaller than the eye. *Teeth*—pointed, and in a single row, without any basal lobe, occasionally there are 2 or 3 teeth in a second inner maxillary row. *Colour*—olive-brown, with a few black spots on the head, and numerous irregularly formed ones on the body, dorsal and anal fins; many of the spots take a vertical direction, and a few are larger than the eye. Fins with a white edge. In some examples the spots are in 2 or 3 regular longitudinal rows.

Hab. Madagascar, Coromandel Coast of India, Andaman Islands to the Malay Archipelago.

82. (10.) Muræna pseudothyrsoidea.

Muræna pseudothyrsoidea, *Bleeker, Batavia, Nat. Tijdschr.* iii, p. 778, *and Muræn.* p. 44; *Day, Fish. India*, p. 670, pl. clxxiii, fig. 3 (see synon.).

Hesál, Maráthi.

Length of head 3½ to 3⅔ in the distance between the end of the snout and the vent; tail a little shorter than the trunk. *Eyes*—nearer end of snout than angle of mouth, 1⅔ to 2 diameters in the length of the snout, and 1½ apart. Cleft of mouth 2¼ in the length of the head. The gill-opening about one third wider than the eye. *Teeth*—in a single row, about 18 or 20 on each side of the mandible, the 2 anterior being canines and of moderate size; one or two teeth of anterior vomerine series subulate and

larger than those in the premaxillaries. The mouth can be completely shut. *Colour*—brownish, covered with fine dark spots on the head and body, intermixed with reticulated yellow lines, most distinct in the caudal region. Sometimes a white edge to fins. Gill-opening usually surrounded by a black spot.

Hab. Coasts of Sind and India to the Malay Archipelago.

83. (11.) Muræna undulata.

Murænophis undulata, *Lacépède, H. N. Poiss.*, pp. 629, 644.
Muræna undulata, *Day, Fish. India*, p. 671, pl. clxxi, fig. 5 (young), & pl. clxxiii, fig. 2 (adult) (see synon.).

Length of head 3¼ to 3⅓ in the distance between the end of the snout and the vent; tail a little longer than the trunk. *Eyes*—1¾ to 2 diameters from the end of the snout, and about midway between the angle of the mouth and the end of the snout. Length of cleft of mouth 2⅓ to 2½ in the length of the head. Gill-opening about as wide as the eye. Anterior nasal tube short. The mouth cannot be completely shut; snout pointed. *Teeth*—in a single row, occasionally one or two additional, forming an inner row in the maxilla; normally 4 pairs of canines in the mandibles, and 18 to 20 teeth in either ramus of mandible; two canines in the maxilla. *Colour*—light brownish, covered with irregularly sized blotches, and usually with light reticulated lines over the body, most distinct posteriorly; no black spot at gill-opening; no white edge to fins.

Hab. Red Sea, east coast of Africa, seas of India to the Malay Archipelago and Pacific Ocean.

84. (12.) Muræna flavimarginata.

Muræna flavimarginata, *Rüppell, Atl.* p. 119, pl. xxx, fig. 3; *Day, Fish. India*, p. 671 (see synon.).

Length of head 3⅔ to 4 in the distance between the end of the snout and the vent: tail rather shorter than the trunk. *Eyes*—small, from 2 to 2½ diameters in the length of the snout, and situated about midway between the angle of the mouth and the end of the snout. Anterior nasal tubes very short: snout rather elevated. Length of cleft of mouth 2½ in the length of the head. The mouth can be completely closed. Gill-opening wider than the eye. *Teeth*—in a single row, except the vomerine band, which is bifurcated anteriorly; canines of moderate size. *Colour*—light brown or yellowish brown, marbled or spotted with darker; the head and end of tail nearly black. Gill-opening in a black spot. Fins usually with a light edge.

Hab. Red Sea, Seychelles Archipelago, Bourbon, Mauritius, and seas of India to the Malay Archipelago.

85. (13.) Muræna afra.

Gymnothorax afer, *Bloch, Ausl. Fische*, t. 417.
Muræna afra, *Day, Fish. India*, p. 671 (see synon.).

Length of head 3¾ in the distance between the end of the snout and the vent; tail slightly longer than the trunk. *Eyes*—diameter about half the length of the snout; situated slightly nearer to angle of mouth than to end of snout. Length of cleft of mouth about 2¾ in the length of the head. Snout pointed; anterior nasal tubes about half as long as the orbit. Gill-opening not quite so wide as the eye. *Teeth*—in old examples in one row, but in the young usually in two rows in both jaws. *Colour*—a light ground, blotched and marked all over with brown, or of a general brownish black.

Hab. Recorded from Tranquebar (Bl. Schn.), Indian Ocean, Australia, and tropical parts of the Atlantic.

86. (14.) Muræna macrura. (Fig. 32.)

Muræna macrurus, *Bleeker, Batavia, Nat. Tijdsch.* vii, p. 324; *Day, Fish. India*, p. 672, pl. clxx, fig. 5 (see synon.).

Seram pambu, Tamil.

Length of head from snout to gill-opening one fourth of the distance between the end of the snout and the vent; tail from 1¾ to twice as long as the trunk. *Eyes*—situated in the front half of

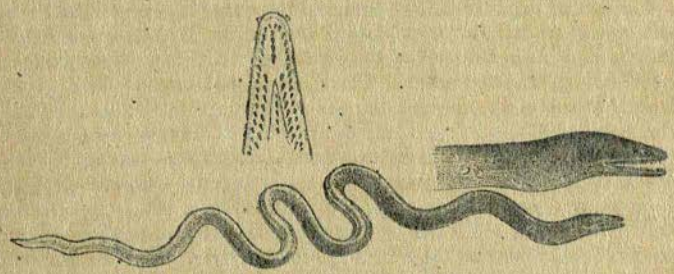

Fig. 32.—*Muræna macrura* and upper teeth.

the distance between the angle of the mouth and the end of the snout, about 2 diameters from end of snout. *Teeth*—pointed, those in the maxilla and mandible in two rows; canines badly developed. *Fins*—the dorsal anteriorly is low and densely enveloped in skin; it commences midway between the gape of the mouth and the gill-opening. *Colour*—uniform brown, the fins tinged with black.

The variety *longissima*, Kaup, has the body comparatively longer than in *macrura*.

Hab. Seas of India to the Malay Archipelago. It attains upwards of 10 feet in length.

87. (15.) Muræna thyrsoidea.

Muræna thyrsoidea, *Richardson, Voy. Sulphur, Ich.* p. 111, pl. xlcx, fig. 1; *Day, Fish. India*, p. 672, pl. clxxii, fig. 3 (see synon.).

Length of head $3\frac{1}{2}$ in the distance between the end of the snout and the vent; tail from one sixth to one third longer than the trunk. *Eyes*—$1\frac{1}{3}$ diameters from end of snout, to which they are nearer than to the angle of the mouth. Anterior nasal tubes equal in length to two thirds of the vertical diameter of the eye. Length of cleft of mouth $3\frac{1}{3}$ in the length of the head. Gill-openings rather larger than the eye. *Teeth*—conical and laterally biserial on the maxilla; about 23 on each ramus of the mandible; vomerine teeth globular and in two rows; no large canines; the mouth cannot be completely shut. *Fins*—dorsal more than two thirds as high as the body. *Colour*—light brown, covered all over with closely-set purplish spots, amongst which are light lines forming a network; gill-opening sometimes with a black mark around it; no white edge to fins.

Hab. Andamans and Burma to the Malay Archipelago, China and the Tonga Islands.

88. (16.) Muræna picta.

Muræna picta, *Ahl, De Mur. et Ophich. in Thunb. Diss.* iii, p. 6, t. ii, fig. 2; *Day, Fish. India*, p. 672, pl. clxxii, fig. 4 (see synon.).

Length of head $3\frac{2}{3}$ in the distance between the end of the snout and the vent; tail about as long as the trunk. *Eyes*—small, about 2 diameters from the end of the snout, and situated over about the centre of the cleft of mouth, which latter is about one third of the length of the head: the mouth cannot be completely closed. Anterior nasal tube not quite so long as the vertical diameter of the orbit. Gill-opening about as large as the orbit. *Teeth*—maxillary and premaxillary teeth in a single row; vomerine ones posteriorly rounded and generally anteriorly bifurcated in a row; the anterior 2 or 3 vomerine teeth are rather curved, sharp, not subulate, and about the same size as those in the premaxillaries. Mandibular teeth in one row, except anteriorly where it is double. *Colour*—there are many different forms of colour, usually the ground tint is grey or greyish yellow covered with black spots, which are connected together by a network of dark lines, causing the fish to appear marbled.

Hab. East coast of Africa, Madagascar, Bourbon, and seas of India to the Malay Archipelago and beyond.

89. (17.) Muræna zebra.

Gymnomuræna zebra, *Shaw, Gen. Zool.* iv, p. 31.
Muræna zebra, *Day, Fish. India*, p. 673 (see synon.).

Length of head $6\frac{1}{2}$ to $7\frac{1}{2}$ in the distance between the end of the snout and the vent; tail one third of the total length. *Eyes*—small, and rather nearer the end of the snout than to the angle of the mouth. *Teeth*—consist of bands of obtuse molars. *Colour*—rich dark brown, ornamented with from 30 to 100 narrow white or yellow rings, which are sometimes incomplete.

Hab. Red Sea and east coast of Africa, through the seas of India to the Malay Archipelago and the Pacific. This species attains a large size.

90. (18.) Muræna nebulosa. (Fig. 33.)

Muræna nebulosa, *Ahl, De Mur. et Ophich.* p. 5, t. i, fig. 2; *Day, Fish. India*, p. 673, pl. clxxii, fig. 2 (see synon.).

Saulinga Pám, Tel.

Length of head $4\frac{1}{2}$ to $4\frac{2}{3}$ in the distance between the end of the snout and the vent; tail a little shorter than the trunk. *Eyes*—nearly 2 diameters from end of snout and situated midway between it and cleft of mouth, which last equals about one third of the length of the head. Gill-opening rather smaller than the eye. *Teeth*—most of the teeth obtuse or molariform. *Fins*—vertical ones rather well developed and commencing a little in front of gill-opening. *Colour*—brownish or olive, darkest along the back. A

Fig. 33.—*Muræna nebulosa* and upper teeth.

row of from 20 to 25 black blotches along the upper surface of the head and back extending on to the dorsal fin, and nearly as wide as the ground-colour; there are some white spots in the centre of each. A similar row of blotches along the abdominal surface. Intermediate ground-colour of fish covered with small black stars, spots, or vermiculated lines. Vertebræ 65/57.

Hab. Red Sea, Madagascar, Bourbon, Seychelles Archipelago, through the Indian and Pacific Oceans. It is said to attain 5 feet in length.

91. (19.) Muræna polyzona.

Muræna polyzona, *Richardson, Voy. Sulphur, Ich.* p. 112, pl. lv, figs. 11–14; *Day, Fish. India*, p. 673, pl. clxix, fig. 5 (erroneously marked *M. schultzei*) (see synon.).

Búdidé pám, Tam.

Length of head one fourth of the distance between the end of the snout and the vent; tail about one third longer than body. *Eyes*—of moderate size, placed about midway between angle of mouth and end of the snout. Length of cleft of mouth $3\frac{1}{2}$ in the length of the head. Gill-opening small, scarcely so large as the eye. *Teeth*—with rounded crowns, their form changing considerably with

age. *Fins*—dorsal rudimentary, commencing a little behind the vertical from the branchial opening. *Colour*—deep brown, encircled with 25–30 fine narrow (yellow) whole or half bands, which usually increase in width as they descend.

Hab. Red Sea, through the seas of India to the Malay Archipelago and the Pacific.

92. (20.) Muræna nigra.

Muræna nigra, *Day, P. Z. S.* 1870, p. 702, *and Fish. India*, p. 674, pl. clxxi, fig. 3.

Length of head 4½ in the distance between the end of the snout and the vent; tail nearly one half of the total length. *Eyes*—situated nearer to the snout than to the angle of the mouth, small, diameter half that of the snout; anterior tubular nostril of moderate length. Gill-opening about as wide as the eye. Cleft of mouth equals one third of length of the head; the mouth cannot be completely closed. *Teeth*—biserial, except in the mandible, where there are three rows in some places; all are obtuse except those of the inner maxillary row, which are pointed and finer than the outer row; premaxillary and vomerine teeth of equal size and with globular heads; mandible with about 20 teeth on each side. *Fins*—dorsal and anal moderately developed; the former commencing just behind a vertical line from the gill-opening, and half as high as the body. *Colour*—uniform black, no light edge to the fins.

Hab. Andamans. The specimen, 16 inches long, was discovered alive under a large stone at low water at Port Blair.

2. Genus GYMNOMURÆNA, Lacépède.

Syn. *Muræenoblenna*, Lacép.; *Ichthyophis*, Lesson; *Uropterygius* Rüpp.; *Channomuræna*, Richardson.

Gill-openings of moderate width or narrow. Two pairs of nostrils on the upper surface of the snout, the posterior being a round foramen, or with a short tube. Teeth small, pointed, and numerous. Fins absent, except a rudimentary one round the end of the tail. Scales absent.

Geographical Distribution. Indian and Pacific Oceans.

Synopsis of Indian Species.

Tail nearly twice as long as trunk. Brownish, with dark blotches ..... 1. *G. tigrina*, p. 84.
Tail rather longer than trunk. Grey, marbled with arborescent dark lines ..... 2. *G. marmorata*, p. 85.

93. (1.) Gymnomuræa tigrina.

Ichthyophis tigrinus, *Lesson, Mém. Soc. d'Hist. Nat. Paris*, iv, p. 399.

Gymnomuræna tigrina, *Day, Fish. India*, p. 674 (see synon.).

Length of head 4¼ in the distance between the end of the snout and the vent; tail nearly twice as long as the body. *Eyes*—small. Posterior nostril slightly tubular in the adult. Extent of cleft of mouth 2⅓ in the length of the head. *Teeth*—no distinct canines; the maxillary and anterior mandibular teeth in two rows. *Colour*—brownish, with various sized irregularly shaped or rounded black spots and blotches.

Hab. East coast of Africa, seas of India to the Malay Archipelago and beyond. An example in the British Museum from the Mauritius is 4 feet in length.

94. (2.) Gymnomuræna marmorata. (Fig. 34.)

Gymnomuræna marmorata, *Lacépède, H. N. Poiss.* v, pp. 648, 650; *Day, Fish. India*, p. 674, pl. clxxii, fig. 5 (see synon.).

Length of head 4 to 4½ in the distance between the end of the snout and the vent; tail rather longer than the trunk. *Eyes*—small, about 1½ or 1⅔ diameters from the end of the snout, to

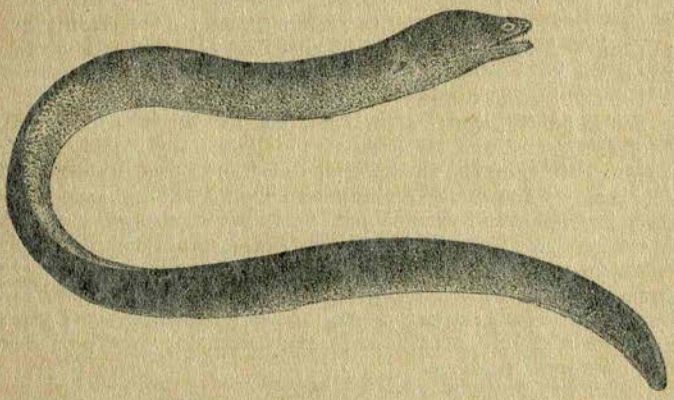

Fig. 34.—*Gymnomuræna marmorata.*

which they are nearer than to the angle of the mouth. Extent of cleft of mouth from 2½ to 2¾ in the length of the head. The gill-opening wider than the eye. Anterior nasal tubes short, the posterior nostrils with a raised edge in adults. *Teeth*—pointed, in a band in each jaw, the inner row the larger; no large canines; in a single row in the vomer, the anterior two rather enlarged and acicular. *Fins*—the vertical fins only exist round the end of the tail, the fin-rays being rudimentary. *Colour*—brownish grey, marbled all over with arborescent dark lines. The variety *G. xanthopterus* has the fins yellow.

Hab. Andamans to the Malay Archipelago.

Second group. MURÆNIDÆ PLATYSCHISTÆ.

3. Genus ANGUILLA, Cuvier.

Syn. *Muræna* (sp.), Artedi; *Terpolepis* (pt.), McClelland; *Paranguilla*, Bleeker.

Gill-openings of moderate extent, situated near the base of the pectoral fins. Upper jaw not projecting beyond the lower. Teeth small and in bands. The dorsal fin commences at some distance behind the nape; pectorals present. Small scales present, which are imbedded in the skin.

