THE FAUNA OF BRITISH INDIA,

INCLUDING

CEYLON AND BURMA.

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FISHES.—Vol. I.

BY

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INTRODUCTION.

The present work is chiefly an abridgment of the author's 'Fishes of India,' published in 1876–78. Several additions and alterations have been made, most of which were published in 1888, in a Supplement to the work just mentioned. The synonymy, having been already quoted in full, has not been repeated in these volumes, but under each species will be found a reference to the original specific description, and to the page in the 'Fishes of India' where full details are given. The illustrations in the present work are, with very few exceptions, copies of those in the 'Fishes of India.'

The state of Dr. Day's health has unfortunately prevented him from correcting the proofs of the present publication beyond the middle of the first volume, and it is probable that some mistakes or omissions may have escaped detection in consequence. The manuscript of the work had been prepared before the author's health gave way; but some additional compression was required, and this the editor has carried out to the best of his ability.

The limits of the area of which the freshwater fauna is here

described have been already defined in the Introduction to the volume of Mammals belonging to the same series ('The Fauna of British India'), and are those of British India and its dependencies, such as Burma, the Andaman and Nicobar Islands, Manipur, Nepal, Kashmir, Baluchistan, &c., together with Ceylon. The marine fishes included are all known to inhabit the seas around British India.

ABBREVIATIONS.

I. FINS.

D.—Dorsal: the fin or fins along the back. The numerals following the letter in this and other fins indicate the number of fin-rays of various kinds. Numerals separated by a *horizontal* line signify variation in the number; an *oblique* line indicates a distinction into two different kinds of rays, the anterior being generally spines or unbranched rays, the posterior branched rays; a *vertical* line implies that the numbers on the two sides of it refer to two distinct dorsal fins. The first number or numbers refer to anterior fins or rays.

Thus D. 7–8 | 1/10–12 means that there are two dorsal fins, the first consisting of 7 or 8 rays all of one kind (probably spines), the second of one ray at the commencement, or anterior end, of the fin of one kind (spine), followed by from 10 to 12 rays of another kind (branched rays).

A.—Anal: the fin (occasionally, but not often, more than one) along the lower border of the body behind the vent. This, like the dorsal, is often composed partly of unbranched rays or spines, partly of branched rays.

C.—Caudal: the fin at the end of the tail.

The above are known as *vertical fins*.

P.—Pectoral fins, one on each side, inserted immediately behind the gill-opening. They are homologous with the fore limbs in other Vertebrata.

V.—Ventral fins, one on each side, very rarely united, inserted lower on the body than the pectoral fins, and known as *abdominal* if situated

behind the pectorals, *thoracic* if below them, *jugular* if before them in position. The ventrals correspond to the hind limbs of Batrachians, Reptiles, Birds, and Mammals.

The ventrals and pectorals are called *paired* or *horizontal fins*.

II. OTHER PARTS OF THE BODY.

B.—Branchiostegal rays (see cut of Perch's head on p. vii). Bony rays supporting the membrane within the gill-cover that serves to close the gill-opening. They are attached to the lower portion of the hyoid arch.

L. l.—Lateral line: a series of perforated scales running along each side in most Teleostean fishes, and generally conspicuous. The numeral represents the number of scales in the lateral line; two numerals with a horizontal line between represent the known extremes of variation: thus L. l. 50–55 means that the number of scales on the lateral line is known to vary from fifty to fifty-five.

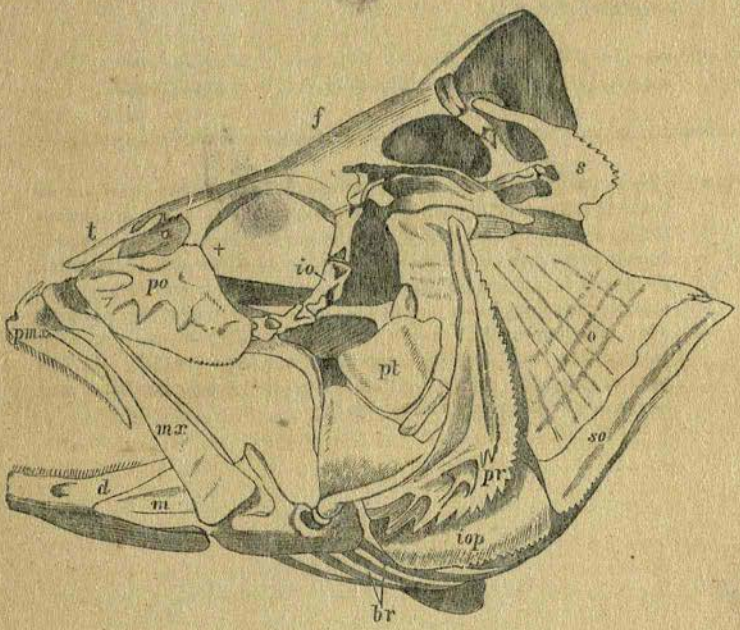
L. r.—The number of transverse rows of scales between the head and caudal fin. When two numerals are given, thus 88/66, the first represents the number of scales above the lateral line, the second that below. When three numbers are given, as 50/48/45, the second figure enumerates the scales on the lateral line, the first those above, and the third those below.

L. tr.—The number of longitudinal rows of scales between the back and abdomen, usually counted, unless some other part of the side is specified, from the anterior end of the dorsal fin to the ventral.

Cæc. pyl. *or* C. p.—Pyloric cæca or pyloric appendages; sacs attached to the duodenum. They may be seen, on opening a fish, just beyond the pyloric end of the stomach.

Vert.—Vertebræ. The first numeral signifies abdominal, the second caudal vertebræ. Thus Vert. 10/14 implies 10 abdominal vertebræ, 14 caudal. The abdominal vertebræ are those between the head and the point of suspension of the anal fin; the majority support ribs, and in none do the parapophyses or processes, one attached low down on each side, unite below to form a hæmal spine. The caudal vertebræ have a hæmal spine below corresponding to the neural spine above.

The terms applied to the head-bones are largely used in descriptions of Acanthopterygians. The accompanying woodcut, representing the skeleton of a Perch's head, and copied from Cuvier and Valenciennes's great work on Fishes, shows the position and names of the principal bones affording generic and specific characters.



Skeleton of Head of a Perch.

f, frontal.
t, turbinal.
po, preorbital.
io, infraorbital ring.
mx, maxillary.
pmx, premaxillary.
m, mandible.
d, dentary bone.
pt, posttympanic.
s, suprascapula.
o, opercle.
so, subopercle.
pr, preopercle.
iop, interopercle.
br, branchiostegal rays.

There are a few other words of frequent use in descriptions of Fishes that require explanation.

Pseudobranchiæ are a series of laminæ attached, in many Teleostean fishes, to the inside of the gill-cover opposite the gills, and are the remains of a

gill which was functional during embryonic life. Whenever present, they may be detected by turning back the gill-cover. In chondropterygian fishes the pseudobranchiæ are differently situated, within the spiracles.

Gill-rakers.—Horny processes on the inside of the branchial arches or bony supports to the gills.

Lower pharyngeal bones.—The dwarfed fifth pair of branchial arches; the 4 anterior pairs bearing gills. These bones often support teeth.

Isthmus.—The small space beneath the throat between the two gill-openings.

Teeth.—There are several kinds of teeth in fishes. Those of the upper jaw are borne by the premaxillary bones, there being no teeth in the maxillaries; the lower-jaw teeth are attached to the dentary bone of the mandible. Besides these, teeth (*vomerine*) are often found on the vomer situated in the middle of the roof of the mouth, articulating on each side in front with the maxillary bones, and behind on each side with the palatines, which also bear teeth in many fishes. Teeth likewise occur on other bones of the skull or hyoid apparatus, or on the tongue. *Villiform* teeth are very fine conical teeth arranged in a band; *cardiform* teeth are coarser or mixed with coarser teeth.

SYSTEMATIC INDEX.

Subclass CHONDROPTERYGII.

Skeleton cartilaginous; no cranial sutures. From one to seven external gill-openings on each side; the gills are attached by their outer edges to the skin, with a gill-opening intervening between each two laminæ; no gill-cover. Two or more series of valves at the conus arteriosus. The optic nerves, although united, do not decussate, or do so only slightly. Body with vertical and paired fins, the posterior pair abdominal; caudal fin with an elongated upper lobe. Intestines with a spiral valve. Male sex with intromittent organs attached to the ventral fins. Ovaries containing large ova, which are fertilized, and sometimes likewise developed internally. Embryo with external deciduous gills. No air-bladder.

This subclass includes the sharks, rays, and chimæras, and is divided into two orders, the second of which does not appear to have representatives in India. Geologically speaking, these fishes existed prior to the Teleosteans.

Synopsis of Orders.

Five to seven external gill-openings, and no cartilaginous gill-cover. Jaws distinct from the skull	1. *PLAGIOSTOMATA.*
A single external gill-opening having a rudimentary cartilaginous gill-cover; four branchial clefts inside the gill-cavity. Palatal and maxillary apparatus attached to the skull	2. *HOLOCEPHALI.*

PISCES.

Vertebrate animals adapted for an aquatic life, having their extremities modified into fins; respiring, almost invariably, solely by means of gills *; possessing a heart with only two (in one instance three) cavities, and being cold-blooded. They are scaleless, or partially or wholly scaled, the scales being sometimes in the form of osseous plates.

Synopsis of Subclasses occurring in India.

Skeleton cartilaginous. Skull without cranial sutures. Gills attached by their outer edges to the skin, with a gill-opening intervening between every two gill-laminæ. Conus arteriosus contractile. Optic nerves not or only partially decussating. A spiral valve to intestines.

I. CHONDROPTERYGII.

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.

II. TELEOSTEI.

. membrano-cartilaginous and notochordal. Skull and in absent. Pulsating sinuses present in place of a heart.

III. LEPTOCARDII.

Order I. PLAGIOSTOMATA.

Syn. *Elasmobranchii.*

Body more or less cylindrical or depressed; the trunk may or may not pass gradually into the tail. From five to seven gill-openings, which may be lateral or inferior. Jaws distinct from the skull.

This order has been subdivided as follows:—

A. Trunk gradually passing into the tail. Gill-openings lateral ..	SELACHOIDEI or Sharks.
B. Gill-openings inferior. Pectoral fins largely developed and constituting a flat disk	BATOIDEI or Skates and Rays.

These fish are employed as food, and portions of them, especially the fins, are largely exported from the Indian to the Chinese markets. In China Dr. Cantor observed that the fins were not exclusively selected from the sharks, *Selachoidei*, but equally from the rays, *Batoidei*. Among those examined at Pinang were found to be fins taken from fishes belonging to the following genera:—*Carcharias*, *Zygæna*, *Stegostoma*, *Pristis*, *Rhinobatus*, *Trygon*, and *Myliobatis*. Gelatine is obtained from the larger fins, glue from the smaller. All except the caudal fins are cut from the fish at the root, so as to leave as little flesh as possible. The root is dipped into wetted lime (Chunam) and then the fins are dried in the sun, and according to their value they are divided into two kinds, "white" and "black." The white consist exclusively of the dorsal fins, which are on both sides of a uniform light colour, and expected to yield more gelatine than the other fins. The pectoral, ventral, and anal fins pass under the denomination of black fins; the colour, however, varies from buff to grey or brown, and most of them are of two different colours, the upper surface being dark and the lower light. The black fins of course are the most numerous, and supposed to yield a comparatively small quantity of gelatine.

Suborder A. *SELACHOIDEI.*

Body more or less cylindrical, the trunk gradually passing into the tail. Gill-openings lateral. The gills in these fishes are not situated in a common cavity but in separate sacs that do not communicate one with another. In those which possess five sacs

the four anterior ones are lined in front with parallel rows of adherent gills, whilst in the fifth these processes are found solely on its proximal side. Water taken in by the mouth for respiratory purposes passes backwards through the pharyngo-branchial slits into these sacs, from whence it emerges by the external gill-openings or stigmata. The scapular arch, which is suspended to the front part of the vertebral column, divides these respiratory sacs from the abdominal cavity. Although opercular pieces are absent, cartilaginous rings are sometimes present surrounding the gill-openings.

The size to which these fish attain is not an invariable index to their character, which is better shown by an examination of the teeth with which they are armed. Some powerful forms have small teeth, whilst the obtuse teeth of particular genera are more calculated for crushing shells and crustacea than for waging war with other fishes. The scales are peculiar, being generally small papillæ that have a coating of enamel: this, under the designation of shagreen, is sometimes employed in certain trades, as for covering small boxes or the scabbards of swords, or even for smoothing down wood. The tail-fin is flexible and of great power, terminating much like the blade of an oar, and giving the bearer great facilities in pursuit; when seizing their prey, if it is large, sharks generally turn on one side.

When breeding, a congress takes place between the sexes, the arrangement of the sexual organs being somewhat similar to what obtains among the higher vertebrates. The male organs are compact, placed far forwards in the abdominal cavity, while attached to the ventral fins are claspers which have intromittent functions. In the females, different parts of the oviduct may be functionally modified, for although the ova are fertilized within this oviduct, the development of the young is not invariably carried out on the same plan, some being perfected prior to extrusion, while in others the ovum is encased in a horny covering and so deposited in the sea. In such forms as produce their young alive, a modified placenta exists.

Geographical Distribution. Sharks are spread throughout the seas and estuaries of cold, temperate, and tropical regions, being most numerous in the last; and some ascend rivers even far beyond the influence of the tides *. They are common along the coasts of India, and some species have a wide range, although they do not appear to descend to any great depth. They seem to scent blood or offal from long distances, but their carrying off human prey is

* Not only sharks but saw-fishes occasionally reside in pieces of fresh water, when the communication with the sea has been cut off. Professor Meyer ('Nature,' Dec. 30, 1875) remarked on this subject that "an accurate comparison (between marine and freshwater forms) showed no difference at all, and therefore the changed conditions seem to have had no influence on the external features of the species."

not of frequent occurrence. Among the most savage species are the ground-sharks of the rivers, as *Carcharias gangeticus*, which seldom loses an opportunity of attacking the bather. The *Galeocerdo rayneri* is likewise greatly dreaded along the coast or in the harbours. Though stationed several years at Cochin, I could only ascertain a single instance of a living human being having been carried off by these fishes, and Col. Tickell mentions that while in Burma for many years he only heard of one such case. The most frequent accidents occurring are after the fish has been hooked and lifted into the fisherman's boat, or else while entangled in a net when attempts are made to seize it or cut it adrift. Corpses are almost immediately eaten by sharks, while it may be said in their favour that they devour the poisonous sea-snakes (*Hydrophidæ*).

Along the coast of Sind, as at Kurrachee, there are considerable shark-fisheries, one form, the Mhor, being harpooned while basking on the surface, and Dr. Buist observed in 1850 that this species was often captured 40 and sometimes 60 feet in length. The largest shark I saw there in 1870 was about 20 feet long, but I was told that others up to 30 feet had been recently taken. Here sharks are likewise netted, the nets being a quarter of a mile or more in length, constructed of strong twine and having a six-inch mesh; floats of light wood are affixed along the upper line, while the lower edge of the net is weighted by stones. These nets are sunk in deep water (from 80 to 150 feet) and well out to sea, where they remain until the following day; they are set two or three times a week according to the weather and local circumstances. Small sharks are eaten by the lower classes, and their flesh is considered along the Malabar coast as very nourishing food for mothers after childbirth, while in Bombay they are largely purchased by the African sailors.

The fins of the sharks are removed and dried in the sun. Strips of flesh are also salted as food, and the livers boiled down for the oil they contain. Fins of sharks and rays, along with fish-maws or fish-sounds, were exported from Kurrachee to Bombay during the 5 years ending 1872–73 to the declared annual average value of about £7415; from Bombay they were re-exported to China. Some forms of large sharks, as *Galeocerdo*, which have the edges of their broad teeth sharp or coarsely serrated, cannot be captured by nets, as they at once cut their way out. But nets are suitable for such species as possess conical teeth; these last may likewise be taken by baited hooks attached to cords composed of many strands, through which the teeth penetrate but do not cut.

Further down the Western coast, as at Calicut, medicinal fish-liver oil of an excellent quality was formerly manufactured, a small factory for this purpose having been constructed at that station in 1854, and the livers of sharks and saw-fishes were purchased from the fishermen. The abundance or paucity of these fishes evidently depended to a very great extent upon whether sardines were or were not present, for these latter forms of *Clu-*

peidæ are very capricious, sometimes forsaking the coast for several successive years, and then as suddenly reappearing in countless millions (see *Clupea longiceps*). No livers under 40 lb. weight were accepted at the factory, as the larger ones gave proportionally a greater amount of oil than the smaller ones; sometimes livers of a great size were purchased. One weighed 290 lb., and another from a female saw-fish 14 feet long 185 lb.

The division Selachoidei among the Plagiostomata has been further subdivided into nine families, the following only of which have as yet been recorded from the seas of India:—

I. A nictitating membrane to eye; two dorsals and an anal fin ..... **Carchariidæ.**
II. No nictitating membrane to eye; two dorsals and an anal fin; nostrils not confluent with mouth, which last is inferior. Spiracles absent or minute. **Lamnidæ.**
III. No nictitating membrane to eye; two dorsals and an anal fin. Mouth near the extremity of the snout. Teeth small and conical ..... **Rhinodontidæ.**
IV. No nictitating membrane to eye; only one dorsal and an anal fin ..... **Notidanidæ.**
V. No nictitating membrane to eye; two dorsals and an anal fin. Mouth inferior. Teeth small, several rows being generally in use at the same time .... **Scylliidæ.**

Family I. CARCHARIIDÆ.