Geographical Distribution. Fishes of this genus appear to be distributed in fresh waters throughout the habitable globe, being reputed to be only absent in the Arctic regions, and probably in cold districts such as Turkestan.

Numerous species have been recorded and more are almost yearly being added to the present mass of synonyms. There appear to be two distinct forms in India, but they are subject to variation in the relative position of the origin of the dorsal fin to the vent; and likewise, but to a minor extent, in the character of the bands of teeth and the position of the eye. The comparative size of the bodies of these fish also varies with age and the existence of suitable food in the localities they inhabit.

Eels attain a large size in India, but not the immense length (300 feet) attributed to those of the Ganges by Pliny. Being seldom eaten except by the lower classes, there is but little demand for them. "The natives have an easy way of taking them. They leave small-mouthed earthen pots with a bit of sheepskin in each over night, and draw them up in the morning, with their fish lying coiled up most comfortably in them" (Thomas, 'Tank Angling in India,' p. 100). In Java the eel, according to Bleeker, is considered by the natives to be a serpent, and they say it attacks small goats and even children. It migrates overland from one river to another when desirous of change.

Synopsis of Indian Species.

Origin of dorsal fin situated about midway between the gill-opening and origin of anal fin ..... 1. *A. bengalensis*, p. 86.
Origin of dorsal fin situated above, rather in front of, or slightly behind the vent .... 2. *A. bicolor*, p. 87.

95. (1.) Anguilla bengalensis. (Fig. 35.)

Muræna anguilla, *Ham. Buch. Fish. Ganges*, p. 22.
Muræna bengalensis, *Gray & Hardw. Ill. Ind. Zool.* (*from H. B.'s MSS.*).
Anguilla bengalensis, *Day, Fish. India*, p. 659, pl. clxviii, fig. 1 (see synon.).

Ahir, Marāthi; *Vellangoo*, Tamil; *Nga-mee-toung*, Arracan; *Salais* and *Cuchia*, Chittagong.

B. xii. D. 250–305. P. 18. A. 220–250. C. 10–12.

Length of head 3 to 3⅓ in the distance between the snout and the vent; length of tail three sevenths more than that of the trunk. The distance between the gill-opening and the origin of the dorsal fin is one third or one fourth more than the length of the head; that between the origin of dorsal and anal fins equals

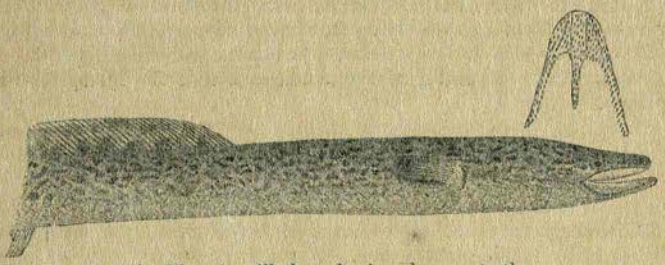

Fig. 35.—*Anguilla bengalensis* and upper teeth.

the length of the head. Head rather broader than the body; snout not broad. Lower jaw prominent. The cleft of the mouth is nearly or quite one third as long as the head, and extends behind the posterior edge of the orbit; diameter of latter 2½ in the length of the snout. Lips well developed. *Teeth*—the vomerine band does not extend posteriorly so far as the maxillary one, the mandibular teeth divided by a longitudinal groove. *Fins*—pectoral equals about two sevenths of the length of the head. *Colour*—brownish above, becoming yellowish on the sides and beneath; the whole of the upper surface of the body, in some examples, covered with black spots and blotches, occasionally continued on to the dorsal fin, which has a light edging; anal with a dark marginal band and a light outer edging.

"It is an irritable creature, swelling its head whenever angered; and constantly, when it can, buries itself in putrescent carcases." (*Ham. Buch.*)

Hab. Islands in the Indian Ocean, continent of India and Burma. This eel is common at the Andaman Islands. It probably ranges to the Malay Archipelago, Formosa, and the Pacific. It attains four feet and upwards in length, and is much rarer on the hills than in the plains.

96. (2.) Anguilla bicolor.

Anguilla bicolor, *McClelland, Cal. Journ. Nat. Hist.* v, p. 178, t. 6, fig. 1; *Day, Fish. India*, p. 660, pl. clxvii, fig. 3, pl. clxviii, fig. 2.

Jee-tah-dah, Andamanese.

B. xii. D. 220–245. P. 18. A. 200–220. C. 10–12.

Length of head 3¼ to 3½ in the distance between the snout and the vent; length of tail one fourth to one sixth more than that of the trunk. *Eyes*—rather variable in size, usually about 2½ dia-

meters in the length of the snout. Head very slightly broader than the body; snout rather broad; lower jaw scarcely longer than the upper. Extent of cleft of mouth equal to rather above one third of the length of the head, and extending to at least one diameter of the orbit behind the eye in the adult, to below it in the immature. Lips thick. *Teeth*—bands of nearly equal width, the vomerine reaching nearly as far backwards as those on the maxilla. *Fins*—dorsal commences above the vent or slightly before or behind it. *Colour*—of a dark olive above, becoming yellowish beneath.

Hab. Coasts of India to the Andamans and the Malay Archipelago.

4. Genus CONGROMURÆNA, Kaup.

Syn. *Gnathophis*, Kaup; *Ophisoma* and *Ariosoma*, Swainson.

Gill-openings wide. Eyes large. Cleft of mouth not extending behind the middle of the eye. Bones in fore part of head with large mucous canals. Posterior nostril patent and opposite the middle of the front edge of the eye; the anterior nostril tubular. Teeth small and pointed, forming bands, those in the jaws not constituting a cutting-edge; vomerine band elongated and narrow. Dorsal fin commencing nearly opposite the gill-opening; the pectoral and also the vertical fins (which are continuous round the tail) well developed. Scaleless.

Geographical Distribution. Tropical and subtropical seas.

97. (1.) Congromuræna anago. (Fig. 36.)

Conger anago, *Temm. & Schleg. Fauna Japon., Pisces*, p. 259, pl. 113, fig. 1.

Congromuræna anago, *Day, Fish. India*, p. 660, pl. clxix, fig. 2 (see synon.).

B. viii. P. 14. D. 170–196. A. 122–145. C. 10.

Length of head $2\frac{1}{8}$ to $2\frac{2}{3}$ in the distance between the end of the snout and the vent; length of trunk about one third less than that of the tail. Cleft of mouth 3 to $3\frac{1}{4}$ in the length of the head,

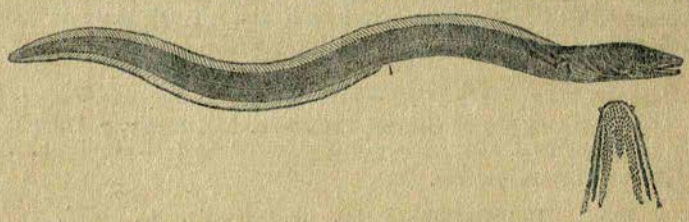

Fig. 36.—*Congromuræna anago* and upper teeth.

terminating below the middle of the eye. *Eyes*—large, 1 to $1\frac{1}{4}$ diameters in the length of the snout, and two thirds of a diameter

apart. Lips rather thick; upper jaw the longer. *Teeth*—of about equal size; the vomerine band extending backwards to about half the length of the maxillary band. *Fins*—dorsal commences slightly behind the gill-opening; pectoral nearly half as long as the head. *Colour*—brownish along the back, becoming dull white beneath. Fins yellow, the vertical ones with a narrow black edging. Upper half of pectoral occasionally stained with black.

Hab. Coromandel coast of India to the Malay Archipelago.

5. Genus **UROCONGER**, Kaup.

Syn. *Congerodon*, Kaup.

Gill-openings rather wide. Muciferous cavities on jaws moderately developed. Hind nostril in the form of a slit opposite the upper third of the orbit; front nostril not tubular. Eyes rather large. Cleft of mouth reaching to rather behind the middle of the orbit. Teeth fine, conical, and subequal in size; those in the jaws biserial; the vomerine teeth in a single elongated row and small. The dorsal fin commences above the root of the pectoral; all the fins well developed. Scaleless.

Geographical Distribution.—Seas of India to the Malay Archipelago, China, and the Philippines.

98. (1.) Uroconger lepturus. (Fig. 37.)

Congrus lepturus, *Richardson, Voy. Sulphur, Ich.* p. 106, pl. 56, figs. 1–6.

Uroconger lepturus, *Day, Fish. India*, p. 661, pl. clxx, fig. 1 (see synon.).

Tolaka, Marâthi.

B. ix. P. 10. D. 200–220. C. 10. A. 120–150.

Length of head $2\frac{1}{2}$ to $2\frac{3}{4}$ in the distance between the end of the snout and the vent; length of trunk about half that of the tail. Cleft of mouth rather oblique, and ceasing below the hind edge of the eye; the extent equals about two fifths of the length of the head.

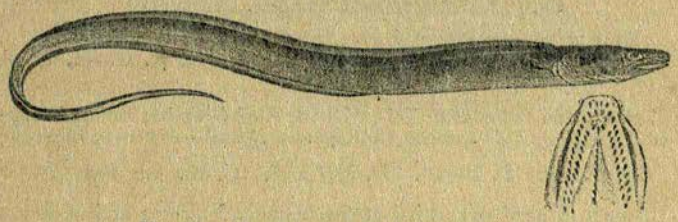

Fig. 37.—*Uroconger lepturus* and upper teeth.

Eyes—2 to $2\frac{1}{4}$ diameters in the length of the snout, and 1 to $1\frac{1}{6}$ diameters apart. Snout depressed, with a row of slit-like openings above the edge of the upper lip. *Teeth*—rather large and unequal

in size; those in the jaws in two rows, placed a slight distance apart, the inner row somewhat the larger; vomerine teeth in a single pointed row about equal in size to the inner maxillary row, one of the anterior teeth is sometimes enlarged. *Fins*—the dorsal commences above the base of the pectoral, which latter equals about one fourth of the length of the head. *Colour*—brownish above, becoming dull white beneath: a row of white-edged glandular openings along the lateral line. Vertical fins edged with black.

Hab. Seas of India to the Malay Archipelago and China.

6. Genus MURÆNESOX, McClelland.

Syn. *Cynoponticus*, Costa, and *Brachyconger*, Bleeker.

Gill-openings wide, approximating to the abdomen. Snout rather elongated, the upper jaw the longer. Two pairs of nostrils, the posterior of which are opposite to the upper part or centre of the orbit. Teeth in the jaws rather fine, with some canines anteriorly; vomer with several rows of teeth, the middle of which are large and conical or compressed. Dorsal fin commencing above the gill-opening; it, the anal, caudal, and pectoral well developed. Vent a long distance from the gill-opening. Scaleless.

The comparative proportions of the parts in these fishes vary considerably with age, season, and food.

Geographical Distribution. Tropical Seas.

Synopsis of Indian Species.

Vomerine teeth large, and without basal lobes. 1. *M. talabon*, p. 90.
Vomerine teeth slender, the posterior ones with basal lobes; the external mandibular row directed outwards..... 2. *M. talabonoides*, p. 91.
Vomerine teeth large, and having a basal lobe; external mandibular row not directed outwards..... 3. *M. cinereus*, p. 91.

99. (1.) Muræsox talabon. (Fig. 38.)

Muræna talabon, *Cuvier*, *Règne An.* ed. 2, ii, p. 350, note 4.
Muræsox talabon, *Day*, *Fish. India*, p. 661, pl. clxviii, fig. 5 (see synon.).

[*Tala-bon* and *Culim-poun*, Tel.; *Kotah* or *Kulivi-pamboo*, Tamil; *Thong-bonto*, Arracan; *Kyla mutchee*, Chittagong; *Nya thembau lowk*, Burmese.

B. xvii–xix. P. 15–16. D. 270–285. C. 10. A. 195–210.

Length of head one third of the distance between end of snout and vent; length of trunk about one fourth less than that of the tail. Extent of cleft of mouth about half of length of head. *Eyes*—diameter one third of length of snout, distance apart 1 diameter. *Teeth*—on the vomer consisting of a row of moderately large, lanceo-

late, widely set ones, without any basal lobes; mandibular teeth much smaller than the vomerine, and those in the external row not directed outwards. *Fins*—the dorsal commences a short distance before the base of the pectoral; the anal under about the fifty-fifth dorsal ray, just posterior to the vent. *Colour*—upper surface of

Fig. 38.—*Muræsox talabon.*

back and head olive, becoming brown posteriorly; abdomen dull white, becoming silvery inferiorly. The throat, cheeks, and gill-covers with golden reflections; vertical fins with dark margins.

Hab. Seas of India to the Malay Archipelago; attaining ten feet or more in length.

100. (2.) Muræsox talabonoides.

Conger talabonoides, *Bleeker, Batavia, Verhand. Nat. Ver.* xxv, *Mur.* p. 20.

Muræsox talabonoides, *Day, Fish. India*, p. 662, pl. clxviii, fig. 3 (see synon.).

B. xviii–xix. P. 15. D. 245–250. C. 10. A. 200–205.

Length of head one third of the distance between end of snout and vent; length of trunk rather less than that of the tail. Extent of the cleft of the mouth about half of the length of the head. *Eyes*—diameter $3\frac{1}{2}$ to $3\frac{3}{4}$ in the length of the snout, and 1 diameter apart. *Teeth*—the anterior on the vomer are straight, slender, compressed, and elongated, while the posterior have a small basal lobe in front and behind; the outer mandibular teeth are directed outwards. *Fins*—the dorsal commences in advance of the base of the pectoral, the latter fin contained $3\frac{3}{4}$ times in the length of the head. *Colour*—silvery, becoming white on the abdomen; vertical fins yellowish, with a narrow black outer border.

Hab. Seas and estuaries of India to the Malay Archipelago. This is the rarest of the three forms of this genus found in India.

101. (3.) Muræsox cinereus.

Muræna cinerea, *Forsk. Desc. Anim.* pp. x and 22.

Muræsox cinereus, *Day, Fish. India*, p. 662, pl. clxviii, fig. 4 (see synon.).

B. xx–xxii. P. 14–16. D. 230–270. C. 10. A. 190–220.

Length of head $2\frac{1}{2}$ to $2\frac{2}{3}$ times in the distance between end of snout and vent; length of trunk rather less than that of the tail. Extent of cleft of mouth equals rather less than half the length of

the head. *Eyes*—2¼ to 2½ diameters in the length of the snout, and 1 diameter apart. *Teeth*—the vomerine are straight, compressed, and with a basal lobe anteriorly and posteriorly: the mandibular teeth are very much smaller than the vomerine, and those in the external row are not bent outwards (as in *M. talaboides*). *Fins*—dorsal commences slightly in advance of the gill-opening; pectoral contained 3¼ times in the length of head. *Colour*—silvery, becoming white on the abdomen; vertical fins yellowish, with either a narrow or wide outer black edge; pectoral yellow or black.

Hab. Red Sea, seas and estuaries of India to the Malay Archipelago and Australia. This is the most common species of the genus in the seas of India.

7. Genus **SAURENCHELYS**, Peters.

Gill-openings of a moderate width. Snout much produced. Nostrils lateral, the front one near the end of snout, the hind one close in front of orbit. Teeth rather small and in several rows. Pectoral fins absent; vertical fins well developed. Air-bladder and pyloric appendages absent. Scaleless.

Geographical Distribution. Coromandel coast of India and the Mediterranean.

102. (1.) **Saurenchelys petersi.** (Fig. 39.)

Saurenchelys petersi, *Day, Fish. India*, p. 663, pl. clxviii, fig. 6.

Length of head 2¼ times between end of snout and vent; length of trunk 3½ times in that of the tail; extent of the cleft of the mouth half the length of the head. *Eyes*—3 diameters in the

Fig. 39.—*Saurenchelys petersi.*

length of the snout, and one diameter apart. *Teeth*—canines present anteriorly; the vomerine teeth large, compressed, but without any basal lobes. *Fins*—the dorsal commences a short distance behind the gill-opening; it is low anteriorly, becoming gradually more developed, and is continuous posteriorly with the anal. Pectorals absent. *Colour*—dorsal fin with a dark edge; it and the anal become almost black in the last one fourth of their extent.

Hab. The single example was taken from the sea in Orissa.

8. Genus **MURÆNICHTHYS**, Bleeker.

Body elongated and cylindrical. Gill-openings narrow. Eyes small. Nostrils on the edge of the upper jaw. Dorsal fin low

or rudimentary, commencing a long distance posterior to the gill-opening; caudal continued round the end of tail. Pectorals absent. Scaleless.