The snout may be produced longitudinally or laterally. Spiracles absent or present. Eye with a nictitating membrane. A small pit may or may not exist above the root of the tail, and a groove at the angle of the mouth may be present or absent. Mouth crescentic, inferior. The teeth may be erect or oblique, with a single cusp, having smooth or serrated edges; or they may be small, the cusps being obsolete; or with one central and one or two lateral cusps. The first dorsal fin, destitute of a spine, is placed opposite the interspace between the pectoral and ventral; anal fin present.

The most abundant species of this family along the coasts of India undoubtedly are such as belong to the genus *Carcharias*, the immature of which are very destructive to herrings and other edible fishes. It has been observed that one of the remarkable results which has followed the construction of the Suez Canal has been the introduction into the Mediterranean sea of sharks, which were formerly almost unknown there.

The number of species of this family found in the Red Sea by Klunzinger, as recorded in his 'Synopsis der Fische des Rothen Meeres' in 1871, was as follows:—*Carcharias* 6, *Loxodon* 1, *Galeocerdo* 2, *Dirrhizodon* 1, which does not show that these fishes are a large element in the fish-fauna. As, however, the more open Indian Ocean is reached, the number of these destructive fishes largely

increases, and innumerable young swarm along the shores, while they are exceedingly numerous off the low coast and muddy seas of Burma. In fact I shall have to describe double the number of forms given by Klunzinger: *Carcharias* 17, *Hemigaleus* 1, *Galeocerdo* 2.

Synopsis of Genera.

First group. CARCHARIINA.

Snout produced longitudinally. Teeth erect or oblique, with a single cusp, which has smooth or serrated edges. A pit at the base of the caudal fin.

No spiracles ..... 1. CARCHARIAS.
Spiracles small. Distinct labial folds. Teeth serrated or notched in the upper jaw. Caudal fin with a single notch ..... 2. HEMIGALEUS.
Spiracles small. Teeth serrated in both jaws. Caudal fin with a double notch ..... 3. GALEOCERDO.

Second group. ZYGÆNINA.

Head produced laterally into the shape of a hammer. Nostrils on front edge of head. Teeth oblique, with a single cusp, having sharp smooth edges. A pit at the base of the caudal fin.

Spiracles absent ..... 4. ZYGÆNA.

Third group. MUSTELINA.

Teeth small, obtuse, or having a central and one or two smaller lateral cusps.

Spiracles small; labial folds well developed. Teeth obtuse. No pit at base of the caudal fin..... 5. MUSTELUS.
No spiracles. A pit at base of the caudal fin..... 6. TRIÆNODON.

First group. CARCHARIINA.

1. Genus **CARCHARIAS**, Müller & Henle.

Syn. *Scoliodon*, *Aprion* or *Aprinodon*, *Physodon*, *Hypoprion*, *Prionodon*, Müller & Henle; *Prionace*, Cantor; *Eulamia*, *Isogomphodon*, *Lamiopsis*, *Platypodon*, *Hypoprionodon*, *Isoplagiodon*, and *Cynocephalus*, Gill.

No spiracles. A pit before the root of the caudal fin. Snout longitudinally produced. Mouth crescentic or angular; the labial fold or groove rarely extends beyond the angle of the mouth. Teeth erect or oblique, with a sharp more or less compressed cusp, sometimes triangular, the edges of which may be serrated or smooth *. The first dorsal fin, destitute of a spine, is placed

* In some forms these characters alter considerably with age.

opposite the interspace between the pectoral and ventral; caudal with a distinct lower lobe.

Respecting the colours in these fishes, I have observed that black spots or marks on the fins frequently become fainter in examples which have been preserved some time in spirit, more especially if they have been removed from the alcohol and permitted to dry.

The fishes constituting this large and widely distributed genus have been subdivided by some authors into several genera, by others into the like number of subgenera or divisions, which latter is the course that I have adopted.

Synopsis of Indian Species.

A. Teeth with smooth edges; all oblique and without swollen bases. (*Scoliodon.*)
Pectoral fin not reaching to below dorsal; length of base of anal nearly equalling its distance from the ventral; second dorsal posterior to base of anal. Groove at angle of mouth not extending on to the upper jaw ..... 1. *C. laticaudus*, p. 9.
Pectoral fin reaching to below origin of dorsal; length of base of anal nearly equalling half its distance from the ventral; second dorsal over end of base of anal. Groove at angle of mouth not extending on to the upper jaw ..... 2. *C. acutus*, p. 10.
A well-marked groove at the angle of the mouth extending a short distance along both jaws ..... 3. *C. walbeehmi*, p. 10.

B. Teeth with smooth edges; those in the centre of the lower jaw smaller than those at the side, the latter swollen at their bases and having an oblique and narrow cusp. Upper teeth flat and oblique. (*Physodon.*)
Snout elongated; end of base of first dorsal above origin of ventral; second dorsal small and posterior to the base of anal ..... 4. *C. müllerí*, p. 11.

C. Teeth with smooth edges; all narrow and standing on a broad base, the upper erect or slightly oblique; the lower erect. (*Aprionodon.*)
Second dorsal as large as the anal and nearly equal in size to the first dorsal. Nostril with a distinct valve inferiorly. Teeth $\frac{27-29}{27-29}$ ..... 5. *C. acutidens*, p. 11.

D. Teeth with smooth edges, except the bases of the upper ones, which are serrated. (*Hypoprion.*)
Snout pointed. The bases of the teeth in the upper jaw serrated on both sides .. 6. *C. macloti*, p. 12.

Snout rounded. Only the outer sides of the bases of the upper teeth serrated	7. *C. hemiodon*, p. 12.
E. Some or all of the teeth serrated both on their bases and on their cusps. (*Prionodon.*)	
Teeth in both jaws serrated. Second dorsal much shorter than anal	8. *C. sorrah*, p. 12.
Teeth in both jaws serrated. Second dorsal not much smaller than the anal. Fins darkish with light edges	9. *C. dussumieri*, p. 13.
Snout obtuse. Teeth in both jaws serrated.	10. *C. gangeticus*, p. 13.
Teeth in both jaws serrated. All the fins black-edged	11. *C. melanopterus*, p. 14.
Fins, except the first dorsal, with black extremities	12. *C. bleekeri*, p. 15.
Teeth coarsely serrated in upper jaw; awl-shaped in lower, some with a basal cusp	13. *C. ellioti*, p. 15.
Upper teeth serrated. Second dorsal opposite to but larger than the anal. A black spot on the second dorsal	14. *C. murrayi*, p. 16.
Upper teeth serrated. Second dorsal opposite the anal. A black spot on second dorsal	15. *C. menisorrah*, p. 16.
Upper teeth serrated and on rather a broad base; lower more slender. Ends of some of the fins black	16. *C. limbatus*, p. 17.
Teeth in both jaws slender, and from thirty-six to forty in number	17. *C. temminckii*, p. 17.

1. (1.) Carcharias laticaudus. (Fig. 1.)

Carcharias (Scoliodon) laticaudus, *Müll. & Henle, Plagios.* p. 28, t. viii.

Carcharias laticaudus, *Day, Fish. India*, p. 712, pl. clxxxviii, fig. 1 (see synonymy).

Dan-da-nee, Sind.; *Nullian sorrah* and *Palah sorrah*, Tel.

Length of preoral portion of snout exceeding the width of the mouth by one fifth, and equal to or slightly more than the distance

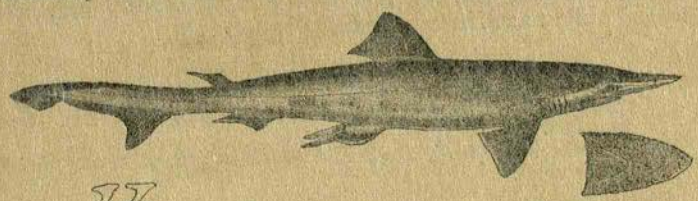


Fig. 1.—*Carcharias laticaudus.*

between the eye and the first gill-opening (longer in the immature); the groove at the angle of the mouth scarcely extends on to the upper jaw. Nostrils very much nearer to the mouth than to the end of snout. *Teeth*—those in upper jaw rather oblique, not swollen

at their bases: those in the lower jaw very oblique, especially near the symphysis: none are serrated. *Fins*—the length of the base of the anal fin is nearly or quite equal to its distance from the ventral: the pectoral does not extend so far as to below the origin of the dorsal; its posterior edge is nearly straight, its internal edge one third of the length of its outer margin. The length of the caudal fin is contained $3\frac{2}{3}$ to 4 times in the total length, but is rather more in adults than in immature specimens. *Colour*—uniform grey superiorly, white beneath: the pectoral of a deep grey, having a white outer edge, as have also the ventral and anal; posterior portion of caudal fin dark grey or nearly black.

Hab. Seas of India to the Malay Archipelago and beyond. This species attains to at least two feet in length.

2. (2.) Carcharias acutus.

Carcharias acutus, *Rüppell, N. W. Fische*, p. 65, t. xviii, f. 4; *Day, Fish. India*, p. 712, pl. clxxxiv, fig. 3 (see synon.).

Purrooway sorrah, Tam.; *Parl sorrah*, Mal.; *Sem sorrah*, Tel.

Length of preoral portion of snout one fourth longer than the gape of the mouth, and equal to or slightly less than the distance between the eye and the gill-opening: a groove at the angle of the mouth not, or but slightly, extending on to the upper jaw. Nostrils nearer to mouth than to the end of the snout. *Teeth*—the upper and lower ones oblique, without swollen bases and none serrated. *Fins*—the length of the base of the anal fin is one half its distance from the ventral or less: the pectoral extends to at least below the origin of the dorsal, its posterior edge is concave, and its internal edge about two fifths the length of its outer: second dorsal small, situated over the posterior half of the anal. Length of caudal fin contained about $3\frac{1}{2}$ to $3\frac{2}{3}$ times in the total length. *Colour*—grey or bronze above, white below: fins grey, the posterior edge of pectoral, outer edges of ventral, anal, and posterior half of caudal, white; upper edge of caudal dark, as is also its posterior lobe.

Hab. Red Sea, seas of India to the Malay Archipelago, and beyond; said to attain to a considerable size.

3. (3.) Carcharias walbeehmi.

Carcharias (Scoliodon) walbeehmi, *Bleeker, Nat. Tyds. Ned. Ind.* x, p. 353.

Carcharias walbeehmii, *Day, Fish. India*, p. 712, pl. clxxxv, fig. 2 (see synon.).

Ei-dah, Andamanese.

Length of the preoral portion of the snout exceeding the width of the mouth by nearly one third, and equalling the distance between the eye and the second gill-opening. A well-marked groove at the angle of the mouth extending on to the upper jaw and along a portion of the mandible. Nostrils rather nearer to the

mouth than to the end of the snout, the distance between the outer edges of the nostrils equal to the extent between them and the end of the snout. *Teeth*—oblique and flat in both jaws, without any serration. *Fins*—the pectoral extends to nearly beneath the middle of the first dorsal fin, it has its posterior edge rather concave, and its inner edge equals one third of the length of its outer; second dorsal rather small, with its posterior lobe produced, it is situated over the last half of the anal. Length of the base of the anal equal to two fifths of its distance from the base of the ventral: caudal fin $3\frac{1}{2}$ times in the total length. *Colour*—light brown superiorly, becoming dull white beneath. Fins grey and mostly with light outer edges.

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

4. (4.) Carcharias mülleri.

Carcharias mülleri, (*Valenciennes*) *Müll. & Henle, Plagios.* p. 30, t. xix, f. 1 (teeth); *Day, Fish. India*, p. 713 (see synon.).

Snout elongated and pointed. Nostrils nearer to the angle of the mouth than to the end of the snout. Mouth nearly as long as wide. *Fins*—the end of the base of the first dorsal situated opposite the origin of the ventral; second dorsal very small and commencing above the last third of the base of the anal. Pectoral extending to below the origin of the first dorsal. *Colour*—brownish, becoming lighter beneath; fins a little darker.

Hab. Bengal.

5. (5.) Carcharias acutidens.

Carcharias acutidens, *Rüppell, N. W. Fische*, p. 65, t. xviii, fig. 3; *Day, Fish. India*, p. 713, pl. clxxxix, fig. 1 (see synon.).

Snout obtuse and rounded, the length of its preoral portion equal to two thirds of the width of the mouth and much less than the distance between the eye and the first gill-opening. Nostrils rather nearer mouth than to the end of the snout. A very short groove at the angle of the mouth not extending on to the upper jaw. Eye small. Gill-openings much wider than the orbit. *Teeth* $\frac{27-29}{27-29}$*, those in both jaws rather slender, erect or oblique, and with the bases rather swollen; none serrated. *Fins*—the base of the first dorsal situated midway between the inner angle of the pectoral and the commencement of the ventral; second dorsal nearly as large as the first, rather larger than the anal and situated above it. Caudal fin $4\frac{1}{2}$ in the total length. Pectoral falciform, its inner edge two sevenths the length of its outer, it reaches to beneath the middle of the base of the first dorsal. *Colour*—of a dull reddish brown, becoming lightest on the sides and beneath.

Hab. Red Sea, coasts of Sind and the Indian Ocean, attaining at least to six feet in length.

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* Twenty-seven to twenty-nine teeth in each jaw.

6. (6.) Carcharias macloti.

Carcharias (Hypoprion) macloti, *Müll. & Henle, Plagios.* p. 34, t. x.
Carcharias macloti, *Day, Fish. India*, p. 713, pl. clxxxviii, fig. 2 (see synon.)

Pala sorrah and *Sorrah Kowah*, Tel.

Length of the preoral portion of the snout exceeding the width of the mouth by one third, and equalling the distance between the eye and the second gill-opening. A short groove at the angle of the mouth, not extending on to the upper jaw. Nostrils nearer to the opening of the mouth than to the end of the snout. *Teeth*—the bases of those in the upper jaw denticulated on both sides; those in the lower jaw erect, with smooth edges and a broad base. *Fins*—the length of the base of the anal is equal to about twice its distance from the origin of the ventral; the pectoral extends to nearly below the hind edge of the first dorsal, its posterior margin is rather concave, its internal equals about one third of the length of its outer edge; caudal $3\frac{1}{4}$ to $3\frac{1}{3}$ in the total length. *Colour*—grey or brown, becoming dull white beneath; the fins grey, the caudal nearly black in its posterior half; outer half of first dorsal dark; pectoral and ventral with a light edge.

Hab. Seas of India to New Guinea.

7. (7.) Carcharias hemiodon.

Carcharias (Hypoprion) hemiodon, (*Val.*) *Müll. & Henle, Plagios.* p. 35, t. xix, f. 2 (teeth).
Carcharias hemiodon, *Day, Fish. India*, p. 714 (see synon.).

Ngamán ngheppyan, Burmese.

Snout obtusely rounded; the distance between the end of the snout and the mouth equals the interspace between the outer angles of the nostrils. No groove at the angle of the mouth. *Teeth*—in the upper jaw oblique, with the outer side of their bases serrated. *Fins*—the pectoral reaches to below the middle of the first dorsal; the second dorsal commences opposite to or rather behind the origin of the base of the anal. Caudal fin $4\frac{1}{3}$ in the total length. *Colour*—grey, becoming lighter beneath.

Hab. Seas of India, ascending rivers, as the Hooghly at Calcutta.

8. (8.) Carcharias sorrah.

Carcharias (Prionodon) sorrah, (*Val.*) *Müll. & Henle, Plagios.* p. 45, t. xvi.
Carcharias sorrah, *Day, Fish. India*, p. 714, pl. clxxxv, fig. 1 (see synon.).

Length of the preoral portion of the snout about equal to the width of the mouth and nearly equal to the distance between the eye and the first gill-opening. No groove at the angle of the mouth. Nostrils about midway between end of snout and mouth. Gill-openings rather wider than the orbit. *Teeth* $\frac{25}{25}$; those in the

upper jaw oblique, serrated, and with a toothed notch on their outer edge; those in lower jaw a little oblique, rather narrow, situated on a broad base and serrated. *Fins*—pectoral falciform, extending to beneath the hind third of the base of the first dorsal fin, its internal margin equalling about one fourth or two sevenths of its outer. Origin of first dorsal slightly posterior to the base of the pectoral, and not extending to above the ventral. The second dorsal smaller than and slightly posterior to the origin of the anal, the latter rather nearer the caudal than the ventral. Caudal fin 3¼ in the total length. *Colour*—dull brown superiorly, and whitish beneath; fins grey, lower caudal lobe and pectorals with black extremities.

Hab. Seas of India to the Malay Archipelago.

9. (9.) Carcharias dussumieri.

Carcharias (Prionodon) dussumieri, (*Valenciennes*) *Müll. & Henle, Plagios.* p. 47, t. xix, f. 8.

Carcharias dussumieri, *Day, Fish. India*, p. 714, pl. clxxxvii, fig. 2 (see synon.)

Choti musi, Marâthi.