Geographical Distribution. Seas of India to the Malay Archipelago.

Synopsis of Indian Species.

Dorsal fin commences before the vent ..... 1. *M. schultzei*, p. 93.
Dorsal fin commences behind the vent..... 2. *M. vermiformis*, p. 93.

103. (1.) Muræniehthys schultzei. (Fig. 40.)

Muræniehthys schultzei, *Bleeker, Batavia, Nat. Tijdsch.* xiii, p. 366; *Visch. Batav.* p. 506; *Day, Fish. India*, p. 663, pl. clxix, fig. 3 * (see synon.).

Length of head $2\frac{2}{3}$ to 3 in the distance between the end of the snout and the vent; length of the trunk three fifths that of the tail. Extent of cleft of mouth equals one third of the length of

Fig. 40.—*Muræniehthys schultzei* and upper teeth.

the head. *Eyes*—of moderate size, situated midway between the angle of the mouth and the end of the snout. Upper jaw somewhat the longer. *Teeth*—in jaws pointed, in three rows, the inner the larger; the palatine teeth in two rows, with obtuse crowns. *Fins*—the dorsal low, commencing in the last sixth of the distance between the gill-opening and the vent. Pectorals absent. *Colour*—brownish along the back, becoming of a yellowish green on the sides and below.

Hab. Andaman Islands to the Malay Archipelago.

104. (2.) Muræniehthys vermiformis.

Chilorhinus (Muræniehthys) vermiformis, *Peters, MB. Ak. Wiss. Berl.* 1866, p. 524.
Muræniehthys vermiformis, *Day, Fish. India*, p. 663 (see synon.).

Angle of the mouth slightly posterior to the eye. Teeth in the jaws and on the vomer in a single row. The origin of the dorsal fin behind the vent.

Hab. Ceylon.

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* A mistake has been made in the plate quoted. The name given for fig. 3, *Muræna polyzona* (*ante*, p. 83), belongs to fig. 5 and *vice versâ*.

9. Genus OPHICHTHYS, Ahl.

Syn. *Ophisurus*, *Pœcilocephalus*, and *Cœcilia*, Lacép.; *Cæcula*, Vahl; *Sphagebranchus*, Bl. Schn.; *Murænopsis*, Lesueur; *Dalophis*, Raf.; *Leptognathus*, Swainson; *Apterichthys*, Duméril; *Leptorhynchus*, Smith; *Ichthyapus*, Bris. de Barneville; *Centrurophis*, *Pœcilocephalus*, *Microdonophis*, *Cœcilopis*, *Herpetoichthys*, *Brachysomophis*, *Elapsopis*, *Mystriophis*, *Echiophis*, *Scytalophis*, *Leptorhinophis*, *Pisoodonophis*, *Lamnostoma*, *Anguisurus*, *Cirrhimuræna*, *Callechelys*, *Ichthyapus*, *Ophisuraphis*, *Crotalopsis*, Kaup; *Achirophichthys*, Bleeker; *Macrodonophis* and *Uranichthys*, Poey.

The gill-openings may be close together. Snout greatly or moderately produced. Cleft of mouth wide or of medium width; lips may or may not be fringed. Teeth in jaws and on vomer, either pointed and granular, or small and conical; in the maxilla they may be in from one to four rows or in bands, while in the mandibles they may be in one or two rows; canines present or absent. Dorsal fin, when present, commences either in advance of or nearly above the gill-opening, or behind the root of the pectoral; the pectorals, when present, may be rudimentary, or only developed in the adult, or else of moderate size; anal present or absent. Extremity of tail free.

This genus has been regarded by some authors as a Family; in all the species the extremity of the tail is free, and there are vomerine teeth.

Synopsis of Indian Species.

A. Teeth obtuse or granular. Pectorals present or absent.
- Head 3½ to 4 times in length of trunk; body nearly two thirds of total length ..... 1. *O. boro*, p. 94.
- Head 7⅓ to 8 times in length of trunk; body rather above a third of the total length.. 2. *O. microcephalus*, p. 95.
- Head 8 to 9 times in length of trunk; body about half of total length. Body surrounded by brown rings, between which are sometimes spots..... 3. *O. colubrinus*, p. 96.

B. Teeth pointed and in a single row. Pectorals absent.
- Head 3½ to 4 times in length of trunk; body half of total length ..... 4. *O. orientalis*, p. 96.
- Head 7½ in length of trunk; body about as long as tail. 16 to 17 large dark spots along the lateral line ..... 5. *O. ornatissimus*, p. 97.

105. (1.) Ophichthys boro. (Fig. 41.)

Ophisurus boro, *Ham. Buch. Fish. Gang.* p. 20, t. v, fig. 5.
Ophichthys boro, *Day, Fish. India*, p. 664, pl. clxxi, fig. 2 (see synon.).

B. xxix–xxxi. D. 320–400. P. 13. A. 250–270.

Length of head (to gill-opening) from 3½ to 4 times in the dis-

tance between the snout and the vent; length of trunk nearly two thirds of the total. *Eyes*—from 2 to 2½ or even 3 diameters from end of snout, and slightly nearer angle of mouth than end of snout. Upper jaw the longer; cleft of mouth extending some distance

Fig. 41.—*Ophichthys boro* and upper teeth.

behind the eye. Snout rather depressed in the young and obtuse in the adult. *Teeth*—granular, in a large patch on maxilla, and in several smaller rows on premaxillaries; large and in several rows on the vomer; two outer granular rows in mandible, with an inner pointed row. The form of the teeth is subject to considerable variation: thus they are usually conical in the young, which character may be retained in the adult age (*O. hyala*); or the young in some instances have globular-headed teeth; the number of rows of teeth is not constant. *Fins*—dorsal low; it commences about the length of the pectoral behind the posterior margin of that fin, and does not quite reach the tip of the tail. Pectoral rounded or pointed, its length equals about one fourth of the distance between the snout and its base. Anal low, not extending to the tip of the tail. *Colour*—greenish olive above, with many minute black spots, becoming greenish white below; the dorsal fin with a dark edging.

The natives in some parts of Bengal imagine that this fish proceeds from the ear of a porpoise. Sir Walter Elliot was informed that in some parts of Madras those captured in salt-water creeks were eaten by the natives as a remedy for weakness or pains in the loins.

When breathing this fish distends its gill-cavities with air taken in at the mouth, while it can also respire that contained in the water. If its gill-openings are kept firmly closed, it takes in air by its mouth; should its mouth be kept shut it struggles until released so as to be able to respire. If the gills are exposed by removing the gill-membranes, it slowly moves its branchiæ, and is able to respire without taking in air by the mouth.

Hab. Seas and estuaries of India and Malay Archipelago, ascending large rivers to far above tidal reach. It attains to at least 24 inches in length.

106. (2.) Ophichthys microcephalus.

Ophichthys microcephalus, *Day, Fish. India*, p. 665 pl. clxx, fig. 2.

Length of head from 7⅓ to 8 in the distance between the end of the snout and the vent; tail nearly twice as long as trunk (1⅔). *Eyes*—of moderate size, situated behind the middle of the distance

between the snout and the angle of the mouth. Extent of cleft of mouth from end of snout $3\frac{1}{2}$ in the length of the head. Anterior tubular nostrils well developed. *Teeth*—obtusely conical and in three rows. *Fins*—low, the dorsal commences over the last third of the pectoral fin, neither the dorsal nor anal is continued round the end of the tail. Pectoral $3\frac{1}{4}$ to $3\frac{1}{3}$ in the length of the head. *Colour*—olive above, becoming of a dull yellow on the sides and beneath; fins externally stained with black.

Hab. Three examples, none less than 25 inches in length, were captured in Malabar.

107. (3.) Ophichthys colubrinus.

Muræna colubrina, *Boddaert, Pallas's Neue Nord. Beytr.* ii, 1781, p. 56, pl. 2, fig. 3.

Ophichthys colubrinus, *Day, Fish. India*, p. 665, pl. clxvii, fig. 4 (see synon.).

"B. xxv. circ. D. 510, circ. A. 318, circ. P. 10, circ."—Bleeker.

Length of head 8 to 9 times in the distance between the end of the snout and the vent; length of trunk about equal to that of the tail; snout projecting. Extent of cleft of mouth equals about $\frac{2}{3}$ to $\frac{1}{4}$ of the length of the head. *Eyes*—rather small, situated behind the middle of the cleft of the mouth. Snout rather pointed. *Teeth*—with rounded crowns and in two rows. *Fins*—the dorsal fin commences in front of the gill-opening, just behind the nape; it and the anal are rather low; pectoral rudimentary. *Colour*—numerous (25 to 35) brown rings surround the body. In some examples a dark round spot exists in the interspace between each ring on the body.

Hab. Red Sea, Andamans to the Malay Archipelago, and beyond.

108. (4.) Ophichthys orientalis.

Dalophis orientalis, *McClelland, Cal. Journ. Nat. Hist.* 1845, v, p. 213.

Ophichthys orientalis, *Day, Fish. India*, p. 665, pl. clxxi, fig. 1 (see synon.).

Manti-bukaro-paumbu, Tel.

Length of head $3\frac{1}{2}$ to 4 in the distance between the end of the snout and the anus; tail as long as the trunk. *Eyes*—small, placed rather behind the middle of the length of the head. The gill-openings are longitudinal slits almost parallel one to the other. Snout projecting, extending beyond the lower jaw, and the openings of the nostrils are on the lower surface. *Teeth*—pointed and in a single row. *Fins*—the dorsal commences at a short distance behind the gill-openings, it and the anal being low; pectorals absent. *Colour*—olive, becoming lightest beneath; one or two rows of round whitish spots across the occiput, having a short line of similar spots directed forward on either side.

"Very common at Madras. The boys catch it at the edge of the surf by bruising a crab in their hands and throwing it into the water, then walking about over the spot, and when they feel an eel about their feet they stoop down and suddenly dash it on to the sand with both hands. If thrown on the moist sand they burrow themselves, *tail foremost*, almost instantaneously." (*Jerdon.*)

Hab. Seas and estuaries of Ceylon and up the Bay of Bengal, certainly as high as Orissa. It attains at least a foot in length.

109. (5.) Ophichthys ornatissimus.

Herpetoichthys ornatissimus, *Kaup, Cat. Apodal Fish.* p. 7, fig. 4.
Ophichthys ornatissimus, *Day, Fish. India*, p. 665 (see synon.).

Length of head from snout to gill-opening 7½ in the length of the trunk; length of tail rather less than that of the trunk. Head depressed. *Eyes*—near end of snout. Jaws of nearly equal length. *Teeth*—pointed, those on the maxilla and front of the vomer in a double, the remainder in a single row. *Fins*—dorsal low, commencing behind the end of the pectoral, the latter with 24 rays and about one fourth the length of the head. *Colour*—irregular dark spots on the head. One transverse and two longitudinal rows of white spots on the occiput; two curved whitish lines between the eyes; sixteen to seventeen large, round, black spots along the lateral line, which are separated by another band of spots of different sizes. Dorsal fin with black marginal spots and stripes.

Hab. Malabar, whence an example 20·8 inches long was brought by Dussumier.

10. Genus **MORINGUA**, Gray.

Syn. *Raitaborua*, Gray; *Ptyobranchus*, McClell.; *Pterurus*, Swainson; *Aphthalmichthys*, Kaup; *Pseudomoringua*, Bleeker.

Body subcylindrical, with the trunk considerably longer than the tail. Gill-openings rather narrow and inferior; heart far posterior to the branchiæ. Cleft of mouth narrow. The posterior nostril situated in front of the eye. Teeth in a single row. Vertical fins limited to the tail; pectorals, if present, small. Scales absent.

Geographical Distribution. Seas of India to the Malay Archipelago and Japan.

Synopsis of Indian Species.

Length of head 6 to 6½ in that of the trunk;
trunk longer than the tail ..... 1. *M. raitaborua*, p. 98.
Length of head 5¾ in that of the trunk;
trunk at least ⅛ longer than the tail .. 2. *M. macrocephala*, p. 98.

110. (1.) Moringua raitaborua. (Fig. 42.)

Muræna raitaborua, *Ham. Buch. Fish. Ganges*, pp. 25, 364.
Moringua raitaborua, *Day, Fish. India*, p. 666, pl. clxx, fig. 3 (see synon.).

Length of head from snout to gill-opening 6 to 6½ in the distance from snout to vent; length of tail from two fifths to three eighths of the entire length. Height of body equals one third of length of head. *Eyes*—rather high up, and 2 to 3 diameters from end of snout; jaws of equal length in front, or the lower slightly the longer.

Fig. 42.—*Moringua raitaborua* and upper teeth.

Cleft of mouth extends above 1 diameter of the orbit behind its posterior margin. Gill-opening a slit at the side of the pectoral fin. *Teeth*—in a single row directed backwards, pointed. *Fins*—dorsal slightly developed, it commences about the length of the head posterior to the anus; the anal arises a short distance behind the anus; both fins are interrupted in the middle, but posteriorly developed and join the caudal. Pectoral equals about one sixth of its distance from the snout. *Lateral line*—distinct. *Colour*—coppery, olive, or even purplish above, becoming silvery underneath; some black dots. Vertebræ 90+14.

Hab. Estuaries of the Ganges to the Malay Archipelago; attaining at least 22 inches in length.

111. (2.) Moringua macrocephala.

Aphthalmichthys macrocephalus, *Bleeker, Atl. Ich.* iv, p. 17, t. 147, fig. 2.
Moringua macrocephala, *Day, Fish. India*, p. 666 (see synon.).

Length of head from snout to gill-opening 5⅔ in the distance from snout to vent; trunk at least two thirds longer than tail. Cleft of mouth about one fifth of the length of the head. *Fins*—a few rays at the end of the tail, otherwise the vertical and pectoral fins are reduced to mere cutaneous folds.

Hab. India and the Malay Archipelago.

Family III. SILURIDÆ.

Margin of the upper jaw formed mainly by the premaxillaries; the maxilla rudimentary, often constituting the base of a barbel; no subopercle. The rayed dorsal fin or the adipose dorsal may be present or absent. Skin scaleless, and either smooth or covered with osseous plates, or scattered tubercles. Air-bladder, when present, either free in the abdominal cavity or more or less enclosed in bone; it communicates with the organs of hearing by means of the auditory bones. Cæcal appendages absent.

The Siluroid, or scaleless, fishes are popularly termed Cat-fishes, owing to most of them being provided with feelers or long barbels arranged around the mouth. They mostly prefer muddy to clear water, and the more developed the barbels, the more these fishes appear to be adapted for an inland or muddy freshwater residence.

The wider and deeper the rivers, the more suited they are for the *Siluridæ*, consequently the larger forms are comparatively rare in the south of India, whilst they abound in the Indus, Jumna, and Ganges, also in the Irrawaddy and other Burmese rivers.

Owing to their usual resort, these fishes appear to employ their feelers in moving about in muddy places, and consequently have less use for their eyes than forms that reside in clear pieces of water. This is one reason why the size of the eye as compared with the length of the head is much greater in the young than in the adult. The eye in fact atrophies, it does not increase in size in proportion with the remainder of the head. In some species, the skin of the head passes over the eye without any trace of a free orbital margin.

In the genus *Arius* and some allied marine forms, the males appear to carry the ova in their mouths perhaps until the young are produced.

Many of these fishes are credited with causing poisonous wounds, and we frequently find such cases admitted into hospitals. The injuries may be divided into two classes, (1) those in which the wounds are of a distinctly venomous description, (2) those in which the jagged spines occasion intense inflammation often of a dangerous character.

The respiration of these fishes is effected in two ways, and it may be appropriate here to refer to the amphibious fishes of India, as the *Labyrinthici* and *Ophiocephalidæ*. Respiration in fishes is carried out normally, (1) by their using the air which is in solution in the water to oxygenate the blood at their gills, (2) by taking in atmospheric air direct, which is employed at a special organ, where it oxygenates the blood, which can be returned for use into the general circulation without going through the gills. The true amphibious fishes respire by the latter method. No doubt we observe that fishes which normally oxygenate their blood solely at their gills, do rise to the surface in very hot weather, when the water is

foul, or insufficiently charged with air, and take in air by the mouth; likewise we find that those which mainly take in atmospheric air direct by the mouth may, to a certain extent, be able to use their gills. If fishes having these two different modes of respiration are placed in a globe of water, across which a diaphragm of net is inserted below the surface, so as to prevent their obtaining access to the atmosphere, those of the first class which oxygenate their blood at the gills are unaffected, whereas those which have accessory breathing-organs and take in air direct, or amphibious fishes, die from blood-poisoning.