Length of the preoral portion of the snout very slightly exceeding the width of the mouth, and equalling the distance between the eye and the first gill-opening. A very short groove at the angle of the mouth, only slightly extending on to the upper jaw. Nostrils nearer the opening of the mouth than to the end of the snout. Gill-openings wider than the orbit. *Teeth* $\frac{25}{26}$, those of the upper jaw oblique and serrated, having a notch on the outer side; those in the mandibles smaller, oblique, narrow, serrated, and with a broad base. *Fins*—pectoral extends to opposite the hind edge of the base of the first dorsal, its posterior margin is slightly concave, its internal margin equals two fifths of the length of its outer edge. Origin of the first dorsal a very slight distance behind the base of the pectoral, and its base not extending to above the ventral. The second dorsal slightly smaller than the anal. The length of the caudal about 4 in the total length. *Colour*—grey or dull brown, becoming white beneath; fins grey with white outer edges; upper two thirds of second dorsal blackish.

Hab. Seas of India to the Malay Archipelago.

10. (10.) Carcharias gangeticus.

Carcharias (Prionodon) gangeticus, *Müll. & Henle, Plagios.* p. 39, t. xiii.

Carcharias gangeticus, *Day, Fish. India*, p. 715, pl. clxxxvii, fig. 1 (see synon.)

Mundah magur, Ooriah; *Nga man goung wyn*, Burmese.

Length of the preoral portion of the snout only two thirds of the width of the mouth, and equalling half of the interspace between the eye and the middle gill-opening; a very slight groove at the

angle of the mouth. Nostrils in the front half of the distance between the end of the snout and the mouth. Gill-openings wider than the orbit. *Teeth*—twenty-seven to thirty in each jaw, all serrated; the upper almost triangular, their outer edge with a notch, very distinct in the immature but becoming almost lost with age; those in the lower jaw narrow, erect, and having broad bases. *Fins*—pectoral elongated falciform, and extending to beneath the middle of the first dorsal; its internal margin $\frac{2}{3}$ of the length of its outer. Origin of the first dorsal slightly posterior to the hind edge of the base of the pectoral, its base not extending to above the ventral. The second dorsal of about the same size as the anal, the latter nearer to the caudal than to the ventral. Length of the caudal $3\frac{1}{2}$ in the total length. *Scales*—small and with rough edges; they are hardly above half the size of those in *C. melanopterus*. *Colour*—grey superiorly, becoming dull white beneath. Fins grey, the pectoral, ventral, and anal with white edges; posterior portion of caudal rather dark.

Hab. Seas of India to Japan, ascending rivers to above tidal influence. It is the commonest form along the Burmese coasts and attains at least nine feet in length.

This is one of the most ferocious among Indian sharks, and frequently attacks bathers even in the Hooghly at Calcutta, where it is so dreaded that a reward is offered for its destruction.

11. (11.) Carcharias melanopterus.

Carcharias (Prionodon) melanopterus, *Quoy & Gaimard, Voy. Uranie & Physicienne, Zool.* p. 194, pl. 43.

Carcharias melanopterus, *Day, Fish. India,* p. 715, pl. clxxxv, fig. 3 (see synon.)

Caval sorrah, Nella vekal sorrah, Raman sorrah, Mukkan sorrah, Boka sorrah, and *Ran sorrah,* Tel.; *Ngúman toungmé,* Arracan; *Hungur,* Chittagong.

Length of the preoral portion of the snout two thirds the width of the mouth and considerably less than the distance between the eye and the first gill-opening; a very short groove at the angle of the jaws. Nostrils nearer to the extremity of the snout than to the end of the mouth. Snout rounded and very obtuse. *Teeth* $\frac{24-25}{24-25}\left(\frac{31}{31}\right)$, the upper broad, flattened, oblique, with a very slight notch or rather concavity on the outer side and serrated; the lower much narrower, pointed, on a broad base and also serrated, these serrations being generally minute, sometimes only on one side of the tooth, and occasionally wanting, especially in the lower jaw. *Fins*—pectoral falciform, extending to beneath the middle or even hind edge of the base of the dorsal, its outer edge three times as long as its inner one. Base of first dorsal a little nearer the pectoral than its posterior end is to the ventral. Second dorsal opposite and similar to the anal. Length of caudal $3\frac{3}{4}$ to $4\frac{1}{4}$ in the total length. *Scales*—comparatively large, lineated, but with almost smooth edges. *Colour*—brown or bluish grey superiorly,

fading to dull white beneath; ends of all the fins deep black. Iris grey, stained darker superiorly. It may be remarked, as showing the size to which this species attains, that the liver of one at the Government fish-oil factory at Calicut weighed 270 lb.

Hab. Seas of India to the Malay Archipelago, and beyond. This form is very common.

12. (12.) Carcharias bleekeri.

Carcharias (Prionodon) bleekeri, *Duméril, Hist. Nat. Poiss.* i, p. 367.
Carcharias bleekeri, *Day, Fish. India*, p. 715 (see synon.).

Length of the preoral portion of the snout equal to the width of the mouth. Nostrils midway between the end of the snout and the mouth. *Teeth* $\frac{25}{25}$, the upper triangular with a slightly notched outer border; the lower nearly erect, narrow, and on a broad base. *Fins*—the dorsal commences a short distance behind the angle of the pectoral; second dorsal opposite to, nearly as long as, but lower than the anal, and elongated posteriorly. Pectoral with its upper edge $4\frac{1}{2}$ to 5 times as long as its lower; caudal one fourth of the total length. *Colour*—a deep black spot at the lower edge of the end of the pectoral fin; a second at the end of the inferior lobe of the caudal; no black spot on the first dorsal.

Hab. East coast of Africa, seas of India.

13. (13.) Carcharias ellioti.

Carcharias ellioti, *Day, Fish. India*, p. 716, pl. clxxxix, fig. 2.
Puducan or *Adugu-pal sorrah*, Tamil; *Pal sorrah*, Tel.

Length of the preoral portion of the snout equal to the width of the mouth. A well-developed labial groove along the outer side of the maxilla, and a slight one on the mandible. Eyes rather small. Nostrils rather nearer to the mouth than to the end of the snout. Gill-openings much wider than the orbit. *Teeth* $\frac{24-26}{30-34}$, the upper nearly triangular without any notch or basal enlargement, very coarsely serrated on both edges; those in the mandible obliquely erect, awl-shaped, becoming smaller and more triangular at the angle of the mouth; the awl-shaped ones have a cusp at either side of the base, below which the outer edge has a few serrations; the external triangular ones are serrated externally. *Fins*—the first dorsal commences just behind the root of the pectoral, its base being nearer to it than to the ventral; second dorsal smaller than the first, but larger than the anal, before which it commences. Pectoral falciform, its internal margin $\frac{1}{3}$ the length of its outer, the fin reaches to beneath the end of the base of the dorsal. Anal below the last two thirds of the second dorsal. Caudal $3\frac{3}{4}$ in the total length. *Colour*—grey superiorly, becoming nearly white beneath.

Hab. Seas of India. At Kurrachee it is not uncommon.

14. (14.) Carcharias murrayi.

Carcharias murrayi, *Günther, A. M. N. H.* (5) xi, p. 137 (1883); *Day, Fish. India, Supplement*, 1888, p. 809.

Snout short and obtuse; the distance between the mouth and the end of the snout being less than that between the inner angles of the nostrils. Nostrils nearly midway between the end of the snout and the mouth. *Teeth*—in the upper jaw of moderate size, the anterior equilateral, rather longer than broad, those on the side oblique with the posterior edge concave and both edges finely serrated; twenty-nine rows in the lower jaw, lanceolate, their edges smooth, with a broad base, two-rooted, and some with an additional minute lobe. *Fins*—first dorsal commences opposite the axil of the pectoral; the second only one third the size of the first, but conspicuously larger than the anal, which is small. Origin of anal behind that of the second dorsal. Pectoral large, exceeding the distance between the first gill-opening and the end of the snout; the length of its hind margin only one fourth of that of its outer. Caudal of moderate length, rather longer than the distance between the two dorsal fins. *Colour*—uniform, top of first dorsal appears to have been black.

Hab. Kurrachee, where an example 6 feet 8 inches long was captured. The specimen, which is in the British Museum, is stuffed and not in a very good condition; it seems only to differ from *C. ellioti* in the size of the second dorsal and anal fins.

15. (15.) Carcharias menisorrah.

Carcharias (Prionodon) menisorrah, (*Val.*) *Müll. & Henle, Plagios.* p. 46, t. xvii.

Carcharias menisorrah, *Day, Fish. India*, p. 710, pl. clxxxiv, fig. 1 (see synon.)

Karamoottee sorrah and *Ciga sorrah*, Tel.; *Nga man nee*, Arracan.

Preoral portion of snout nearly or quite as long as the mouth is wide; the width of the head equals the distance from the angle of the mouth to the end of the snout. A very small groove at the angle of the mouth extending a short distance on to the upper jaw. *Teeth*—twenty-eight in the upper jaw; they are oblique, triangular, notched externally, and serrated in the whole extent of their cusps; lower teeth erect, slender, lanceolate, not serrated, and having broad bases. *Fins*—pectoral not so long as head, one fifth longer than broad at its extremity, it is scarcely emarginate, its inner margin equals about half the length of the outer; base of the second dorsal slightly more than half of that of the first dorsal, it is opposite, and almost as large as the anal. Posterior end of the dorsal fin at the same distance from the ventrals as its anterior end is from the root of the pectoral. Upper edge of the caudal almost straight, its length being slightly more than the interval between its base and the origin of the ventral. *Colour*—grey above,

white below; upper half of the second dorsal generally deep black.

Hab. Red Sea to the Malay Archipelago. Attains twelve feet or more in length.

16. (16.) Carcharias limbatus.

Carcharias (Prionodon) limbatus, *Müll. & Henle, Plagios.* p. 49, t. xix, f. 9 (teeth).

Carcharias limbatus, *Day, Fish. India*, p. 716, pl. clxxxiv, fig. 2 (see synon.).

Length of preoral portion of the snout about equal to the width of the mouth, and slightly less than the distance between the eye and the first gill-opening; a short groove at the angle of the mouth scarcely extending on to the upper jaw. *Eyes*—small; gill-openings about twice the size of the eye. *Teeth*—erect, somewhat constricted above the base, which is broad, the upper teeth broader than the lower, although all are of somewhat similar shape, and serrated, but most distinctly in the upper jaw; in the young the teeth in the mandibles usually appear to have smooth edges, but under the microscope the rudiments of serrations are perceptible. *Fins*—the length of the base of the anal is equal to about two thirds of its distance from the base of the ventral; the pectoral extends to below or even to beyond the hind edge of the dorsal fin; the posterior edge is slightly concave; the internal edge is $\frac{3}{10}$ to $\frac{1}{3}$ the width of the outer. Dorsal commences over the inner angle of the base of the pectoral; second dorsal arises above or slightly posterior to the origin of the anal, than which it is somewhat smaller. Caudal $3\frac{1}{3}$ to $3\frac{1}{2}$ in the total length. *Colour*—grey superiorly, becoming white on the sides and beneath. Fins dark grey; in the *immature* the outer extremity of pectoral, lobe of caudal, and the margins of the fins dark black; ventral and anal white-edged. As age advances, the second dorsal becomes black-tipped and the anal has a darker edge.

Hab. This shark is very common along the sea-coasts of India, and appears to frequent the tropical parts of the Atlantic, and of the Pacific coast of Central America, and to extend throughout the Indian Ocean. It attains at least six feet in length.

17. (17.) Carcharias temminckii.

Carcharias (Prionodon) temminckii, *Müll. & Henle, Plagios.* p. 48, t. xviii.

Carcharias temminckii, *Day, Fish. India*, p. 717 (see synon.).

Length of the preoral portion of the snout about four fifths the width of the mouth. Nostrils nearer to the mouth than to the end of the snout. *Teeth* $\frac{36-38}{38-40}$, upper rather narrow with a broad base, erect and serrated; the lower erect, entire, awl-shaped; the teeth near the outer angle of the jaws very small. *Fins*—first dorsal inserted midway between the roots of the pectoral and ventral fins;

pectoral with its upper edge nearly three times the width of the lower. Second dorsal opposite anal, and nearly as large as the first. *Colour*—uniform.

Hab. Seas of India.

2. Genus **HEMIGALEUS**, Bleeker.

Syn. *Chænogaleus*, Gill.

Spiracles minute and behind the eye. Nictitating membrane present. A pit before the root of the caudal fin both above and below. Snout longitudinally produced. Mouth crescentic, with labial folds. Teeth in the upper jaw denticulated, not so in the lower. The first dorsal fin, which is destitute of a spine, is placed opposite the interspace between the pectoral and ventral; caudal with a single notch.

These fishes have been divided from *Carcharias* on account of the existence of a rudimentary spiracle behind the eye, and likewise because the labial folds, which are rare in *Carcharias*, are developed in all known species of the present genus.

Geographical Distribution. Coromandel coast of India to the Malay Archipelago.

18. (1.) **Hemigaleus balfouri.** (Fig. 2.)

Hemigaleus balfouri, *Day, Fish. India*, p. 717, pl. clxxxv, fig. 4.

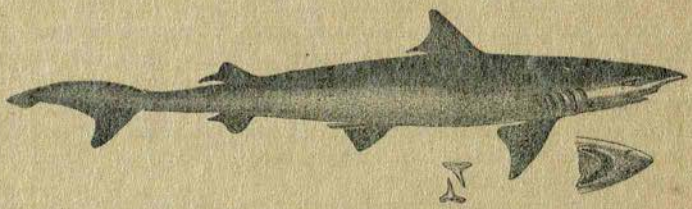

Fig. 2.—*Hemigaleus balfouri.*

Length of the preoral portion of the snout slightly exceeding the width of the mouth, and not quite equalling the distance between the eye and the first gill-opening. Spiracle minute, situated about one half the diameter of the eye posterior to the orbit. A groove at the angle of the mouth extending some distance along each jaw. Nostrils situated nearer to the mouth than to the end of the snout. The distance between the outer angles of the nostrils equal to the width of the mouth. Gill-openings at least twice the width of the orbit. *Teeth* $\frac{24}{24}$, those in the upper jaw smooth, notched externally, or with about three denticulations along the outer side of the base; those in the lower jaw of a slightly smaller size, erect and smooth. *Fins*—pectoral falciform, extending to below the first third of the base of the dorsal fin, the

inner nearly equalling one third of the outer margin. First dorsal (with about 24 rays) having its base almost midway between the end of the base of the pectoral and the origin of the ventral fins. Second dorsal (with about fifteen rays) commencing slightly in advance of the anal; the length of its base equal to rather above one half of that of the first dorsal, while it is a little larger than the anal. Caudal fin equal to about $\frac{1}{5}$ of the total length. *Colour*—dark brown; fins grey, the second dorsal with a dark summit.

Hab. Coromandel coast of India.

3. Genus **GALEOCERDO**, Müller & Henle.

Spiracles small. Nictitating membrane present. Mouth crescentic. Teeth large, flat, triangular, and oblique, serrated on both edges, and with a deep notch on the outer margin. The first dorsal spineless, placed opposite the interspace between the pectoral and ventral fins; caudal with a double notch. A pit on the tail both above and below, at the base of the caudal fin.

Sharks of this genus are much dreaded in India, the native fishermen distinguishing those forms with long conical teeth from others having elongated or triangular cusps with serrated edges. The former can be captured by lines and even by nets; but the latter immediately cut through nets and sever lines, rendering it necessary to attach the hooks to chains. Sharks seem to prefer their food a little high, and therefore the natives bury the bait in the ground for a day or more before using it. It was apparently a fish belonging to this genus which was referred to in the Transactions of the Royal Society of Arts and Sciences of Mauritius, vii. 1873. Col. Pike observed of the specimen that it was 13 feet 9 inches long, and had "a terrible incident connected with it. The men of M.M. steamer 'Emirne' caught it, and it was exposed for sale in the bazar. When cut open, a clasp knife and belt, with the bone of a man's arm, were found in it. This, of course, gave rise to the most horrible surmises, especially as it was rumoured that a few days previously a sailor had deserted from a vessel in the harbour, and was supposed to have been attacked by a shark before he could reach the shore" (p. 27).

Geographical Distribution. Seas of the Tropics, also of temperate and Arctic regions.

Synopsis of Indian Species.

Caudal fin $3\frac{1}{2}$ to 4 in the total length. Teeth denticulated, and of equal size in both jaws. 1. *G. rayneri*, p. 20.

Caudal fin 3 to $3\frac{1}{4}$ in the total length. Teeth denticulated, and rather smaller in the lower than in the upper jaw ..... 2. *G. tigrinus*, p. 21.

19. (1.) Galeocerdo rayneri. (Fig. 3.)

Galeocerdo rayneri, *McDonald & Barron, P. Z. S.* 1863, p. 368, pl. xxxii.; *Day, Fish. India*, p. 718, pl. clxxxvii, fig. 3 (see synon.).

Wulluven sorrah, Tam.; *Kettalum sorrah*, Tel.

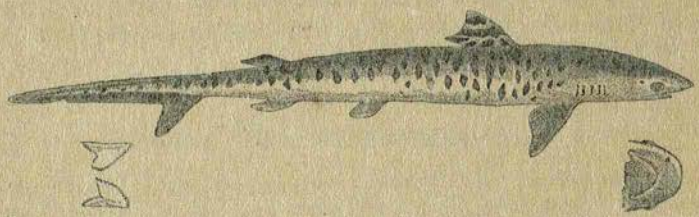

Fig. 3.—*Galeocerdo rayneri.*

Length of preoral portion of the snout much less than the width of the mouth. A groove at the angle of the mouth extending some distance along the side of the maxilla; nostrils nearer the end of the snout than the mouth. Gill-openings not so wide as the orbit. *Eyes*—rather large. *Teeth* $\frac{23}{23}$, large, of equal size in both jaws, compressed and serrated in their whole extent in both jaws, as well as notched externally above the base. *Fins*—pectoral falciform, extending to beneath the anterior third of the first dorsal. Origin of first dorsal a short distance behind the base of the pectoral, but nearer to that fin than to the ventral, which latter is midway between the hind edge of the first dorsal and the origin of the anal. Second dorsal above the anal, the two being of about equal size. Length of the caudal $3\frac{1}{2}$ to 4 in the total length, apparently decreasing in comparative length with age. *Colour*—dark grey superiorly, becoming dull white beneath; cheeks and lower surface of the snout yellowish. Body, from a short distance behind the gill-openings, with numerous large black spots and vertical bars. Fins grey, the first dorsal with irregular vertical bands.

This fish, probably a variety of *G. arcticus*, attains to a considerable size in the Indian seas, where it is not numerous. Besides being exceedingly fierce, Jerdon has remarked that it is very cunning and swells itself out so as to appear like a floating mass of animal substance, and having thus decoyed its prey it immediately attacks it. It eats everything, even sea-snakes. Sir W. Elliot observed that he obtained an example of this voracious shark 12 ft. 4 in. long; in its stomach were the remains of fish of various sizes and several shin-bones of beef partially digested. Another example, $8\frac{1}{4}$ feet long, had the remains of a sea-snake (*Hydrophis nigrocincta*) and of a siluroid fish.

Hab. Indian and Australian Seas; attaining upwards of twelve feet in length.

20. (2.) Galeocerdo tigrinus.

Galeocerdo tigrinus, *Müll. & Henle, Plagios.* p. 59, t. xxiii; *Day, Fish. India*, p. 718 (see synon.).

Length of the preoral portion of the snout equal to one half the width of the mouth and slightly less than the distance between the inner angles of the nostrils. A long labial fold along the edge of the upper jaw. *Teeth*—in lower jaw not so large as those in the upper, denticulated in both jaws, and the denticulations at the base of each cusp also serrated, more especially in the lower jaw. *Fins*—the first dorsal commences above the angle of the pectoral; second dorsal arises slightly in advance of the anal. Length of caudal contained 3 to 3¼ times in the total length, and considerably (one third) exceeding the length of the interspace between the two dorsal fins. *Colour*—grey superiorly, becoming slightly lighter on the sides and beneath; numerous brown or dark grey spots over the body.

Hab. Red Sea, seas of India to Japan, and beyond.

Second group. ZYGÆNINA.

4. Genus ZYGÆNA, Cuvier.

Syn. *Cestracion*, Klein; *Cestrorhinus*, Blainv.; *Sphyrna* (Raf.), Müll. & Henle; *Eusphyrna* and *Reniceps*, Gill.

Comban sorrah, Tam.

The anterior portion of the head is broad, flattened, and laterally elongated, with the eyes situated at its lateral extremities and the nostrils at its fore border. A nictitating membrane present. Spiracles absent. Mouth crescentic. Teeth similar in both jaws, oblique and notched. The first dorsal fin spineless, situated above the interspace between the pectoral and the ventral; caudal with one notch, and a pit at the commencement of the fin.

This genus of sharks is reputed to be very dangerous in some localities. The young are captured along the shores of India and Burma in large numbers.

Synopsis of Indian Species.

A. A groove along front edge of head.
- Each lateral expansion of the side of the head two or three times as long as broad — 1. *Z. blochii*, p. 22.
- The length of the hind edge of each lateral expansion of the head nearly or quite equal to its width near the eye.... — 2. *Z. malleus*, p. 22.
- Anterior edge of head curved but not continuous with the lateral one; the length of the hind edge of each lateral expansion is less than its width near the eyes — 3. *Z. tudes*, p. 23.

B. No groove along front edge of head.
- Anterior edge of head nearly straight; length of hind edge of lateral expansion exceeds width ..... — 4. *Z. mokarran*, p. 23.

21. (1.) Zygæna blochii. (Fig. 4.)

Zygæna blochii, *Cuvier, Règne Anim.* ii, p. 127; *Val. Mém. Mus.* ix, p. 227, pl. i, f. 2; *Day, Fish. India*, p. 719, pl. clxxxiv, fig. 4 (see synon.).

Koman sorrah, Tam.; *Sappa sorrah*, Tel.; *Nga man kuéy*, Burmese.

Each lateral expansion of the side of the head from twice to thrice as long as broad, and with a deep groove along the anterior edge, reaching externally nearly as far as the orbit. The posterior edge of the lateral expansion about as long as its anterior edge, while the external edge is nearly straight. Nostril much nearer the mouth than the eye. *Eyes*—situated near the upper angle of the

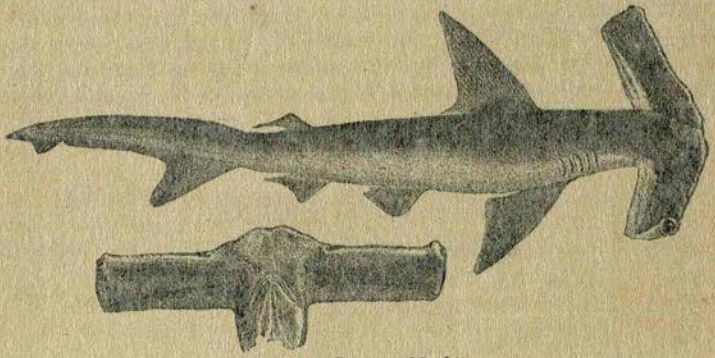

Fig. 4.—*Zygæna blochii.*

external edge of the lobe of the head. *Teeth*—oblique, externally notched and smooth in their entire extent. *Fins*—the dorsal arises slightly behind the base of the pectoral, extending nearly halfway to above the ventral; second dorsal arising above the posterior half of the anal, than which it is much smaller. *Colour*—of a deep grey or brownish-grey, becoming lighter beneath; the fins are usually of a slightly deeper colour than the body.

Hab. Seas of India to the Malay Archipelago, and beyond. Blyth observed that it rarely exceeded 4 feet in length. This is the commonest form on the Malabar coast, where the fishermen consider it attains to a very large size.

22. (2.) Zygæna malleus.

Squalus zygæna, *Linn. Syst. Nat.* p. 399.

Zygæna malleus, *Shaw, Nat. Misc.* viii, pl. 267; *Day, Fish. India*, p. 719, pl. clxxxvi, fig. 4 (see synon.).

Nga man thanwoot, Burmese.

The hind edge of the lateral expansion of the head nearly equals its width near the eye, and has a groove along almost its entire anterior margin. Nostrils close to the eye. *Colour*—body and fins slaty-grey; under surface white. In a female taken at Pinang, Canton observed 37 living young, of which 20 were males and 17 females.

Hab. Tropical and temperate seas.

23. (3.) Zygæna tudes.

Zygæna tudes, *Val. Mém. Mus.* ix, p. 225, pl. ii, f. 1; *Day, Fish. India*, p. 720, pl. clxxxviii, fig. 4 (see synon.).

Koma sorrah, Tel.

Anterior edge of head curved, but the front margin is not continuous with the lateral; the length of the hind margin less than the width near the eye. *Eyes*—situated just below the junction of the anterior and outer edges of the snout. Nostril close to the eye. A groove running along the anterior edge of the head. *Teeth*—oblique, with a notched outer edge. *Fins*—dorsal arises above the hind margin of the inner edge of the pectoral fin, its height equals the length of the pectoral; second dorsal over the hind half of the anal; length of the base of the anal extends $\frac{2}{3}$ of the distance to the ventral; caudal 3 to $3\frac{1}{3}$ in the total length. *Colour*—grey, becoming lighter beneath; first dorsal fin very dark, the upper portion of the second dorsal and the lower caudal lobe deep black in newly captured examples, the colour fading after they have been some time in spirit. One example, captured at Cochin, Dec. 27, 1872, besides the black marks on the fins mentioned, had the hind edge of the dorsal and the end of the pectorals dark.

Hab. Mediterranean, Indian Ocean and Archipelago, also tropical parts of the Atlantic. It attains several feet in length.

24. (4.) Zygæna mokarran.

Zygæna mokarran, *Rüppell, N.W. Fische*, p. 66, t. xvii, f. 3; *Day, Fish. India, Supplement*, p. 809 (see synon.).

Anterior edge of head nearly straight, forming a more or less right angle with the lateral margin. Length of hind edge of one of the lobes equal to its width near the eye; no groove running along the anterior edge of the head. *Eyes*—near nostrils. *Teeth*—oblique, as broad at their base as long, with an indistinct lateral notch, and serrated on both edges. *Colour*—brownish-grey, becoming white beneath.

Hab. Red Sea to Kurrachee.

Third group. MUSTELINA.

5. Genus **MUSTELUS**, Cuvier.

Nictitating membrane present. Small spiracles behind the eyes. Mouth crescentic, with long labial folds. Teeth small, numerous, similar in both jaws, and pavement-like, obtuse, or with indistinct cusps. The first dorsal fin spineless, situated above the interspace between the pectoral and ventral: the second nearly as large as

the first; caudal without a distinct lower lobe, and no pit at the commencement of the fin.

Geographical Distribution. Seas of tropical and temperate regions*.

25. (1.) **Mustelus manazo.** (Fig. 5.)

Mustelus manazo, *Bleeker, Batav. Gen. Verhand.* xxvi, *Ichth. Japan,* p. 126; *Day, Fish. India,* p. 720, pl. clxxxvi, fig. 3 (see synon.).

Pah sorrah, Tel.

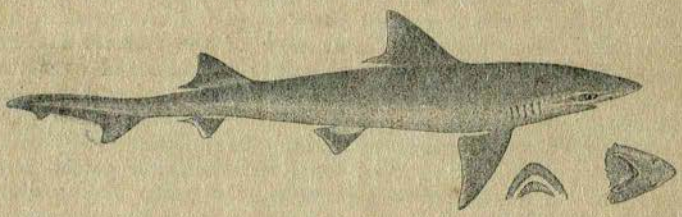

Fig. 5.—*Mustelus manazo.*

Snout produced and pointed, the length of its preoral portion equalling the width of the mouth (or $\frac{1}{4}$ more in the fœtus), which latter is somewhat angular. A well-developed labial fold at each angle of the mouth. *Teeth*—rhombic, and destitute of any distinct cusps. *Fins*—the first dorsal arises opposite the posterior end of the base of the pectoral, and does not extend to above the anal; the second dorsal smaller than the first, but the length of the bases of the two about the same. Pectoral reaches to below centre of first dorsal; anal commences beneath the posterior half of the second dorsal and is smaller than it. Caudal $\frac{2}{9}$ of the total length, its lower lobe moderately developed and notched. *Colour*—reddish grey superiorly, becoming dull white beneath. Posterior extremity of the caudal of a dark colour.

Hab. Seas of India to Japan. I obtained at Kurrachee a female (16·5 inches in length) which had several young inside.

6. Genus **TRIÆNODON**, Müller & Henle.

No spiracles. Nictitating membrane present. Mouth crescentic, with a pit behind its angle. Teeth numerous in both jaws, and consisting of one central cusp and a smaller lateral one on each side. First dorsal spineless, placed opposite the interspace between the pectoral and ventral fins. Lower caudal lobe distinct. A pit at the root of the caudal fin.

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* *Mustelus vulgaris* and *M. lævis* have both been captured in the Red Sea.

26. (1.) Triænodon obtusus*. (Fig. 6.)

Triænodon obtusus, *Day, Fish. India*, p. 720, pl. clxxxix, fig. 3.

Snout short and rounded, the distance between the mouth and the end of the snout about half the width of the mouth. Nostrils nearer end of snout than the mouth, each with a flap. Eye of moderate size. Gill-openings rather wider than the orbit. No spiracle. *Teeth*—with one central and a small lateral cusp on each side. *Fins*—the first dorsal commences behind the inner angle of

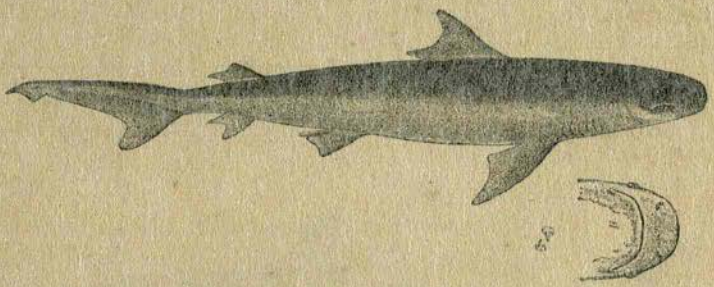

Fig. 6.—*Triænodon obtusus.*

the pectoral and the base does not extend to above the ventral. Second dorsal not quite half as large as the first and situated above the anal. Pectoral reaches to below the middle of the first dorsal; caudal fin nearly $\frac{1}{4}$ of the total length. *Colour*—dark above, becoming lighter beneath.

Hab. A young male, nineteen inches in length, was obtained at Kurrachee.

Family II. LAMNIDÆ.

Spiracles, if present, minute. No nictitating membrane. Mouth inferior and crescentic. Nostrils not communicating with the mouth. First dorsal spineless, and placed opposite the interspace between the pectoral and ventral fins; an anal fin present.

Synopsis of Indian Genera.

A keel along the side of the tail	1. LAMNA.
No keel along the side of the tail. Caudal fin less than one third total length	2. ODONTASPIS.
No keel. Caudal fin nearly one half total length	3. ALOPIAS.

* *Triænodon obesus* (*Carcharias*). Rüppell, N.W. Fische, p. 64, pl. xviii, f. 2.—Snout very short and obtuse. Nostrils with a short tentacle. *Fins*—first dorsal close to the root of the ventral; the second upwards of half the size of the first and opposite the anal. Summits of dorsal and caudal fins white. *Hab.* Red Sea; east coast of Africa; New Hebrides; and probably off India.

1. Genus **LAMNA**, Cuvier.

Syn. *Oxyrhina*, Agassiz.

Spiracles, if present, minute. No nictitating membrane. Mouth wide. Gill-openings large. Teeth large, awl-shaped, smooth or sometimes with a small lateral basal cusp on either side. The first dorsal fin spineless, placed opposite the interspace between the bases of the pectoral and ventral fins. Lower caudal lobe large. A keel along the side of the tail. A pit at the base of the caudal fin *.

27. (1.) **Lamna spallanzanii.** (Fig. 7.)

Oxyrrhina spallanzanii, *Bonap. Faun. Ital., Pesc.* t. cxxxvi, fig. 1.
Lamna spallanzanii, *Day, Fish. India*, p. 722, pl. clxxxvi, fig. 2 (see synon.).

Gammu sorrah, Tam.

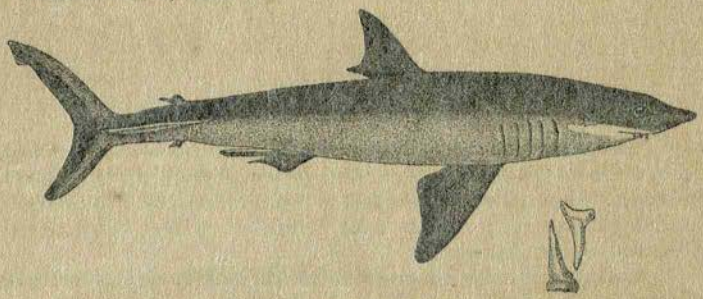

Fig. 7.—*Lamna spallanzanii.*

Snout pointed, angle of the mouth about midway between the nostril and the first gill-opening. Gill-openings very wide. *Teeth*—$\frac{13}{13}$ on each side, awl-shaped, with sharp but entire lateral edges, and destitute of basal cusps; the third on each side of the symphysis of the upper jaw smaller than those on either side of it. *Fins*—the base of the first dorsal rather nearer the pectoral than the ventral fin. Pectoral falciform, its inner being one fourth of the length of its outer margin. Second dorsal and anal small, situated opposite one another; the keel on the side of the tail commences in front of the bases of these fins. *Colour*—grey, becoming lighter beneath.

Lamna jiintheri, Murray (Ann. & Mag. Nat. Hist (5) xiii. p. 349), obtained at Kurrachee, is said to differ, having $\frac{22}{28}$ teeth on either

* In a specimen of this genus, *Lamna cornubica*, Pennant, in Wales, observed two embryos, and Neill, in 1804, remarked of one six feet long, at Newhaven, that "no fewer than thirty young ones appeared, fifteen in each of two bags. These were all from 12 to 14 inches in length, fully formed, and apparently ready for exclusion."

side, and the dorsal being a little further behind the base of the pectoral fin.

Hab. Red Sea and Indian Ocean, also the Atlantic and Mediterranean. This species attains to a very large size.

2. Genus **ODONTASPIS**, Agassiz.

Syn. *Triglochis*, Müller & Henle.