Amongst the *Siluridæ*, *Clarias* has a dendritic apparatus attached to the branchiæ (see fig. 48, p. 114), and *Saccobranchus* has a long air or respiratory sac passing backwards amongst the muscles of the back from behind the gill-cavity proper. The blood from the heart goes up the bulbus arteriosus, and divides into branches on either side, one of which goes to each respiratory air-sac, the anterior on the right, the posterior on the left side. The one on the right goes along the upper wall of the sac, whilst that on the left traverses the lower wall, giving off numerous lateral branches. From this respiratory air-sac the purified blood is returned by a vessel which conveys it direct to the aorta.

It is thus evident that blood can be purified at these respiratory air-sacs, and these fishes can be kept alive hours, and even days, without being in water, thus enabling them to traverse considerable distances where aquatic respiration would be impossible. They are also able, when in water, to depurate some of the blood at the gills, if occasion should render it necessary for them to do so.

The air- or swim-bladder (not respiratory air-sac) exists in two forms amongst the *Siluridæ*. In marine species it is thick and not enclosed in bone, likewise in most of the freshwater forms found in the waters of the plains; but as we approach the hills a change occurs, and in most of the genera the air-bladder possesses an osseous covering.

Geographical Distribution. Tropical and subtropical seas and rivers. Fishes of this family are very abundant in the fresh waters of India, likewise in the estuaries and sea; they are not so common, however, in the clear waters around the Andamans, and are nearly absent from the Red Sea.

Uses. As a rule (excluding *Pseudeutropius*, *Callichrous*, and *Ailia*), the Siluroids are more eaten by the poorer than by the richer classes, and for two reasons—first, they are forbidden to Jews and Mahomedans, and secondly, they are very foul feeders. *Saccobranchus* and *Clarias*, however, are deemed nourishing and often prescribed for patients recovering from illness. The air-bladders of the marine forms are collected for export to China, as they afford a coarse isinglass.

Synopsis of Indian Genera.

First group. HYPOSTOMATINA.

Gill-membranes confluent with the skin of the isthmus; gill-openings small. The rayed dorsal fin, if present, belongs to the abdominal portion of the vertebral column, being in advance of the ventrals. Adipose dorsal present. Pectorals and ventrals horizontal. Air-bladder partially or wholly enclosed in bone.

Osseous plates along the back. The adipose fin in the form of a short spine. Upper caudal ray very elongate ..... 1. SISOR.

An adipose fin. An adhesive apparatus formed of transverse folds of skin situated on the chest between the bases of the pectoral fins ..... 2. PSEUDECHENEIS.

No long caudal ray, osseous dorsal plates, nor adhesive apparatus. A low adipose fin.. 3. EXOSTOMA.

Second group. CHACINA.

Gill-membranes confluent with the skin of the isthmus; gill-openings small. Rayed dorsal and anal fins consisting each of two portions; a strong serrated spine in front of the first dorsal fin, while the posterior portions of both fins are confluent with the caudal. No adipose fin. Ventral with six rays. Air-bladder not enclosed in bone.

Mouth very wide. Eyes rudimentary..... 4. CHACA.

Third group. PLOTOSINA.

Gill-membranes not confluent with the skin of the isthmus; gill-openings wide. Rayed dorsal fin in two portions; the anterior with few rays, and armed with a pungent spine, the posterior long and confluent with the caudal, as is also the long anal. No adipose dorsal. Ventral many (12) rayed. A dendritic post-anal organ. Air-bladder not enclosed in bone.

Teeth on the palate. Pectoral with a spine. 5. PLOTOSUS.

Fourth group. CLARIINA.

Gill-membranes not confluent with the skin of the isthmus; gill-openings wide. Rayed dorsal fin single, spineless and elongated, posteriorly neither it nor the anal confluent with the caudal. No adipose dorsal. A dendritic accessory branchial apparatus attached to the convex side of some of the branchial arches, and received into a recess above and behind the true gill-cavity. Air-bladder transverse, lobed, and enclosed in bone.

Teeth on the palate. A pectoral spine. Ventral with six rays ..... 6. CLARIAS.

Fifth group. SILURINA.

Gill-membranes more or less separate from the isthmus, which they overlap, their hind edges being free even if united to one another.

The rayed dorsal fin, if present, belongs to the abdominal portion of the vertebral column, being in advance of the ventrals. Adipose fin present or absent.

a. Length of the anal fin nearly equal to that of the caudal portion of the vertebral column. Gill-openings wide.

Teeth on the palate. Barbels four or six. Rayed dorsal fin without spine; no adipose fin. Pectoral with a spine. Ventral with eight or more rays; anal with from sixty to ninety rays. Air-bladder free ..... 7. SILURUS.

Teeth on the palate. Barbels eight. Rayed dorsal fin with a short spine, an adipose fin; no pectoral spine. Ventral with six, anal with from fifteen to about twenty-three rays. Caudal rounded or lanceolate. Air-bladder free ..... 8. OLYRA.

No teeth on the palate. Barbels eight. Dorsal fin with one spine and six rays; a small pectoral spine. Anal rather short (eleven to twelve rays). Ventral with six rays; caudal forked. Air-bladder enclosed in bone ..... 9. AMBLYCEPS.

Teeth on the palate. Barbels eight. A short spineless dorsal, also an adipose fin; an elongated anal one (sixty to eighty rays). A strong pectoral spine. Ventral with six rays. An elongated respiratory air-sac, extending backwards amongst the muscles of the back on either side of the neural spines. Air-bladder enclosed in bone ..... 10. SACCOBRANCHUS.

Cleft of mouth deep, extending to behind the eyes. Teeth on the vomer. Barbels four. Rayed dorsal fin short, spineless; no adipose fin. A pectoral spine. Ventral with nine or ten rays; anal with sixty-five to ninety-five rays. Air-bladder free ..... 11. WALLAGO.

Teeth on the palate. Barbels eight. A short dorsal fin with a spine, also an adipose fin. A pectoral spine; an elongated anal fin (forty-seven to fifty rays). Ventral with six rays. Air-bladder partially protected by bone ..... 12. EUTROPIICHTHYS.

Cleft of mouth does not extend to the eye. Teeth on the vomer. Barbels two or four. Rayed dorsal fin when present small; no adipose fin. A pectoral spine. Ventral with ten or less rays; anal with from about forty-five to ninety-five rays. Air-bladder free ..... 13. CALLICHROUS.

Teeth on the palate. Barbels eight. No rayed dorsal, but an adipose fin. Pectoral with a spine; an elongated anal (sixty to seventy-five rays); a pectoral

spine. Ventral with six rays. Air-bladder partially protected by bone .... 14. AILIA.

Similar to *Ailia* but destitute of ventral fins.. 15. ALLICHTHYS.

Teeth present on the palate. Barbels eight. Dorsal and pectoral spines. An adipose dorsal. Ventral with six or eight rays; anal with from about twenty-seven to fifty-five rays. Air-bladder free. 16. PSEUDEUTROPIUS.

Teeth present on the palate. Barbels four. Dorsal and pectoral spines; an adipose dorsal. Ventral with six, anal with from about twenty-nine to thirty-nine rays. Air-bladder free ..... 17. PANGASIUS.

Teeth on the palate. Barbels two or four. A short dorsal having a spine, also an adipose fin; an elongated anal (forty or fifty rays). A pectoral spine. Ventral with six rays. Air-bladder partially protected by bone ..... 18. SILUNDIA.

b. Length of the anal fin much less than the caudal portion of the vertebral column. .....

Gill-openings very wide, the membranes not confluent with the skin of the isthmus, but overlapping one another, being cleft nearly to the chin. Teeth present on the palate. Barbels eight. Dorsal and pectoral spines; an adipose fin. Ventral with six, anal with from about eight or nine to twenty or more rays. Air-bladder free ..... 19. MACRONES.

Gill-openings very wide, the membranes not confluent with the skin of the isthmus, but overlapping one another, being cleft nearly to the chin. Teeth present on the palate. Barbels six or eight. Dorsal and pectoral spines; an adipose fin. Ventral with six, anal with from about fifteen to twenty rays. Air-bladder free ..... 20. LIOCASSIS.

Gill-openings wide, the membranes not confluent with the skin of the isthmus, and scarcely or not notched. Teeth present on the palate. Barbels six or eight. Strong dorsal and pectoral spines, an adipose fin. Ventral with seven or eight rays, anal with twelve to thirteen. Air-bladder free ..... 21. RITA.

Gill-openings wide, the membranes not confluent with the skin of the isthmus, and scarcely or not notched. Teeth present or absent on the palate. Barbels six. Dorsal and pectoral spines; an adipose fin. Ventral with six, anal with from about fourteen to at least twenty-four rays. Air-bladder free ..... 22. ARIUS.

Gill-openings wide, the membranes not con-

fluent with the skin of the isthmus, and not notched. No teeth on the palate. Barbels six. Dorsal and pectoral spines; an adipose fin. Ventral with six, anal with about twenty rays. Air-bladder free ..... 23. KETENGUS.

Gill-openings very wide, the membranes not confluent with the skin of the isthmus, but overlapping one another, being notched. Teeth on the palate. Barbels, one semi-osseous maxillary pair. Dorsal and pectoral spines; an adipose fin. Ventral with six, anal with from about nineteen to twenty-four rays. Air-bladder free ..... 24. OSTEOGENIOSUS.

Gill-openings wide, the membranes not confluent with the skin of the isthmus, and not notched. Teeth present on the palate. Barbels two. Dorsal and pectoral spines; an adipose fin. Ventral with six, anal with about twenty rays. Air-bladder free ..... 25. BATRACHOCEPHALUS.

Gill-openings of moderate width, not confluent with the skin of the isthmus. No palatine teeth. Barbels eight. Dorsal and pectoral spines; an adipose fin. Ventral with six, anal with few (8–10) rays. 26. AKYSIS.

Gill-openings wide, the membranes confluent with the skin of the isthmus. No teeth on the palate. Barbels eight. Dorsal fin with one spine and six rays. A pectoral spine; an adipose fin; anal rather short. Ventral with six rays. Air-bladder enclosed in bone ..... 27. BAGARIUS.

Gill-openings wide, the membranes confluent with the skin of the isthmus. No teeth on the palate. Barbels eight. Dorsal fin with one spine and six or seven rays; an adipose fin. A pectoral spine. Anal short. Ventral with six rays. An adhesive apparatus formed of longitudinal plaits of skin, situated on the chest between the bases of the pectoral fins. Air-bladder enclosed in bone ..... 28. GLYPTOSTERNUM.

As in last genus but having palatine teeth .. 29. EUGLYPTOSTERNUM.

Gill-openings narrow, the membranes being confluent with the skin of the isthmus. Mouth narrow. Occipital, scapular, and humeral processes well developed. No palatine teeth. Barbels eight. Dorsal and pectoral spines present; an adipose fin. Ventral with six, anal with about ten rays Air-bladder free..... 30. ERETHISTES.

Gill-openings rather narrow, the membranes being confluent with the skin of the isthmus. No teeth on the palate.

Barbels six or eight, the two mandibular pairs arising on a transverse line. Dorsal with one spine and six rays; an adipose fin; a pectoral spine. Anal rather short. Ventral with six rays. Air-bladder enclosed in bone ..... 31. GAGATA.

Gill-membranes not confluent with the skin of the isthmus, or only slightly adherent. No palatine teeth. Barbels eight, the two mandibular pairs not arising on a transverse line. Dorsal fin with one spine and six to eight rays; an adipose fin. Anal rather short. Ventral with six rays. Air-bladder enclosed in bone ..... 32. NANGRA.

First group. HYPOSTOMATINA.

1. Genus SISOR, Hamilton Buchanan.

Branchiostegals four. Gill-openings narrow and mostly lateral, the gill-membranes confluent with the skin of the isthmus. Head and anterior portion of the trunk broad and depressed. Eyes small. Mouth small, transverse, the upper jaw the longer. Nostrils round and approximating, but separated by a valve. One maxillary pair of barbels with broad bases, and about five mandibular pairs. Teeth absent. A short dorsal fin destitute of a distinct spine; pectoral with a strong spine. Ventral having seven rays, and situated below the last portion of the dorsal fin. Upper portion of body covered with bony plates. Anal with six rays. Caudal with its upper ray very prolonged. Air-bladder enclosed in a bony capsule. An axillary pore.

Geographical Distribution. Indus and upper portions of the Jumna and Ganges rivers.

112. (1.) Sisor rhabdophorus. (Fig. 43.)

Sisor rhabdophorus, *Ham. Buch. Fish. Ganges*, pp. 208, 379; *Day, Fish. India*, p. 491, pl. cxv, figs. 1, 1*a*, 1*b* (see synon.).

Chennuah, Hind.; *Kir-ri-dee*, Sind.

B. iv. D. 1/6. P. 1/8. V. 7. A. 6 (2/4). C. 11.

Length of head $5\frac{1}{2}$, of caudal 11, height of body contained 11 times in the total length, excluding the caudal filament, which in some specimens equals the length of the body. *Eyes*—small, nearer the gill-opening than the end of the snout, which is rather pointed. A median longitudinal groove on the head reaches to the base of the occipital process. The greatest width of the head equals two thirds of its length. Numerous rough ridges exist on the head, which is covered by very thin skin. The basal bone of the dorsal fin has an anterior and two lateral processes covered

with rough ridges. Mouth small, transverse, inferior, the upper jaw the longer. *Barbels*—the maxillary reach the pectoral spine, and are dilated at their bases. From the lower lip there is a sort of flap, having a rather long barbel at either side, which reaches the gill-opening; and two more intermediate but shorter ones; between these flaps are several short barbels on a transverse line across the chin. There are five plates on either side of the base of

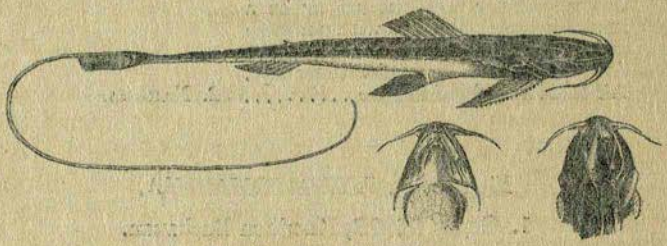

Fig. 43.—*Sisor rhabdophorus.*

the dorsal fin, behind which the back has six elevated scale-like plates along the median line; the last forms a spine before the vertical from the anal fin. The last half of the body is covered by 12 osseous rings, having a sharp edge above and on each side, as is seen in the pipe-fishes. The lateral line has also a series of smaller rough bony plates. *Fins*—dorsal rather higher than long, its first undivided ray weak, and finely serrated anteriorly. Pectoral spine compressed, not quite so long as the head, serrated on both edges, but in general strongly so externally. The ventrals arise under the posterior dorsal rays. The anal commences behind the vertical from the spine on the back. Upper caudal ray with a long prolongation. *Colour*—blackish above, lighter below.

Hab. Indus, Sind, Ganges, and Jumna rivers in Northern India, Bengal, and Behar: the largest I have seen was about 8 inches long, excluding the caudal filament. Not uncommon at Delhi. This fish is only eaten by the lowest and poorest classes. It is said to lie under stones when young.

2. Genus **PSEUDECHENEIS**, Blyth.

Gill-openings small, not extending on to the lower surface of the head, the gill-membranes being attached to a very broad isthmus. Body somewhat elongate; head rather depressed. An adhesive apparatus formed of transverse folds of skin situated on the thorax between the bases of the pectoral fins. Eyes small, subcutaneous, on the upper surface of the head. Mouth transverse, small, inferior. Nostrils on either side approximating, divided by a barbel. Barbels eight, the maxillary pair with broad bases. Teeth villiform in the jaws, palate edentulous. Dorsal

fin with one spine and six rays; the adipose of moderate extent. Pectoral with its inner third vertical, its lower two thirds horizontal, its spine feebly serrated. Ventral horizontal, having six rays, and situated below the dorsal. Caudal emarginate. Air-bladder in rounded lateral portions enclosed in bone.

This genus is evidently adapted for an existence in rapids.

113. (1.) Pseudecheneis sulcatus. (Fig. 44.)

Glyptosternon sulcatus, *McClelland, Cal. Journ. Nat. Hist.* ii, p. 587, pl. vi.

Pseudecheneis sulcatus, *Day, Fish. India*, p. 500, pl. cxvi, fig. 1 (see synon.).

D. 1/6 | 0. P. 1/13. V. 6. A. 11–13 (2–4/7–9). C. 17.

Length of head 7½, of caudal fin 6, height of body 6 in the total length. *Eyes*—small, situated midway between the hind edge of the opercle and the nostrils; the width of the interorbital space 3½ in the length of the head. Lower surface of the head with numerous papillæ, especially near the symphysis. The width of

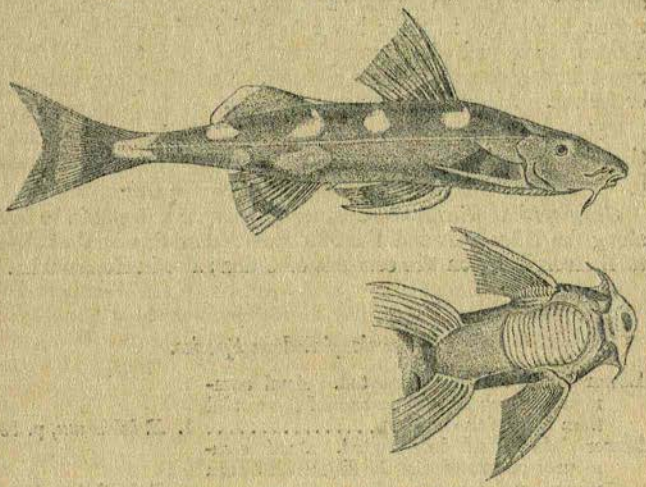

Fig. 44.—*Pseudecheneis sulcatus.*

the head equals its length, *Barbels*—the maxillary pair equal to about one third of the length of the head. *Fins*—spine of anterior dorsal broad, weak, crenulated posteriorly; base of the adipose dorsal as long as the interspace between the two dorsal fins. Pectoral large and extending to above the base or first third of the ventral; pectoral spine broad, finely ctenoid externally in its lower half, crenulated internally, especially in its posterior soft termination.

In some specimens the under surface of the pectoral spine and first ventral ray are striated. Caudal emarginate, lower lobe the longer. The thoracic sucker has about 14 transverse folds. The free portion of the tail about three times as long as deep at its base. *Colour*—blackish, with some large, irregular, yellowish blotches. Fins yellow, with black bands.

Hab. Darjeeling and Khasi hills, attaining 7 to 8 inches in length.

3. Genus **EXOSTOMA**, Blyth.

Syn. *Chimarrichthys*, Sauvage.

Gill-openings narrow, the membranes confluent with the skin of a broad isthmus. Head depressed and covered superiorly with soft skin. No thoracic adhesive apparatus. Mouth inferior, with the lips reflected around the whole or most of its circumference, and usually covered with tubercles. Nostrils close together, separated by a barbel. Eight barbels. Teeth in the jaws in several rows; palate edentulous. Anterior dorsal fin with a rudimentary spine and six rays; adipose fin long and low. Pectorals vertical in their upper, horizontal in their lower half, the spine enclosed in skin. Ventral composed of six rays, inserted some distance behind the rayed dorsal, shaped like the pectoral. Caudal square, emarginate or forked. Air-bladder enclosed in bone.

This peculiar mountain genus has its lips adapted for a sucker, the chest likewise appears to form a flat adhesive surface, bounded by the striated rays of the pectoral and ventral fins.

Geographical Distribution. From the upper waters of the Indus, along the Himalayas and the Mishmee Mountains in East Assam, to Eastern Tibet on the confines of China; also in Tenasserim.

Synopsis of Indian Species.

Lower labial fold uninterrupted. Anal commences much nearer the base of the caudal than that of the ventral ..... 1. *E. labiatum*, p. 108.

Lower labial fold interrupted. Anal commences in last third of the distance between ventral and base of caudal ..... 2. *E. blythii*, p. 109.

Snout more pointed. Caudal forked ..... 3. *E. berdmorei*, p. 109.

Lower labial fold interrupted. Anal commences nearer the base of the ventral than that of the caudal ..... 4. *E. stoliczkæ*, p. 110.

114. (1.) Exostoma labiatum.

Glyptosternon labiatus, *McClell. C. J. N. H.* ii, p. 588.
Exostoma labiatum, *Day, Fish. India*, p. 501 (see synon.).

D. 1/6 | 0. P. 1/11–12. V. 6. A. 1/5. C. 17.

Length of head 5, of pectoral 5, of caudal fin 5, height of body 8 in the total length. *Eyes*—small, situated in the posterior two fifths of the head. Mouth small, inferior, transverse: jaws in the form of a double crescent or ∝-shape. Lips broad, with a median and a lateral lobe on either side, having a barbel between. Nasal barbels reach the end of the snout: the maxillary extend to the pectoral fin. *Fins*—as in the next species. Caudal slightly forked. *Colour*—uniform.

Hab. Mishmi Mountains, East Assam.

115. (2.) Exostoma blythii.

Exostoma blythii, *Day, Fish. India*, p. 501, pl. cxvii, fig. 2.

D. 1/6 | 0. P. 1/17. V. 6. A. 8 (2/6). C. 13.

Length of head $4\frac{3}{4}$, of caudal fin $6\frac{1}{2}$, height of body 5 in the total length. *Eyes*—small, situated on the upper surface of the head: the width of the interorbital space nearly equals the length of the snout, which is broad and depressed. Mouth inferior and transverse, sulcus behind lower lip interrupted. Gill-openings not continued on to the lower surface of the head. *Barbels*—the nasal about three times as long as the orbit; a fleshy appendage to the maxilla having a rudimentary barbel; two pairs behind the lower lip arising on a transverse line. *Teeth*—none on the palate. *Fins*—pectoral subhorizontal, its rays plaited below; base of adipose more than twice as long as that of the rayed fin. Dorsal arising slightly in advance of the ventrals, its spine weak. Ventrals subhorizontal. Caudal with its outer rays slightly produced, rendering it almost lunated. *Air-bladder*—small, in two rounded lobes, both enclosed in a bony capsule. *Colour*—yellowish brown.

Hab. Rivers below Darjeeling; up to at least $3\frac{1}{5}$ inches long.

116. (3.) Exostoma berdmorei.

Exostoma berdmorei, *Blyth, J. A. S. B.* xxix, 1860, p. 155; *Day, Fish. India*, p. 502 (see synon.).

D. 1/6 | 0. P. 1/10. V. 6. A. 6. C. 14.

Maxillary barbels reach the base of the pectoral fin. The snout is much more pointed than in the other species. *Fins*—caudal rather deeply forked. *Colour*—"dingy olive-brown, with obscure dark broad bands, presenting more or less of a clouded appearance: the fins mostly darker, below pale."

Hab. Tenasserim. The typical specimen (4 inches long) in the Calcutta Museum is in such a very bad state of preservation that I am unable to add to Blyth's description.

117. (4.) Exostoma stoliczkæ. (Fig. 45.)

Exostoma stoliczkæ, *Day*, *P. Z. S.* 1870, p. 782, *and Fish. India*, p. 502, pl. cxvii, fig. 3.

D. 1/6 | 0. P. 1/12. V. 6. A. 6. C. 15.

Length of head from 4 in the young to $5\frac{2}{3}$ in the adult, of caudal fin 8, height of body $7\frac{1}{4}$ in the total length. *Eyes*—minute, situated in the middle of the length of the head: the width of the interorbital space equals half the length of the snout, or the distance between the eye and the front nostril. Head depressed, as broad as long, and obtusely rounded. Mouth inferior: lips thick, and studded with small tubercular elevations; the upper and lower lips continuous at the angle of the mouth, but the transverse fold across the lower jaw is interrupted in the middle. Nostrils close together, the anterior round and patent, the posterior tubular; a barbel divides the two nostrils. *Barbels*—the nasal reach the hind edge of the eye; the maxillary have broad basal attachments, and reach the root of the pectoral. Of the mandibular barbels the anterior are situated just behind the inner end of the lower labial fold; they are shorter than the outer pair, which latter extend to the gill-opening. Gill-opening situated on the side of the head in front of and above the base of the pectoral fin. *Teeth*—several rows of pointed ones in each jaw, of which the outer are slightly the larger, rather wide apart, and with rather obtuse summits.

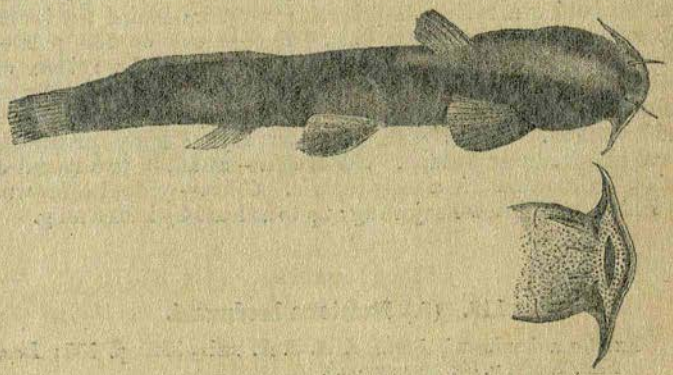

Fig. 45.—*Exostoma stoliczkæ*.

Fins—the dorsal arises midway between the snout and the commencement of the adipose fin; its greatest height is one third more than the length of its base; its spine is rudimentary and enveloped in skin. Adipose dorsal very long and low, posteriorly in some instances it is free, in others it almost appears to decrease in height and join the free portion of the tail. Pectoral nearly as long as the head, having the outer half horizontal and the inner vertical; the spine rudimentary, with a broad, striated, cutaneous

covering. Ventral of a similar form to the pectoral; its first and a portion of its second ray also with a striated cutaneous covering: the fin commences on a vertical line falling just behind the base of the dorsal fin, is rather nearer the snout than the posterior end of the adipose dorsal, and commences midway between the bases of the ventral and caudal fins; it is half higher than long. Caudal cut almost square. Free portion of the tail one half higher than long. *Skin*—tuberculated from the head along the lower surface of the body to nearly as far as the bases of the ventrals. *Colour*—of a dull yellowish green, becoming lightest along the abdomen. Fins yellowish, with dark edges or bands.

Hab. Lek or Ladak, and along the head-waters of the Indus it attains to about 7 inches in length.

Second group. CHACINA.

4. Genus **CHACA**, Cuvier and Valenciennes.

Branchiostegals six to eight. Head large, depressed. Gape of mouth very wide; lower jaw prominent. Gill-openings somewhat contracted, the membranes confluent with the skin of the isthmus. Barbels six *, one maxillary and two mandibular pairs. Teeth villiform in both jaws, palate edentulous. Two rayed dorsal fins, the first having one strong spine and three or four rays, the second confluent with the caudal. Two rayed anal fins, the first with from eight to ten rays, the second somewhat longer and confluent with the caudal. Ventral with six rays, and situated behind the first dorsal. Air-bladder rather large, somewhat cardiform in shape, concave anteriorly, lying across the bodies of the anterior vertebræ and not enclosed in bone. No axillary pore.

Geographical Distribution. Large rivers of Bengal, Assam, and Burma, and sluggish fresh waters in their vicinity. It extends as far as the Malay Archipelago.

118. (1.) **Chaca lophioides.** (Fig. 46.)

Platystacus chaca, *Ham. Buch. Fish. Ganges*, pp. 140, 374, pl. 28, fig. 43.

Chaca lophioides, *Day, Fish. India*, p. 481, pl. cxii, fig. 2 (see synon.).

Coor-cur-riah, Ooriah; *Pémá*, Bhágalpur (Ham. Buch.); *Godir*, Maráthi.

B. vi. D. 1/3-4 | 19-25. P. 1/5. V. 6. A. 8-10 | 8-12. C. 11.

Length of head 3, of caudal fin 6 to 8, height of body 6 in the total length. *Eyes*—small, in the anterior fourth of the head; the width of the interorbital space equals half the length of the head, and along it runs a deep central groove. Head strongly depressed,

* Eight, if there is a nasal pair.

its width equals its length behind the angle of the mouth. Mouth very wide. Head and body in specimens from India having short tentacles, with a ring of them round the eyes, and several along the edge of the lower jaw, but such were not present in a specimen I captured in the Irrawaddy. *Fins*—dorsal spines slightly serrated on both sides, pectoral spine serrated internally. A few tentacles along the lateral line. *Colour*—brownish, marbled darker.

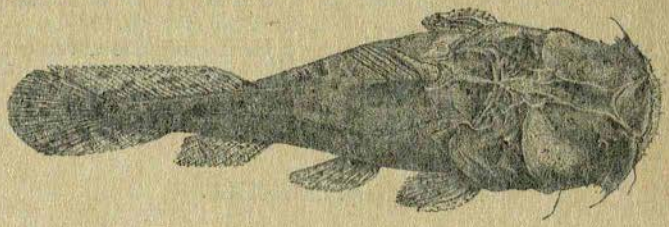

Fig. 46.—*Chaca lophioides.*

Ham. Buchanan observed, "Of all the horrid animals of this tribe the *Chaka* of this district is the most disagreeable to behold. It has the habit of the fishes called by Lacépède *Uranoscope* and *Cottè*, that is, it conceals itself among the mud from which, by its lurid appearance, and a number of loose filamentous substances on its skin, it is scarcely distinguishable, and with an immense open mouth it is ready to seize any small prey that is passing along. In order that it may see what is approaching, the eyes are placed on the crown of the head. All persons turn away from it with loathing."

Hab. Brahmaputra, Ganges, and Irrawaddy rivers, and tanks in connection with them; also some fresh waters of Bombay. This species attains to at least 8 inches in length.

Third group. PLOTOSINA.

5. Genus **PLOTOSUS**, Lacépède.

Syn. *Platystacus*, Bloch; *Copidoglanis*, Günther.

Branchiostegals nine to twelve. Gill-openings wide, the membranes separated by a deep notch, and not being confluent with the skin of the isthmus. Head depressed, covered with thin skin. Eyes with a free circular margin. Nostrils remote from one another. Barbels eight. Teeth conical in the upper, mixed in the lower jaw; molariform on the vomer. Two rayed dorsal fins, the first with one spine and four or five rays; the second many-rayed and confluent with the caudal, as is also the anal. A pectoral spine. Ventral fin many-rayed (12). Air-bladder of moderate size, and not enclosed in bone. A dendritic post-anal apparatus.

Geographical Distribution. From the east coast of Africa through the seas and estuaries of India and Burma to Polynesia and Australia.

Synopsis of Indian Species.

D. 1/5, 2 D+C+A 242-271. Uniform brownish . . 1. *P. canius*, p. 113.
D. 1/4-5, 2 D+C+A 169-190. Brown, with two longitudinal white bands ..... 2. *P. arab*, p. 113.

119. (1.) Plotosus canius. (Fig. 47.)

Plotosus canius, *Ham. Buch. Fish. Ganges*, pp. 142, 374, pl. xv, fig. 44; *Day, Fish. India*, p. 482, pl. cxii, fig. 3 (see synon.).

Irung-kellettee, Tamil; *Nárshinglá*, Maráthi; *Nga khoo khyoung*, Arracan; *Khayoon*, Chittagong.

B. xi–xiii. D. 1/5. 2 D+C+A 242–271. P. 1/10-11. V. 12. Vert. 15/65.

Length of head $4\frac{1}{2}$ to $5\frac{1}{4}$, height of body 7 to $7\frac{3}{4}$ in the total length. *Eyes*—diameter 10 to 11 in the length of the head, the width of the interorbital space $2\frac{1}{2}$ to $2\frac{3}{4}$ in the length of the head. The width of the head equals its length behind the angle of the mouth. *Barbels*—the nasal nearly reach the nape, the maxillary the end of the opercle or base of the pectoral, whilst the outer mandibular pair are slightly longer than the inner. *Fins*—dorsal

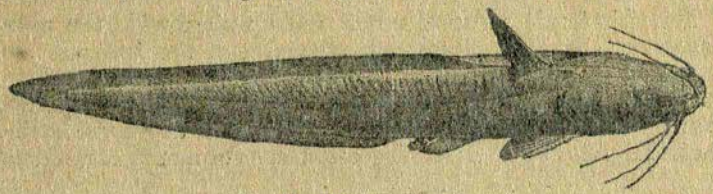

Fig. 47.—*Plotosus canius.*

spine serrated on both edges, and equal to two fifths of the length of the head; pectoral spine similar and equal to one third the length of the head. *Colour*—brown, the vertical fins edged with black.

Bleeker observed that the Malays at Batavia believed the flesh of this fish to possess emmenagogue properties.

Hab. Estuaries of India and Burma to the Malay Archipelago. Attains to 3 feet and upwards in length.

120. (2.) Plotosus arab.

Silurus arab, *Forsk. Descr. Anim.* p. xvi, no. 36.
Plotosus arab, *Day, Fish. India*, p. 483, pl. cxii, fig. 4 (see synon.).

Moorghee, Mal.