Spiracles minute and above the angle of the mouth. No nictitating membrane. Mouth wide and crescent-shaped. Teeth large, awl-shaped, and with one or two cusps at the base. Gill-openings of moderate size. Two spineless dorsal fins, the first opposite the interspace between the pectoral and ventral; the second dorsal and the anal not much smaller than the first dorsal. A pit present or absent at the root of the caudal fin.

Geographical Distribution. Temperate and tropical seas.

28. (1.) Odontaspis tricuspidatus. (Fig. 8.)

Carcharias tricuspidatus, *Day, Fish. India*, p. 713, pl. clxxxvi, fig. 1.

Dundanee, Sind.

Length of preoral portion of the snout equal to half the width of the mouth, and not equal to half the distance between the eye and the first gill-opening; no groove at the angle of the mouth.

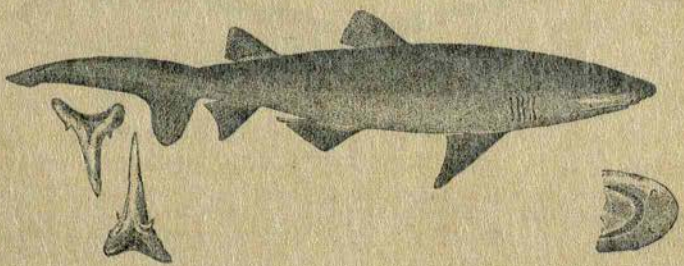

Fig. 8.—*Odontaspis tricuspidatus.*

Nostrils nearer to the mouth than to the end of the snout. Gill-openings much wider than the orbit. *Teeth*—$\frac{32\text{-}34}{30\text{-}34}$, very large, awl-shaped, smooth except at the base, where there exists a small basal cusp on either side. The fourth tooth on each side of the symphysis of the upper jaw very much smaller than those next to it; the central tooth on each side of the symphysis of the mandibles slender; the last few lateral rows in both jaws small. *Fins*—pectoral reaching to below the base of the first dorsal; the inner edge one fifth of the length of the outer. First dorsal very slightly larger than the second, its base situated nearer to the ventral than to the pectoral. The second dorsal slightly in advance of and

about the same size as the anal; length of base of anal equal to its distance from the ventral. Caudal fin $3\frac{1}{2}$ in the total length. *Colour*—brown superiorly, becoming dull white beneath.

Hab. Seas of Sind, where they abound—attaining at least twenty feet; one on board a native craft measured that length. A specimen, $10\frac{1}{2}$ feet long, from South Australia, is in the British Museum; also several jaws.

3. Genus **ALOPIAS**, Rafinesque.

Mouth crescentic. No nictitating membrane to the eye. Spiracles minute, close behind the orbit. Teeth of rather small size, flattened and triangular, having smooth edges. Gill-openings of medium size. The first dorsal fin spineless, inserted above the interspace between the pectoral and ventral fins; the second dorsal above the interspace between the ventral and anal, the latter being very small; caudal very long, with a pit at its commencement. No keel on the side of the tail.

29. (1.) **Alopias vulpes.** (Fig. 9.)

Squalus vulpes, *Gmel. Syst. Nat.* p. 1496.
Alopias vulpes, *Day, Fish. India, Supplement*, 1888, p. 810 (see synon.).

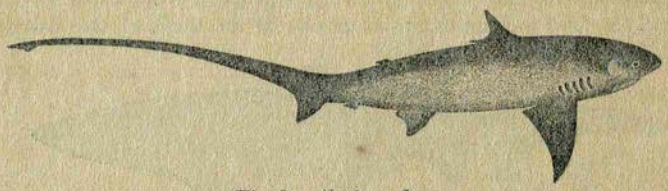

Fig. 9.—*Alopias vulpes.*

Body fusiform, gradually decreasing in size to the caudal fin, the great length of which is about half the total. *Eyes*—rather large. Nostrils beneath and nearer the anterior border of the mouth than the end of the snout. Gill-openings of medium size, the two last being over the pectoral fin. *Teeth*—about $\frac{22+22}{19+19}$, the third or fourth tooth on either side of the centre of the upper jaw being smaller than the others.

Hab. Both shores of the Atlantic Ocean, and the Mediterranean. One example from the Cape is in the Paris Museum. Mr. Haly ('Taprobanian,' 1886, i. p. 167) recorded one 8 feet 8 inches long from Ceylon; it was procured in the Colombo market in Feb. 1884, where it was quite unknown to the fishermen. It has also been obtained from San Francisco Bay, California, and New Zealand.

Family III. RHINODONTIDÆ.

Spiracles minute. No nictitating membrane. Gill-openings wide. Two spineless dorsal fins, the origin of the first opposite to the ventral or somewhat in advance of it; the second small, placed nearly opposite the anal; lower caudal lobe well developed. A keel along the side of the tail. A pit at the root of the caudal fin.

1. Genus **RHINODON**, Smith.

Definition as in family. Mouth and nostrils near the extremity of the snout. Teeth small and conical. Gill-rakers similar to those of the Basking Shark of northern seas.

Geographical Distribution. Ceylon, Seychelles to the Cape of Good Hope. This shark has been said to exceed fifty feet in length, and some authors even assert seventy. It is a harmless form.

30. (1.) **Rhinodon typicus.**

Rhinodon typicus, *Smith, Illust. Zool. South Africa, Pisces,* pl. xxvi; *Day, Fish. India, Supplement,* p. 811 (see synon.)

Snout broad, flat and short. Eyes small. Upper jaw with a long labial fold. *Colour*—brown, with white dots and narrow transverse lines.

Hab. One example recorded by Haly from the west coast of Ceylon.

Family IV. NOTIDANIDÆ.

Spiracles small and on the side of the neck. No nictitating membrane. Gill-openings six or seven. A single spineless dorsal fin placed nearly opposite to the anal; lower caudal lobe present. No pit at the root of the caudal fin.

1. Genus **NOTIDANUS**, Cuvier.

Syn. *Hexanchus* and *Heptanchus*, Rafin.; *Monopterhinus*, pt., Blainv.

Spiracles small and on the side of the neck. No nictitating membrane. Mouth crescentic. No labial fold. Gill-openings six or seven, and wide. Teeth in the upper jaw consisting of one or two pairs that are awl-shaped, followed by six broader ones, which have one strong and several smaller casps. In the lower jaw six large comb-like teeth on each side, and some smaller lateral ones. A single, spineless dorsal fin placed opposite the anal; lower caudal lobe present. No pit at the root of the caudal fin.

Geographical Distribution. Seas of tropical and temperate regions.

31. (1.) **Notidanus indicus.** (Fig. 10.)

Notidanus indicus, *Agassiz, Poiss. Foss.* iii, pp. 92, 217, t. E, f. 1 (teeth); *Day, Fish. India*, p. 723, pl. clxxxix, fig. 4 (see synon.).

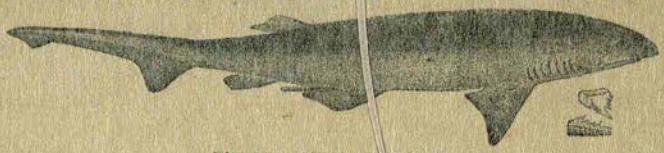

Fig. 10.—*Notidanus indicus.*

Snout rounded and obtuse. Cleft of mouth wider than deep. *Teeth*—opposite the symphysis of the upper jaw is a tooth having a single cusp, those on either side being stronger and denticulated. The central tooth in the lower jaw has no median cusp, but two or three lateral cusps on each side. *Colour*—grey, with dark blotches and marks.

Hab. Seas of India and South Africa to California.

Family V. SCYLLIIDÆ.

Spiracles present. Eye without any nictitating membrane. Mouth inferior. Teeth small, several rows being generally in use. The first dorsal fin spineless, placed above or behind the ventrals; an anal present, which may be in front of, below, or behind the second dorsal.

Synopsis of Indian Genera.

A. Nasal and buccal cavities separate; upper edge of caudal fin smooth ..... 1. Scyllium.
B. Nasal and buccal cavities confluent.
Minute spiracle behind each eye; second dorsal fin nearly opposite anal ..... 2. Ginglymostoma.
Spiracle behind eye and equal to it in size. Caudal portion of body and fin very long ..... 3. Stegostoma.
Spiracle below eye and well developed; anal fin behind second dorsal..... 4. Chiloscyllium.

1. Genus **SCYLLIUM**, Cuvier.

Syn. *Scylliorhinus, Halælurus, Poroderma*, and *Cephaloscyllium*, Gill.

Spiracles behind the eye. Nasal and buccal cavities distinct. Teeth small, in several rows; usually with a central and one or two lateral cusps. Origin of anal fin in advance of that of the second dorsal; upper edge of caudal not serrated.

These sharks, or "dog fishes," do not attain to any large size, but are much dreaded by fishermen, as they get entangled in their

nets, from which great injury occurs. The eggs are somewhat similar to those of the rays. The skins form fine shagreen.

Geographical Distribution. Tropical and temperate seas.

Synopsis of Indian Species.

Nasal valves confluent, with a single transverse uninterrupted flap and a well-developed labial fold ..... 1. *S. marmoratum*, p. 31.

Nasal valves separated from one another by a considerable interspace ..... 2. *S. capense*, p. 31.

32. (1.) Scyllium marmoratum. (Fig. 11.)

Scyllium marmoratum, *Bennett, Life of Sir S. Raffles*, p. 693; *Day, Fish. India*, p. 724, pl. cxc, fig. 2 (see synon.).

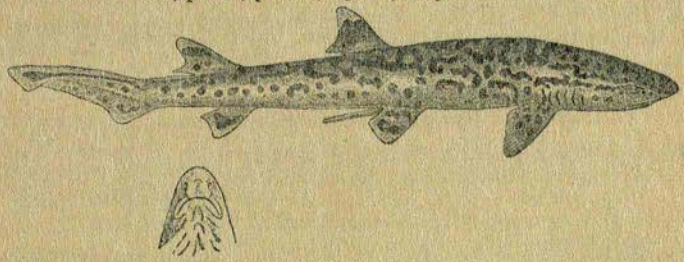

Fig. 11.—*Scyllium marmoratum.*

Length of the snout equals the width of the mouth. Nasal valves confluent in the form of a single broad flap, with a free posterior edge, and no cirrus. A well-developed labial fold. Gill-openings as wide as the orbit. *Teeth*—small. *Fins*—the first dorsal commences just behind the ventral; the second dorsal slightly larger than the first, and has the anal beneath its anterior one half or two thirds. *Colour*—of a tawny brown, becoming lighter beneath. Lines of spots, some of which occasionally become confluent, exist along the body; there may also be bands or ocelli.

Hab. Seas of India, where it is rare, to the Malay Archipelago.

33. (2.) Scyllium capense.

Scyllium capense (*Smith*), *Müller & Henle, Plagios.* p. 11; *Day, Fish. India*, p. 724, pl. cxc, fig. 1 (see synon.).

Snout obt[illegible]usal valves distinct, separated from one another by a considerable space, and having no prominent cirrus. No labial fold to the lower jaw, but a short one on the lower. Gill-openings narrow, not so wide as the orbit. *Teeth*—minute. *Fins*—the first dorsal inserted rather nearer to the anal than to the base of the ventrals; the second dorsal situated entirely behind the anal. *Colour*—[illegible] lightest beneath. Body with light vertical bands and some blotches.

Hab. An Indian example, about 40 inches in length, is in the British Museum.

2. Genus **GINGLYMOSTOMA**, Müller & Henle.

Syn. *Nebrius*, Rüppell.

A minute spiracle behind the eye, which also is minute. A quadrangular flap formed before the mouth by the conjoined nasal valves, and which has a free cirrus on either side. A superior and an inferior lip, the latter not extending across the symphysis. Nasal and buccal cavities confluent. Teeth either in many rows with a strong median and one or two smaller lateral cusps; or else in merely about three rows, of which the foremost only is in use, and each tooth with a convex and serrated edge. Fourth and fifth gill-openings situated close together. Dorsal fins spineless, the first above or behind the ventrals, the second rather in advance of or opposite to the anal.

Geographical Distribution. Red Sea, Indian Ocean to the Malay Archipelago; also tropical parts of the Atlantic.

Synopsis of Indian Species.

Teeth in three rows, with one central and four or five lateral cusps; second dorsal fin larger than the anal ..... 1. *G. concolor*, p. 32.
Teeth in many rows, with one central and three or four lateral cusps; second dorsal fin smaller than the anal ..... 2. *G. milleri*, p. 33.

34. (1.) **Ginglymostoma concolor.** (Fig. 12.)

Nebrius concolor, *Rüppell, N.W. Fische*, p. 62, t. xvii, f. 2.
Ginglymostoma concolor, *Day, Fish. India, Supplement*, p. 811 (see synon.).

Snout short. The nasal cirrus nearly reaches the lower lip. *Teeth*—in three rows, with one central and four or five lateral cusps, having serrated edges. *Fins*—angles of dorsal and of all paired

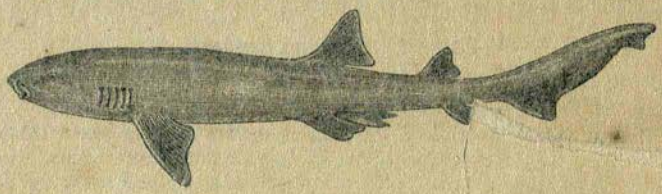

Fig. 12.—*Ginglymostoma concol*

fins pointed; second dorsal much smaller than first, but larger than the anal, and placed nearly opposite latter. Caudal one third of the total length.

Hab. Red Sea, and through the seas ia to the Malay Archipelago.

35. (2.) Ginglymostoma mülleri.

Ginglymostoma mülleri, *Günther, Catal.* viii, p. 408; *Day, Fish. India*, p. 725 (see synon.).

Snout very short, its length not equalling the width of the mouth. Nasal cirrus short, reaching to the edge of the upper lip. *Teeth*—in many rows, each with a large central cusp, and three or four lateral cusps on each side. *Fins*—first dorsal opposite the ventral, angles of all the paired fins pointed; second dorsal slightly in advance of the anal, but rather smaller than it or than the first dorsal. Caudal nearly one third of the total length.

Hab. Red Sea and Indian Ocean. Said to attain 8½ feet in length.

3. Genus **STEGOSTOMA**, Müller & Henle.

Spiracles about the size of the small eyes, behind which they are situated. Fourth and fifth gill-openings close together. Nasal and buccal cavities confluent. Snout obtuse; upper lip thick, with a cirrus on either side. A well-developed labial fold round the angle of the mouth. Teeth small, sometimes trilobed, the dental plate being almost quadrangular. Two spineless dorsal fins, the first above the ventral, the second anterior to the anal, which is near the caudal, the latter being very elongate.

Geographical Distribution. From the Red Sea and east coast of Africa, through the seas of India to the Malay Archipelago, and Formosa.

36. (1.) Stegostoma tigrinum. (Fig. 13.)

Squalus tigrinus, *Gmel. Syst. Nat.* p. 1493.
Stegostoma tigrinum, *Day, Fish. India*, p. 725, pl. clxxxvii, fig. 4 (young) (see synon.).

Pollee-makum, Kongarasi and *Oorookoolti sorrah*, also *Potrava* (when young), Tel.; *Corungun sorrah*, "monkey-mouthed shark," Tam.; *Shinvála*, Maráthi.

Head as broad as long. *Eye*—small, with the spiracle just behind it. Upper lip very thick, like a quadrangular pad, with a

Fig. 13.—*Stegostoma tigrinum.*

barbel on either side. A distinct labial fold round the angle of the mouth, which is slightly nearer to the eye than to the end of the snout. *Teeth*—small and trilobed. *Fins*—the origin of the first dorsal is a little posterior to the base of the ventral, it is about

as high in front as its base is long, and larger than the second dorsal, which commences a short distance behind it and anterior to the anal. Caudal fin very long, being about one half of the total length and with a notch below near its extremity. A low median, tubercular dorsal ridge, and sometimes a second on either side of dorsal fin. *Colour*—(*young*) white or buff, in the form of markings, the fish appearing black, with narrow white lines or bands, between which are white spots, across the head and body; these markings take on various forms in different examples. Adults tawny, or with more or less transverse bands of rounded spots, the colour of the fish being brownish.

Hab. Red Sea, east coast of Africa, seas of India to the Malay Archipelago, and beyond; attaining to 10 or 15 feet in length. This species is common at Madras. Its favourite food consists of mollusks and crustacea.

4. Genus CHILOSCYLLIUM, Müller & Henle.

Syn. *Hemiscyllium*, Müll. & Henle.

Spiracle below the eye. Fourth and fifth gill-openings close together. Nasal and buccal cavities confluent; nasal valve with a barbel. Lower lip continuous or interrupted in the centre. Teeth small, triangular, with or without lateral cusps. Two spineless dorsal fins, the first above or behind the ventrals, the second considerably anterior to the anal, which is near the caudal.

Geographical Distribution. Seas of India to the Malay Archipelago, and Australia.

37. (1.) Chiloscyllium indicum. (Fig. 14.)

Squalus indicus, *Gmel. Syst. Nat.* p. 1503.
Chiloscyllium indicum, *Day, Fish. India*, p. 726, pl. clxxxviii, fig. 3 (see synon.).

Bokee-sorrah or *Ra-sorrah*, Tel.; *Corungun sorrah*, Tam.; *Ettee*, Mal.; *Poos-hee*, Belooch.; *Bálavála*, Maráthi; *Nga man ingmyoung*, Burmese.