B. xi. D. 1/4–5. 2 D+C+A 169–190. P. 1/11. V. 12. Vert. 12/35.

Length of head 5 to $5\frac{1}{2}$, height of body 7 to 8 in the total length. *Eyes*—diameter 5 to $6\frac{1}{2}$ in length of head and situated in the middle of the same; the width of the interorbital space equals one third of the length of the head. Greatest width of the head equal to its length behind the angle of the mouth. Upper jaw

slightly the longer, the width of the gape of the mouth equalling two fifths of the length of the head. *Barbels*—the nasal reach the hind edge of the eyes, the maxillary one half to two thirds as long as the head, the mandibular shorter. *Fins*—dorsal spine rather strong, one third as long as the head and serrated on both sides. *Colour*—chestnut-brown, with two bluish-white longitudinal bands, the superior proceeding from above the eye along the base of the dorsal fin, the inferior from the maxilla along the middle of the side of the body. Bleeker observed that these bands entirely disappear in adults. Vertical fins with black edges.

Wounds from the pectoral spines of this fish are much dreaded by the natives of India and are said to cause severe inflammation or even tetanus.

Hab. From the Red Sea and east coast of Africa through the seas of India to Japan and Polynesia.

Fourth group. CLARIINA.

6. Genus CLARIAS, Gronovius.

Syn. *Macropteronotus*, Lacépède; *Cossyphus* and *Phagorus*, McClelland.

Branchiostegals seven to nine. Gill-openings wide, the membranes not being confluent with the skin of the isthmus, and separated by a deep notch. A dendritic accessory branchial apparatus, attached to the convex side of the second, third, and fourth branchial arches, is received into a recess above and behind the usual gill-cavity. Head depressed, gape of mouth of moderate

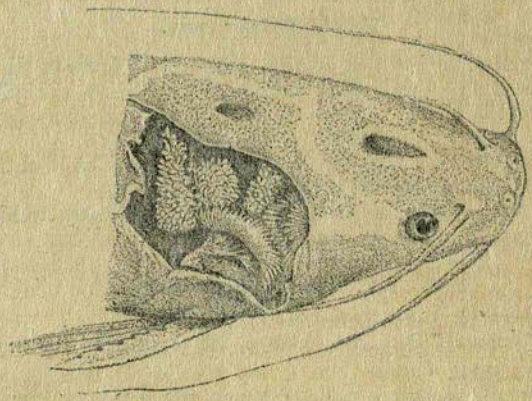

Fig. 48.—*Clarias magur*, showing accessory branchial apparatus.

extent, anterior and transverse. Eyes small, with a free circular margin. Barbels eight. Teeth villiform in the jaws and in a band across the vomer. Dorsal fin long and spineless, extending from the neck to the caudal fin, with which it is continuous: no adipose fin. Ventral with six rays. Pectoral with a spine. Air-bladder small, transverse, lobed, and enclosed in bone.

Mr. Kitchen Parker, F.R.S. (on the shoulder-girdle, Ray Society, 1868, p. 29), observed of the air-bladder and its surroundings in *Clarias* :—"The remarkable trumpet-shaped cavities belong to the atlas and axis vertebræ, and they are strongly attached to the post-temporals and clavicles at their point of junction ; they lodge the lateral cornua of the three-lobed air-bladder. These cavities are very imperfect below ; but this deficiency is largely supplemented by a transverse splint on each side, attached below to the anterior edge of the great cylinder of the atlas. There is a smaller splint in each cavity, and two smaller splints eke out the mouth of each of these trumpets. The large obliquely transverse splints (they are sometimes turned backwards) meet within a line and a half below the centrum of the atlas, between and behind the splints. This and the next centrum are deeply grooved."

Geographical Distribution. Throughout Africa and Western Asia to India, Ceylon, Burma, Siam, the Malay Archipelago, Hong Kong, the Philippines and beyond. These fish being amphibious, live for some time after removal from their native element.

Uses. Considered by the natives of India as exceedingly wholesome and invigorating.

Synopsis of Indian Species.

D. 62–76, A. 45–58. Vomerine teeth villiform. 1. *C. magur*, p. 115.
D. 70–77, A. 53–63. Vomerine teeth obtuse. 2. *C. teysmanni*, p. 116.
D. 69–70, A. 50–59. Pectoral spine externally serrated. Vomerine teeth very obtuse.... 3. *C. dussumieri*, p. 117.
D. 64–68, A. 46–50. Vomerine teeth obtuse and in two pyriform bands..... 4. *C. assamensis*, p. 117.

Macropteronotus jagur of Hamilton Buchanan, Fish. Ganges, pp. 145, 374, appears to be a monstrosity of *Clarias magur*, in which the last few vertebræ have been accidentally lost or removed, and the new caudal fin has become continuous with the dorsal fin superiorly and the anal inferiorly.

121. (1.) Clarias magur. (Figs. 48, 49.)

Macropteronotus magur, *Ham. Buch. Fish. Ganges*, pp. 146, 374, pl. xxvi, fig. 45.
Clarias magur, *Day, Fish. India*, p. 485, pl. cxii, fig. 5 (see synon.).

Kug-ya, Punj. ; *Mah-gur*, Beng. ; *Magurah*, Ooriah ; *Nga-khoo*, Burmese and Mugh. ; "*Māngri*, Patna, and *Monghir*, H. Buch." ; *Marpoo*, Tel.

B. ix. D. 62–76. P. 1/8–11. V. 6. A. 45–58. C. 15–17.

Length of head to end of gill-covers 5⅓, of caudal fin 8¾, height of body 6½ to 7½ in the total length. *Eyes*—diameter 8 in the length of the head, 2 to 2½ diameters from the end of the snout, the width of the interorbital space equals one half the length of the head. The greatest width of the head equals its length.

Upper jaw the longer, the width of the gape of the mouth equals four ninths of the length of the head. Head shagreened superiorly and covered with fine granules. Two depressions on the head, the anterior oblong and situated so that its first fourth is between the eyes; the posterior oval and placed midway between the posterior extremity of the anterior fossa and the end of the occipital process. Occipital process rounded behind, the width of its base

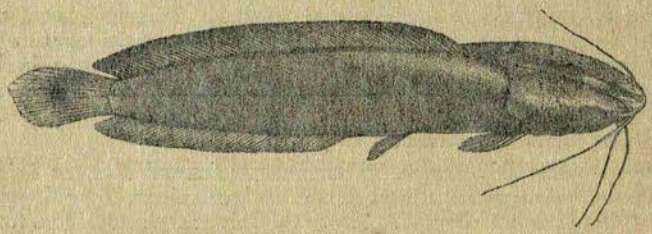

Fig. 49.—*Clarias magur.*

rather above twice its length. *Barbels*—the nasal reach the base of the occipital process; the maxillary the base or middle of the pectoral fin, the mandibular are shorter. *Teeth*—on the vomer villiform, not so fine as those in the jaws and becoming a little blunted with age, they form an uninterrupted band which in its centre is as wide as the premaxillary band or rather narrower. *Fins*—pectoral fin reaching to below the commencement of the dorsal; pectoral spine finely serrated, but covered with skin. Caudal free. *Colour*—dingy green or brownish superiorly, becoming lighter beneath; the vertical fins usually with reddish margins.

Hab. Fresh and brackish waters of the plains of India, Burma, Ceylon, and the Malay Archipelago. This fish lives long after its removal from its native element, being amphibious. It attains at least a foot and a half in length. As food it is deemed highly nourishing.

122. (2.) Clarias teysmanni.

Clarias teysmanni, *Bleeker, Batavia, Nat. Tijdsch.* xiii, p. 344; *Day, Fish. India*, p. 484 (see synon.).

B. ix. D. 70-77. P. 1/7-10. V. 6. A. 53-63. C. 17. Vert. 16/41.

Length of head to end of opercle 5 to $5\frac{1}{2}$, height of body $6\frac{1}{2}$ to $7\frac{1}{2}$ in the total length. *Eyes*—situated in the commencement of the second third of the total length of the head to the end of the occipital process. The greatest width of the head equals its length to hind edge of opercle. Head nearly smooth. Occipital process two thirds as long as wide at its base. *Barbels*—the nasal as long as the head, the maxillary reach the end of the pectoral fin, the mandibular are shorter. *Teeth*—those on the vomer somewhat obtuse, forming a crescentic band which in its centre is about equal in

width to the premaxillary band. *Fins*—the pectoral extends nearly to below the origin of the dorsal; spine of pectoral moderately strong, more than two thirds the length of the fin, rugose or finely serrated along its outer edge, serrated internally. Caudal free. *Colour*—brownish.

Hab. Ceylon and Java.

123. (3.) Clarias dussumieri.

Clarias dussumieri, *Cuv. & Val. H. N. Poiss.* xv, p. 382; *Day, Fish. India*, p. 484 (see synon.).

B. ix. D. 69–70. P. 1/8. V. 6. A. 50–59. C. 16.

Length of head to end of gill-cover 6, of caudal fin 9, height of body 8¾ in the total length. *Eyes*—in the commencement of the front third of the distance between the end of the occipital process and the snout; the width of the interorbital space equal to half the length of the head. The greatest width of the head equals its length; its upper surface finely shagreened and covered with skin; on it are two depressions—the anterior, which is oblong, extends to opposite the front margin of the eyes; the posterior, which is oval, is midway between the posterior end of the anterior depression and that of the occipital process, which last is scarcely produced and 3½ times as wide at its base as it is long. *Barbels*—the nasal reach the hind edge of the eye, the maxillary the base of the pectoral fin, those on the lower jaw are shorter. *Teeth*—those on the palate with globular heads and in an uninterrupted curved band, which is rather wider than that on the premaxillaries. *Fins*—pectoral spine rather strong; its length equals half the distance between the base of the occipital process and the end of the snout; it is rather strongly serrated externally with a few recurved spines near its extremity, more feebly internally, whilst the length of the fin only equals half the distance between its base and that of the ventral, it does not quite reach to below the origin of the dorsal. Caudal distinct from the other vertical fins.

Hab. Malabar and Pondicherry to the Malay Archipelago.

124. (4.) Clarias assamensis.

Clarias assamensis, *Day, Fish. India*, p. 485.

Mah-gur, Assamese.

B. ix. D. 64–68. P. 1/8–11. V. 6. A. 46–50. C. 14.

Length of head to end of opercle 5¾ to 6¼, of caudal fin 8½, height of body 6⅓ to 7 in the total length. *Eyes*—in the commencement of the anterior third of the total length of the head, width of the interorbital space equal to two fifths of the total length of the head. The greatest width of the head equals its length between the snout and the hind edge of the opercle; the width of the gape of the mouth equals one third of the total length of the head. Upper

surface of the head very finely shagreened and covered with thin skin; two depressions on the head—the anterior oblong and reaching forwards to between the middle of the eyes; the posterior oval and commencing midway between the posterior end of the anterior fossa and the end of the occipital process, which latter is rounded, and twice as broad at its base as it is long. *Barbels*—the nasal reach to the base of the occipital process, the maxillary to the end of the pectoral spine, the mandibular are shorter. *Teeth*—those on the vomer globular and arranged in two pyriform bands, the widest end internal and exceeding the width of the premaxillary band. *Fins*—pectoral reaches to below the commencement of the dorsal fin and halfway to the base of the ventral, its spine strong, one third of the total length of the head, rough externally, serrated internally. Ventral reaches anal. Vertical fins not confluent with the caudal. *Colour*—greenish brown, vertical fins edged with red.

This fish appears to take the place of *C. magur* in Assam, and I have procured it from Goalpara and as high as Sadiya. Its teeth distinguish this from other species or possibly varieties.

Hab. Upper and Lower Assam.

Fifth group. SILURINA.

7. Genus **SILURUS**, Artedi.

Syn. *Parasilurus*, pt., Bleeker.

Dorsal profile nearly horizontal; head covered with soft skin. Gill-openings wide, the gill-membranes not confluent with the skin of the isthmus, and deeply notched. Mouth transverse. Eyes without free orbital margins, situated above the level of the angle of the transversely placed mouth. Nostrils remote from one another. Barbels six (*Silurus*, Bleeker); or four (*Parasilurus*, Bleeker); one pair being maxillary, and one or two pairs mandibular. Teeth cardiform or villiform in the jaws, in one or two transverse bands on the vomer, none on the palatines. One very short and spineless first dorsal but no adipose fin; anal terminates close to the caudal, but is not usually continuous with it; ventrals situated posterior to the dorsal, and consisting of eight or more rays. Air-bladder not enclosed in bone.

Geographical Distribution. Eastern Europe, Central and South-eastern Asia. In India and Burma this genus is represented in the ghâts on the Western coast; along the Himalayas from Afghanistan to Darjeeling, also in the hills above Akyab and the Tenasserim provinces, in Cochin China and beyond. These fishes, so far as I know, have not been recorded from waters of the plains of India.

Synopsis of Indian Species.

A. With six barbels. (*Silurus.*)
  A. 58–62. Vomerine band of teeth interrupted. Leaden, shot with purple. 1. *S. wynaadensis*, p. 119.
B. With four barbels. (*Parasilurus.*)
  A. 70–78. Vomerine band of teeth uninterrupted. Purplish brown ..... 2. *S. afghana*, p. 119.
  A. 62–64. Vomerine band of teeth interrupted. Leaden, shot with purple. 3. *S. cochinchinensis*, p. 120.

125. (1.) Silurus wynaadensis. (Fig. 50.)

Silurus wynaadensis, *Day*, *P. Z. S.* 1873, p. 237; *and Fish. India*, p. 480, pl. cxi, fig. 6 (see synon.).

B. xii–xiv. D. 5. P. 1/10. V. 8. A. 58–62 (2/58–60). C. 19.

Length of head 6 to 7, of caudal fin 10, height of body 8 to 8½ in the total length. *Eyes*—small, situated just above the angle of the mouth, from 2½ to 3 diameters from the end of snout, and 5 apart. The greatest width of the head equals its length behind

Fig. 50.—*Silurus wynaadensis.*

the nostrils; lower jaw slightly the shorter and rather elevated in the centre. Width of the gape of the mouth equals the postorbital length of the head. A row of large open pores along the lower jaw and across the cheeks. *Barbels*—the maxillary nearly twice as long as the head, the mandibular pair on each side situated one anterior to the other at a distance equalling one diameter of the orbit, both extend nearly to the base of the pectoral fin. *Teeth*—two oval patches on the vomer divided by a short interspace. *Fins*—dorsal small, situated anterior to the origin of the ventral. Pectoral with a short but strong spine ending in a soft termination. Ventrals reach the origin of the anal, the latter is divided from the rounded caudal by a notch. *Colour*—leaden, becoming purplish beneath and covered all over with small black points; some specimens have a dark finger-mark on the shoulder.

Hab. Wynaad, in a stream about 3000 feet above the level of the sea. Said never to exceed 12 inches in length.

126. (2.) Silurus afghana.

Silurus afghana, *Günther*, *Catal.* v, p. 34; *Day*, *Fish. India*, p. 481, pl. cxii, fig. 1 (see synon.).

D. 2. P. 1/13–14. V. 10. A. 70–78. C. 19.

Length of head 6 to 6½, of caudal fin 9 to 12, height of body 9 to 12 in the total length. *Eyes*—small, situated above and behind the angle of the mouth and in the anterior half of the head; the width of the interorbital space rather exceeds half the length of the head. Upper jaw slightly the longer. *Barbels*—four, the maxillary reach the base of the ventral, the single mandibular pair as long as the head. A single row of six widely separated open glands under the mandible. *Teeth*—in a single uninterrupted horseshoe-shaped band on the vomer. *Fins*—the pectoral as long as the head behind the eyes, rounded, its spine moderately strong, short, entire, and having a soft termination; dorsal fin rudimentary, and in the anterior third of the total length excluding the caudal fin; anal and caudal scarcely united. *Colour*—uniform, purplish black or brown.

Hab. The Himalayas; Griffith is said to have sent this fish from Afghanistan, but some Khasi hill specimens were unfortunately mixed with his Afghan collections. I received several specimens from Dr. Duka, who obtained them at Darjeeling, and Jerdon presented some to the British Museum, the largest of which is about 7·2 inches in length; the locality was not stated, but the specimens probably came from either the Kashmir or Assam regions.

127. (3.) Silurus cochinchinensis.

Silurus cochinchinensis, *Cuv. & Val. H. N. Poiss.* xiv, p. 352; *Day, Fish. India*, p. 481, pl. cxiii, fig. 2 (see synon.).

B. xiv–xv. D. 4. P. 1/11. V. 10. A. 62–64 (2/60–62). C. 17.

Length of head 6 to 6½, of caudal fin 7½, height of body 6½ in the total length. *Eyes*—minute, situated in the commencement of the anterior half of the head, and above the angle of the mouth. Upper jaw slightly the longer. The width of the head equals its length behind the nostrils. *Barbels*—the maxillary about twice the length of the head, the mandibular pair rather shorter than the head. *Teeth*—in two oval spots on the vomer divided by a smooth interspace. *Fins*—dorsal arises before the origin of the ventral. Pectoral with a short but strong and scarcely serrated spine; ventrals extend to the origin of the anal, which last is slightly joined to the caudal, the latter being rounded. *Colour*—leaden, purplish below, and covered all over with minute black points, which sometimes form an irregular finger-mark on the shoulder. Caudal sometimes yellow.

Hab. The hill-ranges above Akyab, Tenasserim, and Cochin China.

8. Genus OLYRA, McClelland.

Syn. *Branchiosteus*, Gill.

Body elongate and low, the dorsal profile nearly horizontal; head depressed and covered above with soft skin. Gill-openings

wide, the gill-membranes not being confluent with the skin of the isthmus, but notched nearly to the chin. Mouth terminal and transverse; jaws of about equal length, or the lower the longer. Nostrils remote from one another, the posterior provided with a barbel. Barbels eight. Eyes small. Villiform teeth in the jaws and on the palate. First dorsal fin without a spine, and with from six to eight rays; adipose dorsal long and low. Anal of moderate length (15 to 23 rays); ventrals inserted below the dorsal and with five or six rays; caudal lanceolate or rounded. Air-bladder not enclosed in bone. Skin smooth.

Gill subdivided the genus into those species which have the jaws subequal in length, the anal with more than 20 rays, and the caudal lanceolate (*Olyra*); and those in which the lower jaw projects, the anal has less than 20 rays, and the caudal is rounded (*Branchiosteus*).

Geographical Distribution. Small fishes from the Khasi hills and British Burma.

Synopsis of Indian Species.

D. 7/0, A. 18–23. Jaws of equal length. Caudal lanceolate ..... 1. *O. longicaudata*, p. 121.

D. 8/0, A. 16. Jaws of equal length. Caudal lanceolate ..... 2. *O. burmanica*, p. 121.

D. 6/0, A. 15. Lower jaw the longer. Caudal rounded ..... 3. *O. laticeps*, p. 122.

128. (1.) Olyra longicaudata.

Olyra longicaudata, *McClelland, Calc. Jour. N. H.* ii, p. 588, pl. xxi, fig. 1; *Day, Fish. India*, p. 475, *and Supplement*, p. 806 (see synon.).

B. vi. D. 7/0. P. 1/4. V. 5. A. 18–23. C. 12.

Length of head 7, height of body 14 in the total length. *Eyes*—behind the angle of the mouth and above its level, small, the diameter of each equal to half the length of the snout; they are two diameters apart. *Barbels*—eight, the maxillary reaching the base of the pectoral fin, the remainder short. *Fins*—rayed dorsal as high as the body, the adipose very low. Pectoral spine strong and serrated, the fin being as long as the ventral, the latter arises below the commencement of the dorsal and nearer the vent than the gill-opening. Anal scarcely so high as the body above it. Caudal lanceolate, its upper rays being prolonged.

Hab. A small species obtained from the Khasi hills and Tenasserim.

129. (2.) Olyra burmanica. (Fig. 51.)

Olyra burmanica, *Day, Fish. India*, p. 475, pl. cxi, fig. 5.

D. 8/0. P. 1/4. V. 7. A. 16 (3/13). C. 17.

Length of head $7\frac{1}{2}$, of caudal fin 3, height of body $7\frac{1}{2}$ in the total length. *Eyes*—small, subcutaneous, and in the anterior half of

the head, above the level of the angle of the mouth. Jaws of nearly equal length, head depressed. Nostrils patent, wide apart, the posterior with a barbel in front of it, the anterior just over the

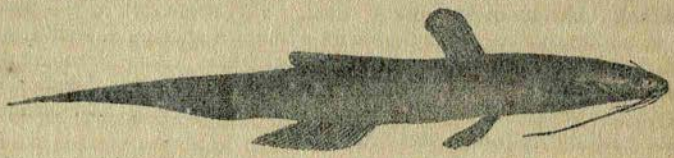

Fig. 51.—*Olyra burmanica.*

snout, but not in front of it. Gill-openings wide, not confluent with the isthmus, and extending laterally to opposite the end of the opercle. *Barbels*—eight, not dilated at their bases, the maxillary the longest, almost extending to the base of the ventral fin, the external mandibular as long as the head. *Teeth*—villiform in both jaws, those in the outer row slightly the longest; in an uninterrupted horseshoe-shaped band across the palate. *Lateral line*—present. Skin smooth. *Air-bladder*—large, thin, and in the abdominal cavity. *Fins*—dorsal without any spine, its first ray the shortest, it arises opposite the ventral; adipose dorsal very low and long. Pectoral spine rather strong, slightly serrated externally, coarsely so internally, the fin only extends halfway to the ventral. The anal rays increase in length to the last. Caudal with its central rays strongest and elongated, making the fin one third of the total length. *Colour*—dark brown.

Hab. Pegu Yoma or Mountains.

130. (3.) Olyra laticeps.

Olyra laticeps, *McClelland, Calc. Jour. N. H.* ii, p. 588, pl. xxi, fig. 2; *Day, Fish. India*, p. 475 (see synon.).

B. xiii. D. 6/0. P. 1/9. V. 7 (6?). A. 15. C. 18.

Eyes—small and vertical. Head much depressed at the snout. Lower jaw longer than the upper. Six or eight slender barbels. *Teeth*—villiform in the jaws, palate edentulous. *Fins*—the anal rays gradually increase in length from the commencement of the fin. Caudal entire.

Hab. Khasi hills.

9. Genus **AMBLYCEPS**, Blyth.

Branchiostegals twelve. Gill-openings wide, the gill-membranes not confluent with the skin of the isthmus, notched as far forwards as the chin. No thoracic adhesive surface. Head covered with soft skin. Eyes small, subcutaneous. Mouth anterior; gape wide. Nostrils close together, the posterior having a barbel. Teeth in jaws villiform; palate edentulous. Anterior dorsal fin enveloped

in skin, having one spine and six rays. Pectoral with a concealed spine. Ventral with six rays, inserted behind the vertical from the posterior margin of the rayed dorsal. Anal rather short (9 to 12 rays). Caudal forked. Air-bladder almost entirely enclosed in bone. No axillary pore.

Geographical Distribution. Small fishes inhabiting the fresh waters of India and Burma, usually on or near hills. Griffith observed (Cal. Journ. N. Hist. ii, p. 564) respecting certain fish from the Mydan valley in Afghanistan, "the most remarkable fish is a dark-coloured loach-like *Silurus*, which is not uncommon about Julraiz."

I have a large series of this fish, and they show such diversities that it appears to me that all are varieties of one species.

131. (1.) Amblyceps mangois. (Fig. 52.)

Pimelodus mangois, *Ham. Buch. Fish. Ganges*, pp. 199, 379.
Amblyceps mangois, *Day, Fish. India*, p. 490, pl. cii, fig. 6, and pl. cxvii, fig. 1 (see synon.).

Billi, "a cat," and *Sudaal*, Punj.

B. xii. D. 1/6 | 0. P. 1/7. V. 6. A. 9–12 (2–3/7–9). C. 19. Vert. 12/23.

Length of head 6¼, of caudal fin 6, height of body 7 to 9 in the total length. *Eyes*—small, situated in the anterior two fifths of the head. Mouth wide, lower jaw somewhat the longer. *Barbels*—nasal as long as the head, and equalling the internal mandibular

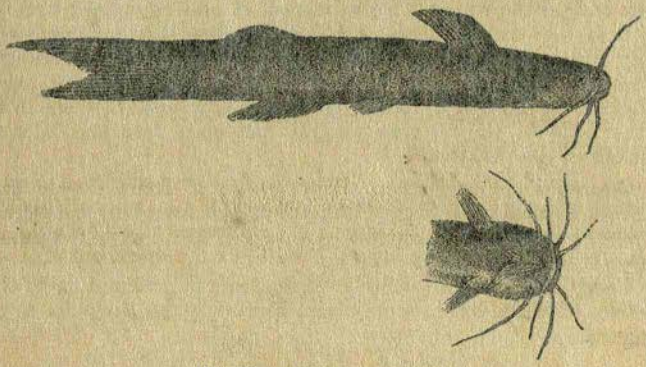

Fig. 52.—*Amblyceps mangois.*

pair, the maxillary reach the end of the pectoral spine, while the outer mandibular are not quite so long. *Fins*—dorsal not so high as the body, and situated in the commencement of the second fifth of its total length, dorsal spine about half as high as the rays; the latter are partly enveloped in skin, as are also those of the

anal. Adipose dorsal low, the length of its base equalling that of the rayed fin, and two thirds of the interspace between the two fins. Pectoral scarcely extending halfway to the base of the ventral, which latter does not reach the anal. Caudal deeply forked, its upper lobe the longer. Caudal peduncle as high as long. *Lateral line*—absent. *Air-bladder*—has a small rounded lobe on either side of the body of the second vertebra, and all but a small portion of its front surface enclosed in bone. *Colour*—olive-brown, lightest beneath. In some a dark line commences opposite the opercles and soon subdivides—one branch going to the centre of the base of the caudal, the other to the base of the anal.

Hab. The Himalayas; found in the Jumna for some considerable distance from the hills, also through Burma to Moulmein. This fish does not appear to exceed 5 inches in length. When captured it bites most viciously, and lives for some time after its removal from the water.

10. Genus **SACCOBRANCHUS**, Cuvier and Valenciennes.

Syn. *Heteropneustes*, Müller.

Branchiostegals seven. Gill-openings wide, the membranes not being confluent with the skin of the isthmus, and separated by a deep notch. Gill-cavity having an accessory posterior sac, which extends backwards on either side of the neural spines amongst the muscles of the abdominal and part of the caudal region. Head depressed, covered with very thin skin; mouth transverse. Eyes with a free circular margin. Barbels eight. Teeth present in the jaws and on the vomer. Dorsal fin short and spineless; ventral with six rays situated under the dorsal. Anal long and confluent with the caudal or separated from it by a notch. Air-bladder placed transversely across the bodies of the anterior vertebræ, where it is enclosed by bone; two ducts pass upwards, one from either side of the air-vessel, unite, and open into the inferior surface of the pharynx.

Geographical Distribution. Fresh waters of India, Ceylon, and Burma, extending to Cochin China, but not found in the Malay Archipelago. Fishes of this genus can live long after their removal from the water.

Uses. Considered exceedingly wholesome and invigorating by the natives of India, but in some places deemed by the Brahmins to be impure.

Synopsis of Indian Species.

Anal fin united to the caudal. D. 8, A. 70.
Eyes small ..... 1. *S. microps*, p. 125.
Anal fin separated from the caudal by a notch.
D. 6–8, A. 60–79 ..... 2. *S. fossilis*, p. 125.

132. (1.) Saccobranchus microps.

Saccobranchus microps, *Günther, Catal.* v, p. 31; *Day, Fish. India,* p. 486.

D. 8. P. 1/6. A. 70.

Length of head $7\frac{1}{2}$, height of body 8 in the total length. *Eyes*—much smaller than in *S. fossilis*, and less than one third the length of the snout. *Barbels*—the nasal reach the end of the pectoral, the maxillary the root of the ventral fin. *Teeth*—the vomerine band is interrupted in its centre. *Fins*—origin of the dorsal is two sevenths of the length (excluding the caudal fin) from the end of the snout. Pectoral spine feebly serrated, two thirds as long as head. Ventral fin reaching the anal, which last is united with the caudal. *Colour*—brown.

Hab. Ceylon, growing to 6 inches in length.

133. (2.) Saccobranchus fossilis. (Fig. 53.)

Silurus fossilis, *Bloch, Ich.* t. 370, fig. 2.

Saccobranchus fossilis, *Day, Fish. India,* p. 486, pl. cxiv, fig. 1 (see synon.).

Bitchu ka mutchee and *Singi*, Hind.; *Singee* and *Sheen-ee*, Assam. *Thay-lee*, Tam.; *Mar-pu*, Tel.; *Singee*, Ooriah, Beng. and N.W. Prov.; *Nga-gyee* and *Nga-khoo*, Burmese and Mugh.; *Lahoord* (young), *Nulhe* (adult), Punj.; *Kahree-meen*, Mal.; *Lo-har*, Sind.; (*Kamacha singgi*, Bhāgálpūr, H. B.).

B. vii. D. 6-7. P. 1/7. V. 6. A. 60-79. C. 19.

Length of head from $5\frac{1}{2}$ to 7, of caudal fin from about 9 to 14, height of body (greatly depending upon food or season) from 5 to 8 in the total length. The width of the head equals its length, and that of the gape of the mouth is contained $2\frac{1}{4}$ to $2\frac{1}{2}$ times in the length of the head. *Eyes*—from 2 to 3 diameters from end of snout. *Barbels*—the maxillary extend to the middle of the pectoral,

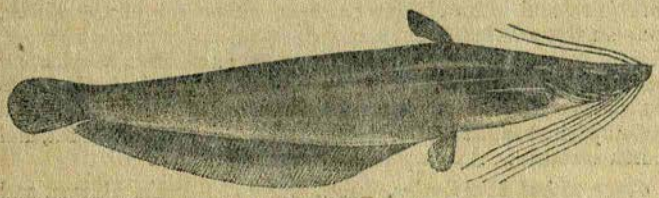

Fig. 53.—*Saccobranchus fossilis.*

or even the commencement of the ventral fins. *Teeth*—those on the vomer in a pyriform patch on either side, converging anteriorly, widely divergent posteriorly. *Fins*—the dorsal commences rather before the anterior third of the body; the ventrals reach to the third or fourth anal ray or just to the origin of that fin. Pectoral spine serrated internally, it usually has a few serrations externally at its anterior end; it is from two thirds to

three fourths as long as the head. Anal and caudal separated by a more or less distinct notch. *Colour*—leaden, sometimes with two longitudinal yellowish bands. The young are occasionally reddish.

Wounds from the pectoral spine of this fish are dreaded in India, as they are reputed to be very poisonous, even occasioning tetanus. As soon as captured, the offensive spine is broken off by blows with a stake, consequently it is difficult to procure large and perfect specimens. Fishermen dread this fish so much that they would prefer cutting the meshes of their nets and allowing it to escape than endeavour to remove it uninjured. As food the flesh is esteemed for its invigorating qualities, and tanks are frequently stocked with these fishes during the rainy season. When food is plentiful they fatten well; if the reverse they become lanky, thus altering the comparative height of the body to that of its length.

In a specimen captured at Bezwada, September 12th, 1868, the ova were fully developed; the colour of the eggs was of a pea-green.

Hab. Fresh waters of Sind, India, Ceylon, Burma, and Cochin China; attaining a foot or more in length.

11. Genus **WALLAGO**, Bleeker.

Branchiostegals from fifteen to twenty-one. Gill-openings wide, the membrane not being confluent with the skin of the isthmus, and being rather deeply notched. Body elongated and compressed, the dorsal profile being nearly straight. Head covered with soft skin. Cleft of mouth deep, extending to below or even behind the eyes. Snout rather produced; lower jaw a little the longer. Nostrils some distance apart, the posterior small and patent, the anterior slightly tubular. Barbels four, one maxillary and one mandibular pair. Eyes above the level of the angle of the mouth, and not covered with skin. Teeth numerous and cardiform in both jaws, and in an oblique patch on either side of the vomer, none on the palatines. A short spineless dorsal, situated above or slightly before the ventrals; no adipose fin; anal long, terminating near the caudal, which last consists of two rounded lobes. Ventrals with from eight to eleven rays. Air-bladder heart-shaped, situated in the abdomen, and attached to the bodies of the second, third, and fourth vertebræ. Axillary pore, if present, minute.

Geographical Distribution. Fresh waters of India, Burma, and the East Indian Archipelago.

Uses. Good eating: thrives well in tanks, especially if they have grassy margins; but it destroys vast numbers of other fish.

134. (1.) Wallago attu. (Fig. 54.)

Silurus attu, *Bl. Schn. Syst. Ich.* p. 378, t. 75.

Wallago attu, *Day, Fish. India*, p. 479, pl. cxi, fig. 4 (see synon.).

Wak-lah, Mal. and Tam.; *Mul-la* and *Pi-i-kee* and *Jer-i-kee*, Sind.;

Boyari, Beng.; *Shivada* and *Pari*, Marâthi; *Boalli*, Oriah; *Loil*, Chittagong; *Nya bat*, Burmese.