Head rather depressed and flatter below than above. *Eye*—small, with the spiracle (which is of about the same size) below and slightly posterior to it. Lips surround the mouth, the lower

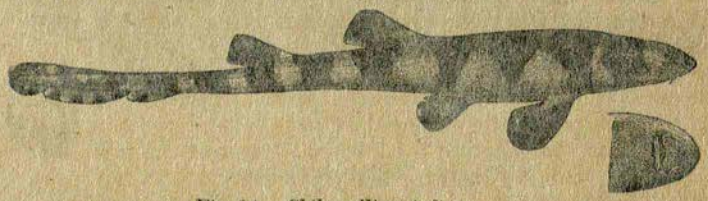

Fig. 14.—*Chiloscyllium indicum.*

labial fold being continuous; the mouth at its angle one third nearer to the eye than to the end of the snout, which is obtuse. Nasal valve with an elongated barbel. *Teeth*—small, triangular

with lateral cusps. *Fins*—the origin of the first dorsa is just posterior to the base of the ventral, the anterior edge of the former exceeds the length of its base, which latter distance equals the length between the two dorsal fins, both of which have their anterior and upper edges rounded; the second fin somewhat smaller than the first and ending some distance anterior to the origin of the anal. Anal notched, terminating close to the caudal fin, which is also notched posteriorly, and is contained about 5½ times in the total length. From one to three smooth or tubercular ridges may exist along the back, or may be entirely absent. *Colour*—this varies exceedingly: usually grey with dark, or even black, cross-bands, which may or may not include white spots; sometimes the cross-bands break up into spots or bands, having dark edges; or the fish is simply of a reddish-brown colour.

Hab. Seas of India to the Malay Archipelago, and beyond.

Suborder B. *BATOIDEI.*

Spiracles present; gill-openings in five pairs, and on the ventral surface of the body. Body depressed, forming, with its largely developed pectoral fins, a more or less flat disk, and usually having a thin and slender tail. Dorsal fin, when present, in the caudal portion of the body; anal absent.

Some of these fishes approach the sharks in external form, the tail portion not being so sharply contracted behind the trunk as in most rays.

Skates and rays exist in enormous numbers in the Indian seas, where they attain to a great size, and some are dreaded by fishermen because of the wounds inflicted by their caudal spines, while others cause great injury to the oysters and other mollusks. Skates are gregarious, and may suddenly arrive, to the dismay of the owner of an oyster-bed, as they appear to remain so long as any mollusks are to be obtained. Rays lie concealed in the sand, and are reputed to be able to suddenly encircle fish or prey swimming above them with their long whip-like tails, and then wound them with their serrated tail-spines. They are observed in aquaria to cover their victims with their expanded body and subsequently convey their prey to their mouths by movements of their pectoral fins. Their skins were formerly valuable as shagreen, being considered superior to those of sharks. Irrespective of this use, they are occasionally employed as rasps or sand-paper, to give the first surface to wood or horn which it is desired to polish. Their fins are exported, along with those of the sharks, to China, where they are in request for soups, while from their livers an oil is extracted (see pp. 5, 6, *ante*).

The thin horny cases, inside which are the fœtal rays, are more quadrangular in form and comparatively smaller than what are observed among the sharks; such cases have a horn-like projection from each corner.

Synopsis of Indian Families.

I. A flattened snout, having lateral teeth, rendering it saw-like. Trunk passing gradually into the tail ..... **Pristidæ.**

II. Pectoral fins not continued to the snout. Trunk gradually passing into the tail, which has two dorsals and a caudal fin.... **Rhinobatidæ.**

III. Trunk a broad smooth disk. Usually dorsal and caudal fins. An electric organ ..... **Torpedinidæ.**

IV. Trunk a broad and generally a rough disk. Pectoral fins extend on to the snout. A fold along each side of the tail; no serrated caudal spine. No electric organ..... **Raiidæ.**

V. Pectoral fins extend on to and are confluent at the snout. No fold along side of tail, which latter is usually armed with a serrated spine ..... **Trygonidæ.**

VI. Pectoral fins do not extend on to the side of the head; snout with a detached pair of fins ..... **Myliobatidæ.**

Family I. PRISTIDÆ. (Saw-fishes.)

Snout much produced, flattened, and having a saw-like appearance, due to the existence of large teeth on its lateral edges. Trunk passing gradually into the tail.

The endoskeleton of a tooth of the saw of one of these fishes consists of from three to five hollow tubes, tapering towards their extremity, and covered with an osseous deposit which is perforated with fine holes. The teeth vary both in size and number in the same species, rendering them unsuitable as specific, but admissible as individual distinctions.

Great injuries can be inflicted by these fishes, which strike sideways with their formidable snouts; and although not personally a witness to the fact, I have been informed on native authority that large ones have been known to cut a bather completely in two. The largest example I saw was off the coast of Sind (*Pristis zysron*); it measured over 16 feet, the rostrum being 4 ft. 2 in. in length. A *P. cuspidatus*, 14 feet long, captured at Calicut, was found to have a liver weighing 185 lb., which was taken to the oil-factory when I was present.

At Gwádur, on the Mekran coast, I found that the fishermen of all religions presented the saws of these fishes at a small temple, where they were hung up inside or piled round the outside. The priest was expected to pray for success for the fishermen in their takes and a safe return to shore. At the Andaman Islands the aborigines wishing to make a suitable offering to their superintendent, attacked an enormous saw-fish, which they harpooned, and eventually secured at the risk of their lives. They presented him with the rostrum, which I now possess.

Geographical Distribution. Seas of tropical and temperate regions.

1. Genus **PRISTIS**, Latham.

Body elongated and depressed. Gill-openings inferior and of moderate width. Spiracle wide and posterior to the eye, which latter has no nictitating membrane. Nostrils inferior. Teeth minute and obtuse. Dorsal fins spineless, the first opposite or nearly opposite the ventrals; front edge of pectoral free.

Synopsis of Indian Species.

A. Caudal fin with a distinct lower lobe.
From 23 to 35 pairs of teeth on the snout; in the young their hinder edge is barbed. Dorsal fin arises behind the root of the ventral .. 1. *P. cuspidatus*, p. 37.
B. Caudal fin without any distinct lower lobe.
From 17 to 20 pairs of teeth on the rostrum, commencing at its base. Dorsal fin almost entirely in advance of ventrals ..... 2. *P. perrotteti*, p. 38.
From 25 to 32 pairs of teeth on the rostrum, commencing near its base. Dorsal fin almost entirely posterior to the ventrals ..... 3. *P. zysron*, p. 38.
From 24 to 27 pairs of teeth on the rostrum. Dorsal fin opposite ventral ..... 4. *P. pectinatus*, p. 39.

38. (1.) Pristis cuspidatus. (Fig. 15.)

Pristis cuspidatus, *Latham, Tr. L. S.* 1794, ii, p. 279, pl. 26, fig. 3 (rostrum); *Day, Fish. India*, p. 728, pl. cxci, fig. 3 (see synon.).

Yahla, Tel.; *Vela meen*, Tamil.

Rostrum narrow and of about the same width throughout, armed with from twenty-three to thirty-five pairs of broad teeth, those on one side (generally the right) often exceeding in number those on the other. This dentition is absent in the fœtus, while

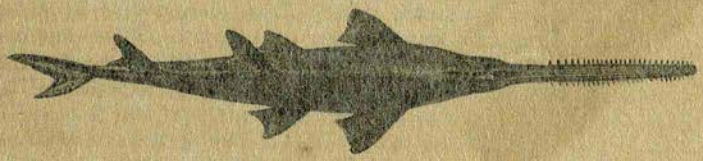

Fig. 15.—*Pristis cuspidatus.*

in the immature it only exists in the anterior three quarters of the snout, and in the adult a considerable portion of the base is unarmed. Usually the anterior six pairs of teeth are opposite one another, and the posterior teeth in the immature are mostly barbed behind. Mouth transverse, with a membranous valve (fringed in the young) behind the teeth in the upper jaw, and with a deep notch near the symphysis. The pupil is transverse, with a semicircular flap above and another below: these flaps are easily raised, depressed, or expanded, according to the stimulus of light received, which they can partially or entirely exclude; lens very soft. Spiracles large, nearly transverse, posterior to the eyes,

half a diameter of the eye in width. Nostrils situated about one and a half transverse lengths from the mouth; they have long triangular narrow valves in their upper, and a hem-like one at their lower margins; their distance asunder posteriorly equals their length, and is twice as much anteriorly. *Teeth*—small, longer than broad. *Fins*—the first dorsal commences just behind the ventral; the second dorsal midway between the posterior extremity of the first dorsal and the base of the caudal. The two dorsals are of equal size, their upper margins concave, and the posterior lobe of each produced. Posterior margin of the caudal deeply excavated so as to form two lobes. A keel passes along the tail, dividing the lateral from the abdominal surfaces. *Colour*—greyish-yellow above, whitish beneath. Iris golden, with a black edge.

Hab. Seas of India to the Malay Archipelago, ascending rivers; attaining 20 feet and upwards in length. The flesh is equally esteemed with that of the sharks. The fins are prepared and sent to China: oil is extracted from the livers, whilst the skins are useful for sword-scabbards or for smoothing down wood.

39. (2.) Pristis perrotteti.

Pristis perrotteti, *Müll. & Henle, Plagios.* p. 108; *Day, Fish. India*, p. 729, pl. cxci, fig. 1 (see synon.).

Kondah, Ooriah.

Rostrum of moderate breadth, rather narrow anteriorly, armed with from seventeen to twenty pairs of teeth, mostly about the same number on either side, and commencing at the base of the snout; the first four pairs being opposite one another, and the breadth of the base of each anteriorly being about equal to one third of the interspace. Spiracles placed very obliquely, from 1 to 1½ diameters behind the orbit. *Teeth*—larger than in *P. cuspidatus* or *P. zysron*, oval, longer than broad. *Fins*—the first dorsal almost entirely in advance of the ventral; second dorsal commences nearly midway between the posterior extremity of the first dorsal and the base of the caudal; these two fins are of about equal size; inferior margin of the caudal with a faint indication of a lobe. *Colour*—reddish brown superiorly, becoming dull white along the abdominal surface; iris golden, with a black edge.

Hab. Tropical seas, entering rivers. In the Mahanadi river, Orissa, I observed it at least forty miles from the sea, far beyond the influence of the tides, where I obtained several specimens 4 ft. in length. In Orissa it is only eaten by the sweepers and the very lowest castes.

40. (3.) Pristis zysron.

Pristis zysron, *Bleeker, Batav. Gen. Verhand.* xxiv, *Plagios.* p. 55; *Day, Fish. India*, p. 729, pl. cxci, fig. 2 (see synon.).

Vella sorrah, Tamil.

Rostrum intermediate in width between *P. cuspidatus* and *P. perrotteti*, of about the same breadth throughout, and armed with from twenty-five to thirty-two pairs of teeth, of mostly the same number on either side; they commence just in front of the base of the snout, the posterior ones are much further apart than the anterior. *Teeth*—intermediate in size between *P. cuspidatus* and *P. perrotteti*. *Fins*—first dorsal almost entirely behind the ventrals; second dorsal as large as the first, or larger, is situated rather near to the root of the caudal, to which its posterior lobe almost reaches; caudal without a lower lobe. *Colour*—sandy-brown, becoming lighter beneath.

Hab. Seas of India to the Malay Archipelago; attaining at least 20 ft. in length. This species is perhaps more common in the seas of India than *P. cuspidatus*. It is especially abundant along the Mekran and Sind coasts, where it is much dreaded.

41. (4.) Pristis pectinatus.

Pristis pectinatus, *Latham, Tr. L. S.* 1794, ii, p. 278, pl. 26, fig. 2 (snout); *Day, Fish. India, Supplement*, p. 811 (see synon.).

Nga-tat-way, Burmese; *Khurra mach*, Chittagong.

Rostrum nearly twice as wide at its termination as at its base, and armed with from twenty-four to twenty-seven pairs of, generally, long teeth, not placed opposite one another. *Fins*—first dorsal commences opposite ventral, the second dorsal of about equal size to the first; no lower caudal lobe. *Colour*—as in the last.

Hab. Red Sea and through the Indian Ocean. One 24 ft. long asserted by fishermen to have been taken at Akyab.

Family II. RHINOBATIDÆ.

The disk slightly dilated laterally; the rayed portion of the pectoral fin not continued on to the snout. Trunk gradually passing into the tail, which is thickened and has a longitudinal fold along each side. Two well-developed dorsals, likewise a caudal fin. No electric organs.

These fishes are very destructive to marine crustacea and mollusks; and are said to congregate in large droves.

Geographical Distribution. Tropical and temperate seas.

Synopsis of Indian Genera.

Two dorsal fins, the anterior opposite the ventrals ..... 1. RHYNCHOBATUS.
Two dorsal fins, the anterior situated far behind the ventrals ..... 2. RHINOBATUS.

1. Genus **RHYNCHOBATUS**, Müller & Henle.

Syn. *Rhina*, sp., and *Rhinobatus*, sp., Bl. Schn.; *Rhamphobatis*, Gill.

Body depressed and elongated. Gill-openings inferior, narrow, and inside the base of the pectoral fin. Spiracles wide and behind the eyes, which latter have no nictitating membrane; snout rather elongated and acute; nostrils inferior, oblique, wide slits. Teeth obtuse, ridged; the dentary plate having an undulated surface. Dorsal fins spineless, the first opposite the ventrals; front edge of pectoral free, not extending to the head; caudal with a well-marked lower lobe.

Geographical Distribution. From the Red Sea and east coast of Africa through the seas of India to the Malay Archipelago and China.

Synopsis of Indian Species.

Snout elongated; few tubercles or spines on head or body. A black shoulder-spot and numerous white spots on upper surface 1. *R. djeddensis*, p. 40.
Snout broad, having a semicircular outline. Rows of large tubercles and spines on head and trunk. Brown ..... 2. *R. ancylostomus*, p. 41.

42. (1.) **Rhynchobatus djeddensis.** (Fig. 16.)

Raja djiddensis, *Forsk. Descrip. Anim.* p. 18.
Rhynchobatus djeddensis, *Day, Fish. India*, p. 730, pl. cxcii, fig. 1 (see synon.).

Walawah Tenkee, *Nul Ulavi*, or *Tipi Ulavi*, Tel.; *Ránja*, Marathi; *Palunga* or *Parangan*, Tam.

Snout elongated, the distance between the mouth and end of snout equals one fourth to one fifth of the entire length excluding

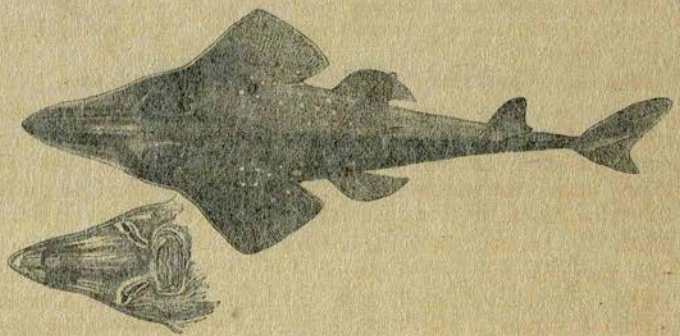

Fig. 16.—*Rhynchobatus djeddensis.*

the caudal fin, being shortest in adults. *Eyes*—rather large; the spiracle close behind the orbit. *Teeth*—oval, wider than broad, with a horizontal cusp across the centre of each; $\frac{40-42}{40-42}$, twenty to twenty-five vertical rows across the middle of both jaws. Dental plate with a central and a smaller lateral elevation; corresponding emarginations exist in the upper jaw. *Fins*—the first dorsal

commences opposite the centre of the base of the ventral. The second dorsal is half as far from the base of the caudal as from the posterior extremity of the first dorsal; and is smaller than the latter fin, but of the same shape. *Scales*—minute, of irregular shapes and sizes, keeled; a number of tubercles, directed backwards, exist in rows in some parts of the body; a supraorbital row extends from the anterior margin of each orbit round its upper edge to above the spiracle; a second passes from a central point between the termination of the last two and proceeds along the back to the base of the first dorsal, the tubercles on it being much further apart than in the other lines; from slightly behind the commencement of the dorsal line of spines is a short diverging row on either side, also a row on the shoulder, and two or three spines on the scapula. The lateral keel commences a little above the termination of the ventrals. *Colour*—the immature are dull grey above, whitish, sometimes tinged with red, beneath. A dark or black band on the upper eyelid and a dark spot beneath on either side of the snout; also there is usually, but not invariably, a black spot at the root of the pectoral, which may have several small white spots round it. The body and sometimes the pectoral fins are spotted with whitish or light grey. Iris golden. The adult is of a dull grey above and lighter on the abdomen.

Hab. Red Sea and east coast of Africa, seas of India to the Malay Archipelago, and beyond. The flesh is considered nourishing whether eaten salted or fresh, and oil from the liver is much esteemed. The young are captured along the Coromandel coast in large numbers about the month of March. This fish grows to at least six feet in length.

43. (2.) Rhynchobatus ancylostomus.

Rhina ancylostomus, *Bl. Schn. Syst. Ich.* p. 352, t. lxxii.
Rhynchobatus ancylostomus, *Day, Fish. India*, p. 730, pl. cxciii, fig. 3 (see synon.).

Mun ulava, "mud skate," Tam.; *Nalla dindi*, or *Pottila sora*, Tel.

Snout very broad with a semicircular outline. A longitudinal row of tubercles on each side of the head above the eyes continued on to the shoulders, and a median one along the back, with two short lateral rows between the last and the pectoral fin; a few tubercles round the front edge of the eye and below the spiracle. *Teeth*—$\frac{77}{75}$; twenty-two vertical rows in the centre of the upper and twenty-seven in the centre of the lower jaw. The dental surface deeply undulated, with one large median and a smaller lateral elevation in the lower jaw and with corresponding emarginations in the upper. The teeth are largest on the summit of each elevation; all are obtusely rounded, with several longitudinal ridges across each. *Colour*—dull brown, lighter beneath; the body and sometimes the fins covered with whitish spots; occasionally some tortuous black lines.

Hab. From the east coast of Africa through the seas of India to the Malay Archipelago and China. One 6 ft. 10 in. long was sent by Dr. Jerdon to the British Museum; in it were found the

remains of great numbers of crustacea of many kinds. The natives assert that this ray swims slowly just above the bottom of the sea not far from the shore, picking up what it can find.

2. Genus **RHINOBATUS**, sp., Bl. Schn.

Syn. *Syrrina*, Müll. & Henle.

Body depressed and elongated. Spiracles wide, behind the eyes. Snout elongated, the cranial cartilage produced and the interval between it and the pectoral fin filled by a membrane. Nostrils oblique and wide; the anterior nasal valves not confluent. Teeth obtuse, ridged. Dorsal fins spineless, both far behind the ventral; no lower caudal lobe.

Geographical Distribution. Tropical and subtropical seas. Individuals are exceedingly numerous along the coast of India, and prefer a sandy to a muddy bottom. Tickell observed that they have the singular habit of coming so close to the edge of the water that the retiring wave frequently leaves them exposed to the air, in which condition they contentedly remain allowing the surf to cover them and desert them alternately. They often select a smooth, sloping, sandy beach for this purpose, where they lie with their snouts pointed seawards, so that if danger approaches they wriggle seawards and swim away with the next wave.

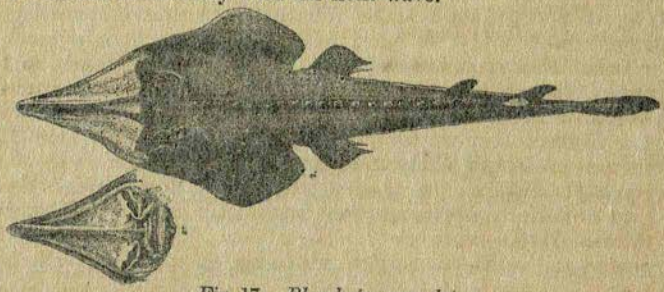

Fig. 17.—*Rhinobatus granulatus.*

Synopsis of Indian Species.

Snout elongated; a row of spines along the middle of the back ..... 1. *R. granulatus*, p. 42.
Snout rather obtuse; a few blunted spines along the middle of the back ..... 2. *R. halavi*, p. 43.
Nostrils very large, their distance apart at the base being less than half their length .... 3. *R. thouini*, p. 44.
Snout rather elongated; a row of tubercles along the middle of the back ..... 4. *R. columnæ*, p. 44.

44. (1.) **Rhinobatus granulatus.** (Fig. 17.)

Rhinobatus granulatus, *Cuv. Règn. Anim.* ed. 2, ii, p. 396; *Müll. & Henle, Plagios.* p. 117, t. xxxviii; *Day, Fish. India*, p. 732, pl. cxcii, fig. 2 (see synon.).

Suttiwarah, Tel.; *Pur-run-gun*, Tamil; *Cun-da-ree*, Sind.; *Nga-man-haing*, or *Nga-man-kha*, Burmese; *Mattia byllia*, Chittagong.

Snout elongate, its length being from 4½ to 5⅓ in the total, and as a rule being longest in the immature; the width of the interorbital space varies from 2⅓ to 3½ in the length of the snout. Anterior nasal valve with no lateral dilatation. The distance between the external angles of the nostrils equals about two thirds or three fifths in the preoral portion of the snout; the two rostral ridges narrow and closely approximating in their anterior half or two thirds; mouth transverse. *Teeth*—$\frac{42}{32}$, dental plate with a central and lateral elevation in the lower, with corresponding depressions in the upper jaw: 20 to 22 vertical rows in the upper and 13 in the lower jaw opposite the symphysis. *Scales*—tubercles on the back, and a row of compressed spines along its middle, which become obsolete with age; some spines on the edge of the orbit and on the shoulder. In the young a row likewise along either side of the upper edge of rostral ridge. *Colour*—reddish grey superiorly, becoming dull white beneath.

Hab. Seas of India to the Malay Archipelago and Australia. This ray attains at least seven feet in length.

45. (2.) Rhinobatus halavi.

Raja halavi, *Forsk. Descr. Anim.* p. 19.
Rhinobatus halavi, *Day, Fish. India*, p. 731, pl. cxciii, fig. 4 (see synon.).

Páré, if young *Padangan*, Tam.

Snout rather obtuse, its length contained 7 to 8 times in the total. The width of the interorbital space 2¼ to 2⅓ times in the length of the snout. Anterior nasal valve not dilated laterally. The distance between the outer angles of the nostrils four fifths the preoral length of the snout; the length of the nostrils about equals the distance their bases are asunder. Rostral ridges divergent posteriorly, becoming confluent in their anterior half or two thirds. *Teeth*—transversely oval, with a slight ridge along the centre, the width of the plate above the symphysis of both jaws being one eighth of its length; $\frac{70}{66}$ rows of teeth, and fifteen vertical rows in the median line in either jaw. The dental plate almost straight. *Fins*—the two dorsals of about the same size, their distance asunder equalling the interspace between the second dorsal and the base of the caudal, the latter being 7½ to 8⅓ in the total length. *Scales*—somewhat trefoil-shaped and flattened, being rather largest along the median line of the back, which, however, is not spined, although a few tubercles almost form spines. *Colour*—reddish grey superiorly, becoming white beneath; fins and snout with a reddish tinge. Large examples have occasionally black blotches over them.

Hab. From the Mediterranean, west coast of Africa and Cape of Good Hope: also from the Red Sea through the seas of India to the Malay Archipelago and China. This species attains at least six feet in length.

46. (3.) Rhinobatus thouini.

Raie thouin, *Lacépède, H. N. Poiss.* i, p. 134, pl. i, figs. 3–5.
Rhinobatus thouini, *Müll. & Henle, Plagios.* p. 120; *Day, Fish. India,* p. 732, pl. cxc, fig. 4 (see synon.).

Snout of moderate extent, contained 5 or 6 times in the total length; the width of the interorbital space $2\frac{2}{3}$ in the length of the snout. Anterior nasal valves not dilated laterally. The distance between the outer angles of the nostrils equals two thirds of the length of the preoral portion of the snout; the length of the nostrils is more than twice the extent their bases are apart. Mouth straight. Rostral ridges confluent in almost their entire length. *Teeth*—small, upwards of one hundred rows in either jaw. *Fins*—the two dorsals of about the same size, high and pointed, the first if laid flat nearly reaching the base of the second dorsal; caudal $6\frac{1}{2}$ in the total. *Scales*—skin granulated with a row of compressed spines along the middle of the back and smaller ones over the shoulders and above the eyes. *Colour*—brown, becoming yellowish white beneath.

Hab. From the Red Sea through the seas of India to the Malay Archipelago. This species attains to $6\frac{1}{2}$ feet in length, according to Bleeker.

47. (4.) Rhinobatus columnæ.

Rhinobatus columnæ, *Bonaparte, Faun. Ital.* iii, pl. 152; *Müll. & Henle, Plagios.* p. 113; *Day, Fish. India, Supplement,* 1888, p. 811 (see synon.).

Snout rather elongated, the distance between the outer angles of the nostrils is equal to two fifths of the length of the preoral portion of the snout. Each anterior nasal valve connected to a fold of skin that passes towards the median line and so nearly joins that of the opposite side. The upper rostral ridges are convergent in front. Back finely granular, with a median row of small tubercles. *Colour*—brown; young examples have a white snout.

Hab. Mediterranean, the Indian and Atlantic Oceans.

Family III. TORPEDINIDÆ.

Trunk broad and disk smooth. Anterior nasal valves confluent and forming a quadrangular flap. Body gradually passing into the tail, which latter has a rayed dorsal (except in *Temera*) and caudal fin; a longitudinal fold along both sides. An electric organ situated between the pectoral fin and the head.

The upper surface of the electric organs in these fishes is positive and the lower negative.

Geographical Distribution. Tropical, subtropical, and temperate seas. In India the species of this family do not appear to be used as food.

Synopsis of Indian Genera.

Two dorsal fins; spiracles immediately behind the eyes .. 1. NARCINE.
One dorsal fin ..... 2. ASTRAPE.

1. Genus **NARCINE**, Henle.

Disk distinct from the tail, which has a lateral fold on each side and is longer than the disk. Spiracles close behind the eyes: nasal valves confluent, forming a quadrangular flap. Teeth nearly flat, with a central point. Two dorsal fins, the anterior behind the ventrals and usually smaller than the posterior. An electric apparatus present.

It must be noted that an apparatus exists in fishes of the genus *Raia* which presents the anatomical characters of electric organs, and has been known for a long period.

Geographical Distribution. Tropical and subtropical seas.

48. (1.) **Narcine timlei.** (Fig. 18.)

Raja timlei, *Bl. Schn. Syst. Ich.* p. 359.
Narcine timlei, *Day, Fish. India*, p. 733, pl. cxcii, fig. 3 (see synon.).
Temeree and *Nalla Temeree*, Tel.

Outline of disk somewhat rounded, broader than long; along the side of the tail is a broad skinny keel reaching the base of the caudal fin. Caudal portion of fish rather longer than the body. Nasal valves confluent, forming a quadrangular skinny flap which is rather elongated in the middle. Spiracle just behind the orbit and not tuberculated on the edge. *Teeth*—flattened anteriorly, the internal ones with a small median cusp; the dental plate only embraces the central half of each jaw, the lips being thickened and continuous at the angles. The form of the dental plate varies, being either angular in the mandible, the angle pointing downward,

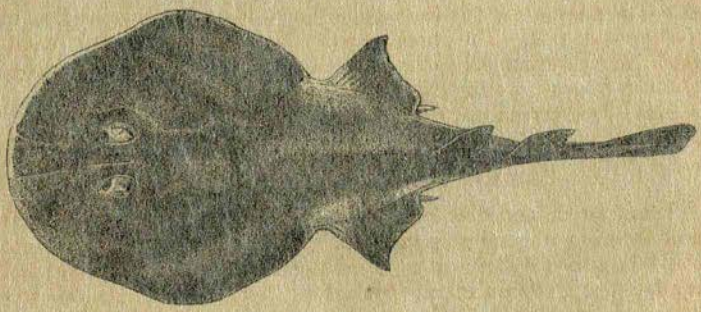

Fig. 18.—*Narcine timlei.*

or similar to what obtains in the upper jaw. *Fins*—the first dorsal usually commences just behind the ventrals, but occasionally over their posterior extremity, it is somewhat smaller than the second; in the young its apex forms an angle, which in the adult becomes rounded. The distance between the two dorsals equals that between the posterior dorsal and the caudal. The size and shape of the two dorsals is similar. Caudal with its hinder edge rounded

and confluent with its lower edge. *Colour*—body and fins reddish brown above, with numerous irregularly sized chocolate-coloured spots; lower surface white. Pupil triangular, apex below. Iris golden. In the immature the spots have a white margin. Some examples are marked all over with large brown blotches much wider than the ground-colours; in others no spots at all exist. These differences in colour do not depend on sex or age.

Hab. Seas of India to the Malay Archipelago. This fish attains at least eighteen inches in length.

2. Genus ASTRAPE, Müller & Henle.

Tail with a fold on either side. Spiracles close behind the eyes, which last are minute. Nasal valves confluent, forming a large quadrangular flap. Teeth flattened or with a central elevation, the dental plate extending slightly beyond the outer edge of the jaws. A single dorsal fin on the tail; caudal well developed. An electric apparatus on the side of the head between it and the pectoral fin.

Geographical Distribution. Seas of India to the Malay Archipelago and China, also the Cape of Good Hope and Madagascar.

49. (1.) Astrape dipterygia. (Fig. 19.)

Raja dipterygia, *Bl. Schn. Syst. Ich.* p. 359.
Astrape dipterygia, *Day, Fish. India*, p. 734, pl. cxcii, fig. 4 (see synon.).

Zinzina, Marathi; *Timiri tiki*, Tel.

Disk rounded, as wide as long, extending posteriorly to over the anterior margins of the ventrals. Tail shorter than the body; a

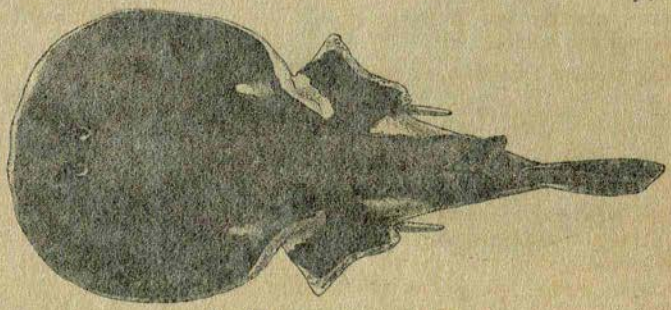

Fig. 19.—*Astrape dipterygia.*

low keel along the lateral edge of the former. Snout short. Spiracles smooth, close to and much larger than the eyes; vent slightly nearer to the head than to the posterior extremity of the caudal fin. *Teeth*—pointed, with tetragonal bases; they project slightly beyond the margin of the jaws. *Fins*—ventrals with their angles acute in the young, rounded in the adult. Caudal rounded, its

upper and lower portions confluent. *Colour*—dull reddish olive above, whitish below. A white spot near each side of the posterior end of the head, another above the end of the ventral, and generally a third at the root of the caudal; ventral with a white edge.

Hab. Seas of India to the Malay Archipelago, China and Japan. This species attains at least ten inches in length.

Family IV. RAIIDÆ.

Disk broad, rhombic; tubercules or spines usually present. The pectorals extend to the snout. The body passes gradually into the tail, which has a longitudinal fold on either side. No serrated caudal spine. Electric organs absent *.

In the year 1815 Colonel Montagu drew attention to a sexual character which was observable in some species of these fishes, in which the teeth were blunted in the females and pointed in the males. Another sexual character is that of spines on the body which are temporarily developed during the breeding-season.

Geographical Distribution. Seas of both hemispheres, but more numerous in the northern; it possesses but few representatives along the coasts of India, and seems to be absent from the Red Sea.

1. Genus **PLATYRHINA**, Müller & Henle.

Disk rhombic, with a fold on either side; tail distinct. Nasal valves distinct. Two dorsal fins on the tail; caudal well developed; ventrals separated one from the other. Body covered with rough asperities and spines.

Geographical Distribution. Seas of India to China and Japan.

50. (1.) Platyrhina schonleinii.

Platyrhina schonleinii, *Müll. & Henle, Plagios.* p. 125, t. xlv; *Day, Fish. India,* p. 735 (see synon.).

Disk subcircular; snout obtuse; tail as long as the disk. Dental plate undulating; three elevations in the lower and three corresponding depressions in the upper jaw. Nostrils wide apart. A row of strong spines and also smaller lateral ones along the median line of the back and tail; some more along the edge of the orbit and on the shoulder. *Colour*—brown, covered with light blotches; said sometimes to have dark cross bands and large dark spots.

Hab. Coromandel coast of India. A male example, 27½ inches in length, was in the Madras Museum.

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* See remarks to genus *Narcine*, p. 45, ante.

Family V. TRYGONIDÆ.

Disk wide; the pectorals continued to the extremity of the snout, where they become confluent. Tail long and slender, without any lateral folds. Vertical fins, if present, imperfectly developed, or they may be modified into a serrated spine.

The forms with armed tails, generally termed "sting rays," occasion exceedingly dangerous injuries, not merely owing to the jagged nature of the caudal spines, but apparently also to the presence of some irritating foreign substance, which is carried into the wound.

Geographical Distribution. Tropical and temperate seas.

Synopsis of Indian Genera.

Tail long and spineless. Body densely covered with tubercles ..... 1. UROGYMNUS.
Tail long, armed with a serrated spine. Teeth flattened 2. TRYGON.
Tail long, armed with a serrated spine, and having a broad lower cutaneous fold continued to its termination ..... 3. TÆNIURA.
Body very broad, tail very short and armed with a serrated spine. Teeth with from one to three cusps ..... 4. PTEROPLATEA.

1. Genus **UROGYMNUS**, Müller & Henle.

Syn. *Anacanthus*, Ehren.; *Rhachinotus*, Cantor.

Disk subcircular; tail long and distinct, destitute of any spine, but with a narrow inferior fold; pectorals united anteriorly. Teeth flattened. Body covered with osseous tubercles, amongst which are sharp conical spines.

Geographical Distribution. From the Red Sea and east coast of Africa, throughout the seas of India to the Malay Archipelago.