B. xix–xxi. D. 5. P. 1/13–15. V. 8–10. A. 86–93 (4/82–89). C. 17. Vert. 13/56.

Length of head 5 to 5½, of caudal fin 9, height of body 6½ in the total length. *Eyes*—with free lids, diameter two fifteenths of length of head, 2 diameters from end of snout. Width of head rather less than its length, and half its height. Snout rather produced. Cleft of mouth extending to about 1 diameter behind the orbit, the lower jaw being slightly the longer. *Barbels*—the maxillary twice as long as the head, mandibular as long as the

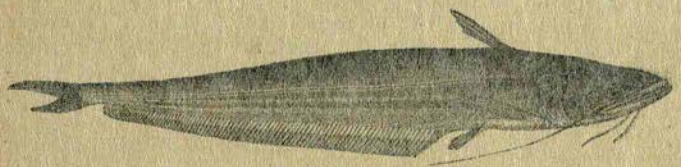

Fig. 54.—*Wallago attu.*

snout. *Teeth*—generic. *Fins*—the dorsal nearly as long as the pectoral, which last equals in length the depth of the cleft of the mouth. Pectoral spine finely serrated internally. Anal not confluent with the caudal, which last consists of two lobes. *Air-bladder*—of moderate size, somewhat heart-shaped, situated in the front portion of the abdomen, and attached to the anterior vertebræ. *Colour*—uniform, fins sometimes covered with fine dots.

Hab. Fresh waters throughout India, Ceylon, and Burma, and sometimes, according to Col. Tickell, within tidal influence. Attains at least six feet in length, and is good eating, but is a voracious and not very cleanly feeder, said to mostly feed at night time.

12. Genus **EUTROPIICHTHYS**, Bleeker.

Branchiostegals eleven. Gill-openings wide, the membranes not being confluent with the skin of the isthmus, but separated by a deep notch. Body and head compressed. Head covered with soft skin. Eyes with broad adipose lids. Cleft of mouth deep, extending to below the eyes; upper jaw slightly the longer. Nostrils wide and patent, the anterior and outer one being at the side of the snout. Eight barbels. Teeth in jaws sharp; and in a broad band across the vomer and palatines. First dorsal short, having one spine and seven rays; the adipose short. Pectoral with a spine. Ventral with six rays, and situated below the rayed dorsal. Anal long (47–50 rays). Caudal forked. Air-bladder externally protected by bone. No axillary pore.

135. (1.) Eutropiichthys vacha. (Fig. 55.)

Pimelodus vacha, *Ham. Buch. Fish. Gang.* pp. 196, 378, pl. 19, fig. 64.
Eutropiichthys vacha, *Day, Fish. India*, p. 490, pl. cxiv, fig. 6 (see synon.).

Butchua and *Nandi butchua*, Ooriah; *Chel-lee*, Sind.; *Nee-much*, N.W. Prov.; *Váchá*, Beng.; *Nga-myen-kouban*, *Katha-boung*, and *Nga-myee-ying*, Burmese.

B. xi. D. 1/7 | 0. P. 1/13-16. V. 6. A. 3-4/41-47. C. 17.

Length of head 5½ to 5¾, of caudal fin 5, height of body 5 to 5½ in the total length. *Eyes*—with broad adipose lids, diameter 3½ to 3¾ in the length of the head, 1 diameter from the end of snout, and 1 to 1¼ apart. Width of the head equals its length behind the middle of the eyes. Cleft of mouth rather oblique, its extent being one fourth more than the width of the gape; the angle situated under the middle or hind third of the eyes; snout compressed and pointed, the upper jaw being slightly the longer. *Barbels*—the nasal pair reaching to the hind edge of the head or even slightly further; maxillary ones to the end of preopercle, or they may be even as long as the head; the mandibular ones, which

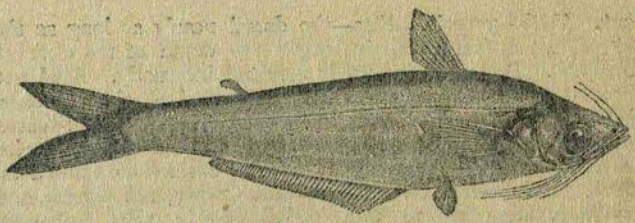

Fig. 55.—*Eutropiichthys vacha.*

arise on a transverse line across the chin, are rather shorter. *Teeth*—sharp in the jaws, in a pyriform band on the palatines, the latter with those on the vomer forming an uninterrupted band, that nearly touches the band on the upper jaw. *Fins*—dorsal spine thin, serrated posteriorly, and usually as long as the head, excluding the snout. Pectoral fin reaching the base of the ventral; pectoral spine rough externally, serrated internally, and as long as that of the dorsal. Ventral situated under the posterior dorsal rays, and only extending halfway to the anal. Free portion of the tail as high as long. *Colour*—silvery, greyish along the back; pectoral and caudal usually edged with black.

Variety *Eutropiichthys burmannicus* has A. 4/55, and its nasal barbels almost reach to the dorsal fin, the maxillary to the middle of the pectoral spine, whilst all the others are longer than the head. The pectoral spine is serrated externally, and reaches the anal fin.

Hab. From the Punjab through the large rivers of Sind, Bengal, and Orissa, and variety *E. burmannicus* in Burma. This species attains upwards of a foot in length. It is good eating.

13. Genus CALLICHROUS, Hamilton Buchanan.

Syn. *Ompok*, Lacép.; *Kryptopterus*, *Kryptopterichthys*, *Micronema*, *Phlacronotus*, *Hemisilurus*, *Silurodes*, *Pseudosilurus*, and *Silurichthys*, Bleeker; *Pterocryptis*, Peters.

Branchiostegals twelve to fifteen. Gill-openings wide; the membranes not confluent with the skin of the isthmus, deeply notched and overlapping. Head covered with skin. Cleft of mouth oblique, not extending so far as the front of the eyes; the lower jaw the longer. Eyes subcutaneous, situated behind and opposite the angle of the mouth, lateral or sometimes partially on the lower surface of the head. Barbels four or two, one pair maxillary, and some distance behind the symphysis a mandibular pair, the latter sometimes being rudimentary or even absent. Nostrils remote from one another. Teeth villiform in the jaws, in an uninterrupted (*Silurodes*, Bleeker) or interrupted (*Callichrous*, Bleeker) band on the vomer, none on the palatines. Dorsal fin spineless, short, rudimentary, or absent, when present anterior to the ventrals; no adipose fin. Pectoral with a spine. Anal long, continuous with (*Pterocryptis*, Peters) or terminating close to the caudal, the latter being forked, emarginate or rounded. Ventral with eight to ten rays. Air-bladder rather small, attached to the lower surfaces of the second to the fourth vertebræ, and not enclosed in bone. No axillary pore.

Geographical Distribution. Sind, India, Ceylon, Burma, through Siam, to the Malay Archipelago and China.

Uses. Although rarely exceeding a foot in length, these fishes are usually excellent as food, and from their quality have been termed "Butter-fish" by Europeans in Bengal, and are generally known as "*Puffta*," Hind.

Synopsis of Indian Species.

A. Anal fin united to the caudal.	
Teeth on the palate in an uninterrupted band. D. 2, A. 75. Maxillary barbels not quite so long as the head	1. *C. gangeticus*, p. 130.
Vomerine teeth in two separate patches. D. 4, A. 47. Maxillary barbels reach middle of pectoral fin	2. *C. sindensis*, p. 130.
B. Anal fin distinct from the caudal.	
A. 60–75, V. 8. Maxillary barbels reach ventral fin. Pectoral not so long as head, spine smooth or serrated ..	3. *C. bimaculatus*, p. 131.
A. 66–71, V. 9–10. Maxillary barbels shorter than the head. Pectoral spine feebly serrated	4. *C. pabo*, p. 132.
A. 69–73, V. 8. Eyes large. Maxillary barbels reach middle of fish. Pectoral fin reaches fourth or fifth anal ray	5. *C. macrophthalmus*, p. 132.

A. 61-69, V. 8. Maxillary barbels reach anal fin; of a purplish-brown colour ..... 6. *C. malabaricus*, p. 133.

A. 54-60, V. 8. Maxillary barbels reach middle or end of pectoral fin. 7. *C. pabda*, p. 133.

136. (1.) Callichrous gangeticus.

Pterocryptis gangetica, *Peters, MB. Ak. Berl.* 1861, p. 712.
Callichrous gangeticus, *Day, Fish. India*, p. 476 (see synon.).

B. xii. D. 2. P. 1/12. V. 10. A. 75.

Length of head nearly one seventh, height of body two nineteenths of the total length. Maxillary barbels do not quite reach the pectorals, whilst the mandibular ones reach the edge of the gill-membrane. Vomerine teeth in an uninterrupted band. *Fins*—pectoral spine feebly serrated; anal united with the caudal.

Hab. Ganges. I have not procured this species in India, my nearest approach to it being *C. sindensis*.

137. (2.) Callichrous sindensis. (Fig. 56.)

Callichrous sindensis, *Day, Fish. India*, p. 476, pl. cx, fig. 1.

B. xii. D. 4. P. 1/12. V. 8. A. 47 (2/45). C. 13.

Length of head $4\frac{3}{4}$, of caudal fin 7, height of body $4\frac{2}{3}$ in the total length. *Eyes*—diameter $4\frac{1}{2}$ in the length of head, 1 diameter from end of snout, and 2 apart. The dorsal profile rather elevated, and a little concave over the orbits. The greatest width of the head equals its height, or its length excluding the snout. Cleft of mouth very oblique, the lower jaw prominent, and the eye situated rather

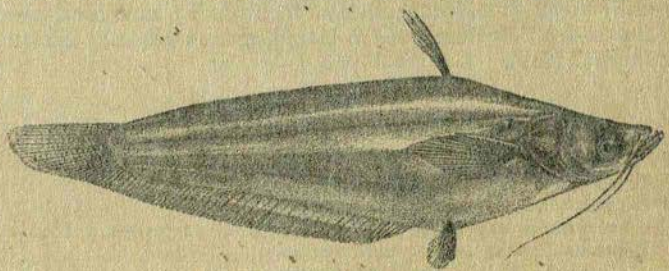

Fig. 56.—*Callichrous sindensis.*

above the angle of the mouth. *Barbels*—the maxillary reach to the middle of the pectoral fin; the mandibular are thin and nearly half as long as the head. *Teeth*—in two small oval patches on the vomer not confluent in the median line. *Fins*—dorsal narrow at its base. Pectoral spine as long as the head behind the middle of the eyes and finely serrated internally; the fin reaches to nearly above the commencement of the anal. Ventral reaches the first anal ray. Anal united to the caudal. *Colour*—silvery, with a black spot behind the gill-opening and above the base of the pectoral fin; body and fins with numerous cloudy dark markings.

Hab. Sind from the Indus.

138. (3.) Callichrous bimaculatus. (Fig. 57.)

Silurus bimaculatus, *Bloch, Ich.* t. 364.
Callichrous bimaculatus, *Day, Fish. India,* p. 476, pl. cx, figs. 4 & 5 (see synon.).

Dúka-dúmá, Tel.; *Godla,* Canarese; *Dimmon,* Sind.; *Chotah-* or *Chéla-wahlah,* Tam.; *Poh-tah,* Ooriah; *Puh-boh,* Assam.; *Pufta, Goongwah,* and *Pallu,* Punj.; *Goong-wah-ree* and *Puf-ta,* N.W. Provinces; *Gugli,* Maráthi; *Kanee rabda,* Beng.; *Nga noothan,* Burmese.

B. xii. D. 4. P. 1/13. V. 8. A. 60–75 (2–3/58–72). C. 17.

Length of head 5 to 7, of caudal fin $6\frac{2}{3}$ to 7, height of body $5\frac{1}{3}$ to $5\frac{1}{2}$ in the total length. *Eyes*—situated opposite the angle of the mouth; diameter 4 to $5\frac{1}{3}$ in the length of the head, 1 to $1\frac{2}{3}$ diameters from the end of snout, and $2\frac{1}{4}$ to $3\frac{2}{3}$ apart. The greatest width of the head equals its length behind the angle of the mouth. The lower jaw very prominent, the width of the gape of the mouth equals the postorbital length of the head or its length to behind the middle of the eyes. *Barbels*—the maxillary pair reach the middle of the pectoral or the commencement of the anal. *Teeth*—in two small oval patches, one on either side of the vomer, and not continuous. *Fins*—dorsal arises in the commencement of the second two sevenths of the body, it is narrow and two thirds as high

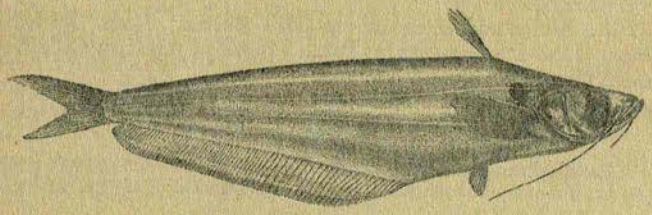

Fig. 57.—*Callichrous bimaculatus.*

as the body. Pectoral as long as the head behind the angle of the mouth, its spine of moderate strength, as long as the head behind the middle of the eyes, and strongly or feebly serrated on the inner side, or even entire. Anal ceases close to, but is not continuous with, the forked caudal. *Colour*—silvery shot with purple, a black spot on the shoulder behind the gill-opening and above the middle of the pectoral fin; in some specimens this black spot is much better defined than in others. Occasionally the caudal fin is tipped with black.

The character of the pectoral spine, whether smooth * or serrated, is not a specific distinction.

Hab. The fresh waters of Sind, and from the Punjab throughout India, Ceylon, and Assam to the Malay Archipelago and beyond. Sometimes observed in Burma, according to Col. Tickell, within tidal influence. Attains at least a foot and a half in length.

* At Trichinopoly I opened eight specimens having entire pectoral spines; all were females, one had 47,844 eggs.

139. (4.) Callichrous pabo.

Silurus pabo, *Ham. Buch. Fish. Ganges*, pp. 153, 375, pl. 22, fig. 48.
Callichrous pabo, *Day, Fish. India*, p. 477, pl. cx, fig. 6 (see synon.).

B. xii. D. 5. P. 1/14. V. 9–10. A. 66–71 (3/63–66). C. 17.

Length of head 5 to 5¼, of caudal fin 8½, height of body 5 to 5½ in the total length. *Eyes*—diameter 4 to 4½ in the length of the head, 1¾ diameters from the end of snout, and 2½ apart. The greatest width of the head equals its length behind the middle of the eyes. The lower jaw slightly in advance of the upper; the width of the gape of the mouth equals half the length of the head. *Barbels*—the maxillary reach the hind edge of the eye or a little further; the mandibular are fine and short. *Teeth*—in two short transverse patches rather distant from one another in the median line. *Fins*—the dorsal situated in the commencement of the second third of the length of the body. Pectoral fin as long as the head behind the angle of the mouth, the spine feebly serrated (entire in Burma) and half as long as the head. Ventral with ten rays in India, nine in Burma. *Colour*—silvery, with a badly marked shoulder-spot.

I found in Burma a variety of this fish, clouded all over with fine dark spots; it had black tips to the caudal lobes, and nine ventral rays.

Hab. Jumna and Ganges rivers, also Burma. Ham. Buchanan observed that it was termed at Patna *Támbúlíyá páptá*, or *Callichrous* resembling a betel-leaf.

140. (5.) Callichrous macrophthalmus.

Pseudosilurus macrophthalmos, *Blyth, J. A. S. B.* xxix, 1860, p. 156.
Callichrous macrophthalmus, *Day, Fish. India*, p. 478, pl. cx, figs. 2 & 3 (see synon.).

B. xv. D. 4. P. 1/12–15. V. 8. A. 69–73 (2–3/66–70). C. 18.

Length of head 5½ to 6, of caudal fin 6 to 7, height of body 5 to 6 in the total length. *Eyes*—diameter 3¾ to 4 in the length of head, 1 to 1½ diameters from end of snout, and 2 to 2¼ apart. The greatest width of the head equals its length excluding the snout. Cleft of the mouth descends to opposite the upper third of the eye; the width of the gape equals one half to four ninths of the length of the head. *Barbels*—the maxillary pair reach to opposite the eighth or tenth anal ray; the mandibular are nearly one half the length of the head. *Teeth*—in a very narrow oblong patch on either side of the vomer, and not continuous in the median line. *Fins*—the dorsal half as high as the body, narrow (especially in Madras specimens), and situated in the commencement of the second third of the length of the fish excluding the snout. Ventrals equal 1½ diameters of the eye. Anal not united to the caudal, the latter deeply forked. *Colour*—silvery, a dark round shoulder-spot over the middle of the pectoral spine;