51. (1.) **Urogymnus asperrimus.**

Raja asperrima, *Bl. Schn. Syst. Ich.* p. 367.
Urogymnus asperrimus, *Day, Fish. India*, p. 736, pl. cxcv, fig. 1 (see synon.).

Moollan tiriki, Tam.

Disk nearly as wide as long; snout scarcely projecting. Body densely covered with small heart-shaped scales, between which are numerous thorns which are generally erect, and are continued posteriorly to the first fifth of the tail, where they cease. On the pectoral fins are numerous small conical spines, irrespective of those over the body amongst the tubercles. *Colour*—greenish above, white beneath.

Hab. Red Sea, east coast of Africa, seas of India to the Malay Archipelago. One, 2 feet across the disk, existed in the Madras Museum. This species is said to attain to 4 or 5 feet in length.

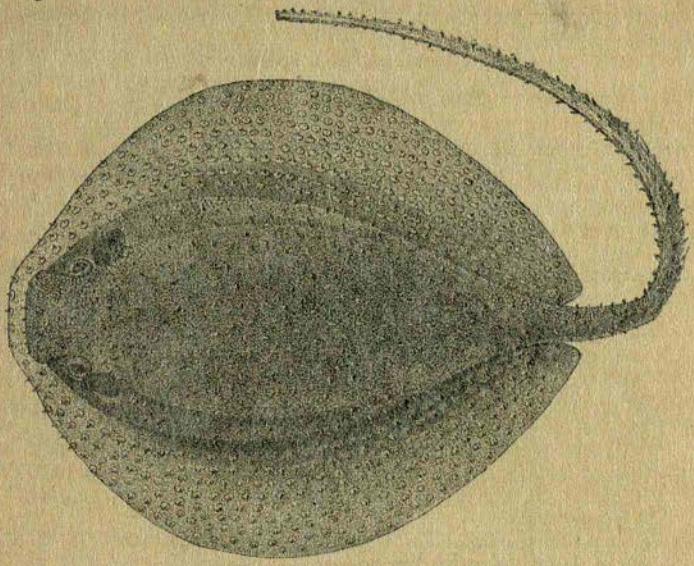

Fig. 20.—*Urogymnus asperrimus.*

2. Genus **TRYGON**, Adanson.

Syn. *Himantura, Hemitrygon,* and *Hypolophus,* Müll. & Henle; *Paratrygon,* Duméril.

Pákat, Maráthi.

Disk oval or rhomboidal; tail elongated and tapering. Nasal valves coalescent, forming a quadrangular flap. Teeth flattened, or with a central point or transverse ridge. Pectoral fins united anteriorly; tail destitute of a fin, or if with a cutaneous fold, such does not extend to its extremity; it is armed superiorly with one or two lanceolate spines that are serrated on both sides. Body smooth or with tubercles.

In this genus the colours in individuals of the same species are subject to considerable variation, and this is not invariably due to age. The character of the tubercles and their extent have also been (as I think erroneously) employed to characterize some species: thus one, *Trygon chindrakee* (Cuv.), Bleeker, is a form without tubercles or spines, except on the tail; *T. polylepis,* Bleeker, has small tubercles in the interorbital space, a narrow band along the back with a few indistinct enlarged ones, but none

on the tail; *T. walga*, Müll. & Henle, has the interorbital space and back covered with small tubercles, no larger ones in the median line, but a series of short spines between the root of the tail and the larger spine. Now all these forms, with every intermediate variation, occur, and the smooth body usually confined to the young may be persistent in the adult.

Synopsis of Indian Species.

A. Lower dental laminæ somewhat pointed, the upper being angularly bent for their reception. Tail with a cutaneous fold. (*Hypolophus.*)
A broad fold along lower surface of tail. Upper part of body covered with flat tubercles .... 1. *T. sephen*, p. 50.
B. Dental laminæ transverse; if undulating, slightly so. Tail with a cutaneous fold. (*Trygon.*)
Snout pointed. Tail three times as long as disk. Tubercles few ..... 2. *T. bennetti*, p. 52.
Tail half longer than disk. Body nearly smooth. Blue ocelli on upper surface ..... 3. *T. kuhlii*, p. 52.
Tail scarcely as long as body. Tubercles few .. 4. *T. imbricata*, p. 52.
Snout very pointed and produced. A few tubercles in median line of back ..... 5. *T. zugei*, p. 52.
C. Dental laminæ transverse; if undulating, slightly so; tail without a cutaneous fold. (*Himantura.*)
Snout rather pointed. Tail very long. One or more large tubercles in middle of back. Brown or spotted ..... 6. *T. uarnak*, p. 53.
Tail twice as long as disk. A row of pointed tubercles on the back, which is spined all over ..... 7. *T. marginatus*, [p. 54.
Snout very pointed. Tail three to four times as long as disk. A central and several smaller tubercles on the back ..... 8. *T. bleekeri*, p. 54.
Snout pointed. Tail rather longer than disk. Tubercles variously disposed ..... 9. *T. walga*, p. 55.

52. (1.) **Trygon sephen.** (Figs. 21, 22.)

Raja sephen, *Forsk. Descr. An.* p. 17.
Trygon sephen, *Day, Fish. India*, p. 740, pl. cxcv, fig. 2 (see synon.).
Adavalan tiriki, Tamil; *Volugiri tenkee* and *Wolga tenkee*, Tel.; *Govál pákat*, Maráthi.

Disk rather broader than long; the length of the tail three to four times that of the body. Snout most obtuse in adults. *Teeth*—lower dental laminæ somewhat pointed, the upper angularly bent for their reception; $\frac{33}{25}$ rows transversely, and $\frac{20}{25}$ vertically opposite the symphysis; they are all flattened, those in the centre of the upper jaw being the smallest. *Fins*—tail with a broad lower cutaneous fold; there may be one or two serrated spines

situated rather behind its anterior third. *Scales*—upper surface of the head and body and base of tail covered by thick, concave, or flat-headed, several-sided tubercles; in the scapular region and

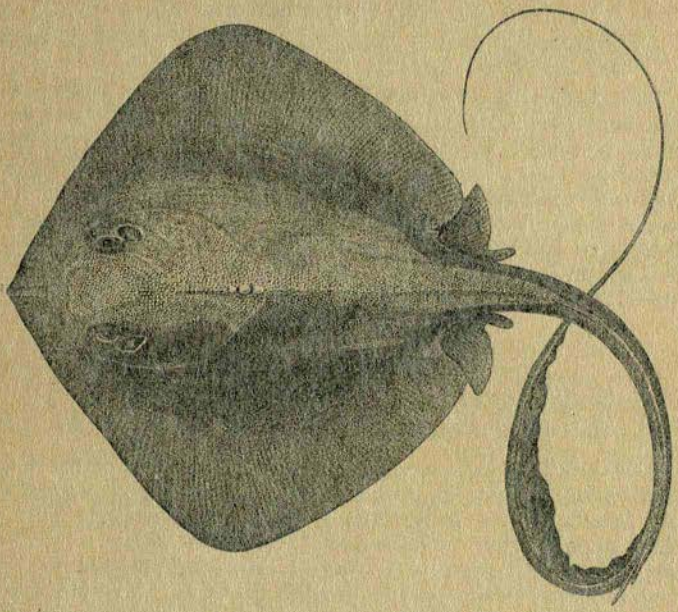

Fig. 21.—*Trygon sephen.*

central line of the back are two large, smooth, approximating tubercles in the young, and three in the adult, the middle and largest of which is usually oval, the second in size posterior and heart-shaped, the anterior or smallest round or heart-shaped. *Colour*—the upper surface of the immature is reddish brown; but in the adult lead-coloured, becoming black in the posterior two thirds of the tail. Some examples have a row of black blotches near their outer margin.

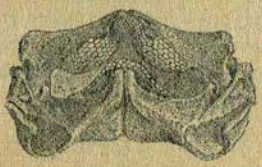

Fig. 22.—Teeth of *Trygon sephen.*

Hab. Red Sea, through the seas of India to the Malay Archipelago, and beyond. This fish grows to a large size. The jaws represented in the figure (22) were from an example 5 ft. 10 in.

across the disk. In its stomach were found crustacea, mollusks, &c. *T. sephen* is most common during the south-west monsoon, when it approaches the shore.

53. (2.) Trygon bennetti.

Trygon bennetti, *Müll. & Henle, Plagios.* p. 160, t. liii; *Day, Fish. India*, p. 739 (see synon.).

Disk about as broad as long; tail about three times as long as disk, and with a low cutaneous fold along its inferior surface. Snout somewhat pointed. Eyes nearer together than to the end of the snout. A tubercle in the middle of the back in adults, with some flat ones around it, which extend backwards to the caudal spine; but the young are quite smooth. *Colour*—a pale fleshy-red, which becomes almost white in parts, the tail being darker near its extremity.

Hab. Seas of India to China and beyond.

54. (3.) Trygon kuhlii.

Trygon kuhlii, *Müll. & Henle, Plagios.* p. 164, pl. li; *Day, Fish. India*, p. 739, pl. cxciii, fig. 2 (see synon.).

Kunnoo tirike and *Shemen tenkee*, Tel.

Disk broader than long; tail about one half longer than the disk. Snout somewhat obtuse, its length equal to or slightly exceeding the breadth of the interorbital space. Two appendages on the floor of the mouth. *Teeth*—dental plate more undulated in the upper than in the lower jaw. *Fins*—a cutaneous fold along the tail both above and below, caudal spine well developed. *Colour*—above of a dull brown, covered with numerous small black spots and larger rounded blue ocelli, each having a rather dark outer edge.

Hab. East coast of Africa, seas of India to the Malay Archipelago. This ray attains to at least $5\frac{1}{2}$ inches across the disk at Madras.

55. (4.) Trygon imbricata.

Raja imbricata, *Bl. Schn. Syst. Ich.* p. 366.
Trygon imbricata, *Day, Fish. India*, p. 739 (see synon.).

Disk as broad as long, snout produced and pointed; tail scarcely as long as the body, with low upper and inferior cutaneous folds. Small tubercles on the nape and back, with a row of conical spines on the shoulder and back; while along the tail as far as the spine are large tubercles intermixed with smaller ones.

Hab. Coromandel coast of India.

56. (5.) Trygon zugei.

Trygon zugei, *Müll. & Henle, Plagios.* p. 165, t. liv; *Day, Fish. India*, p. 739, pl. cxc, fig. 3 (see synon.).

Chumbara-kah, Tam.

Disk about as broad as long, with the snout very much produced

and acutely pointed, its length being about ⅓ that of the disk; tail equal to 1½ or twice the length of the disk. Eyes small; interorbital space concave. *Teeth*—dental laminæ undulated. *Fins*—a distinct cutaneous fold along the lower surface of the tail, commencing opposite the base of the spine; there is likewise a fold along the upper surface of the tail. A strong and long spine, serrated in its last third, is situated at about the commencement of the second quarter of the tail, and anterior to it a row of small spines; the body otherwise smooth. In some examples a row of tubercles exists along the median line of the back. *Colour*—dull brown superiorly, the edge of the fins black.

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

57. (6.) Trygon uarnak.

Raja uarnak, *Forsk. Descr. Anim.* p. 18.

Trygon uarnak, *Müll. & Henle, Plagios.* p. 158; *Day, Fish. India*, p. 737, pl. cxciv, fig. 1 (see synon.).

Sona kah tiriki, Tam.; *Puli tenke*, Tel.; *Sankush*, Ooriah; *Lek kŷouk*, Burmese; *Hankoos*, Chittagong.

Disk about as broad as long, snout pointed and rather prominent; tail from three to four times as long as the body. Iris with a well-developed superior flap. *Teeth*—dental laminæ undulating. *Fins*—no cutaneous folds on the tail, which is armed with a serrated spine situated about ½ the length of the disk from the root of the tail. *Tubercles*—vary in different specimens, absent in the very young: in those with a disk of about 6 inches across there are two or three rows of widely separated oval tubercles on either side of the head, internal to the eyes, and meeting on the occiput, from thence towards the scapula is a single row of larger and more widely separated ones. In the middle of the back three large closely approximating scales or tubercles, the centre one heart-shaped, the anterior round, and the posterior almost heart-shaped. In some specimens, of a large size, there are also numerous distant thorns on the tail, which may disappear with age. In specimens with a disk of 3 feet across, the head, back, and sides are covered with smooth, roundish scales, having intermediate smaller ones. *Colour*—varying according to age: up to the period when the breadth of the disk is about 9 inches the body is of a yellowish brown, darkest along the back, and the abdomen white: a short distance beyond the commencement of the tail it is irregularly annulated with alternate narrow light brown, and broad or narrow dark brown rings. With increasing age black spots commonly appear on the body, and when it has attained the width of 3 feet across its disk it is light brown or greenish olive, covered with lighter and in some almost white spots, or reticulated with white lines, whilst the anterior extremity of the tail also shows the remains of the rings. The adult is uniformly brownish or greenish olive. Iris golden. Occasionally there are light spots on the posterior portion of the disk.

Hab. Red Sea, seas and estuaries of India to the Malay Archipelago, and China, also the Cape of Good Hope. The immature are frequently captured in the back-waters, and wounds from their caudal spines are much dreaded. The species attains a large size; 5 feet or more across the disk. The late Sir W. Elliot observed that from a female of this species 13 feet long (including the tail 8 feet 9 in.) a young was removed perfectly formed and of the same colour as its mother. In the cold season, as about October, these fish are frequently perceived springing out of the water for some distance in the same manner as trout do just prior to breeding. They devour large quantities of small fish, crustacea, mollusks, &c.

58. (7.) Trygon marginatus.

Trygon marginatus, *Blyth, J. A. S. B.* xxix, 1860, p. 38; *Day, Fish. India*, p. 738 (see synon.).

Disk slightly broader than long, tail from one half longer than the disk to nearly twice as long. The width of the interorbital space equals the length of the snout. Tubercles sparsely set all over the upper surface, but a little larger along the median line, where they appear like small limpets; an irregular row of pointed tubercles on either side of the middle line of the back; tail tuberculated as far as its spine, but destitute of any fin. *Colour*—grey above; buffy white below, with a dark border, except in front.

Hab. Hooghly at Calcutta. I examined an example in which the disk was 16 inches across and 15 long; Blyth observed one specimen which was 52, and another 60, inches across the disk, and the tubercles were extended on to the edge of the disk and even to its under surface. This would therefore appear to be a result of age.

59. (8.) Trygon bleekeri.

Trygon bleekeri, *Blyth, J. A. S. B.* xxix, 1860, p. 41; *Day, Fish. India*, p. 738, pl. cxcv, fig. 3 (see synon.).

Pakat, Maráthi; *Seman tirike*, Tam.

Tail from three to four times as long as the disk. Snout prolonged and pointed. Width of interorbital space equal to $\frac{1}{2}$ or $\frac{1}{3}$ the length of the snout anterior to the eye. A large round tubercle in the middle of the back, and commonly before it three smaller ones triangularly disposed, and three similarly placed behind it. Tubercles sometimes present along the upper surface of the tail to the caudal spine, from whence, in adults, they are continued to its extremity. *Colour*—"Brown above and below, with a narrow white median longitudinal patch on the abdomen" (*Blyth*). Sometimes this ray is brown above with the margins of the disk dark.

Hab. Bengal. Blyth observed one 25 inches long to base of tail, the tail 72 inches; another 15 and 56 inches.

60. (9.) Trygon walga.

Trygon walga, *Müll. & Henle, Plagios.* p. 159, t. li; *Day, Fish. India*, p. 738, pl. cxciv, fig. 3 (see synon.).

Isacurrah tenkee, Tenkee shindraki, Tel.

Disk about as broad as long, with the snout pointed and acutely projecting, more so in some examples than in others. Eyes smaller in the adult than in the young. Interorbital space concave. *Teeth*—small, having a transverse elevated ridge along each. Dental laminæ undulated. *Fins*—no cutaneous folds on the tail, the length of which is rather longer than the disk. One or two (sometimes more) large serrated spines on the tail at the commencement of its second third; between this and the base of the tail exists a median line of about seven short spines. *Scales*—interorbital space, and a varying width along the middle of the back and also on the tail covered with numerous fine tubercles; there are usually no larger ones, but in some examples there is one larger on the centre of the shoulder, in others a few more anterior to it. Neither the number, size, character, nor extent of the distribution of the tubercles and spines depends on age or sex, adults even may be without any of either. In one example (a male) the band of tubercles along the back is very narrow, a row of large ones exists in the median line of the scapular region, and four along the back of the tail. This would be intermediate between *T. walga* and *T. polylepis*. Another example has a row of small spines all along the first third of the back of the tail, and a moderately sized, rather compressed median scapular spine with six smaller ones anterior to it; a very wide band of tubercles exists along the back. One example has the smaller caudal spine very well developed, a very narrow row of tubercles along the back, and a central scapular tubercle. Another has only a few small tubercles and one central spine in the scapular region, some between the eyes, and some fine spines between the base of the tail and the two large spines. Young examples are often destitute of tubercles or armature except the caudal spines, and this immature character may be seen in some adults. *Colour*—dull grey or brown superiorly, white beneath.

Blyth has observed that the males are larger than the females and have proportionately longer tails; very commonly the second caudal spine (more especially of the females) does not extend beyond the first one. Some have a small lanceolated tubercle on the centre of the dorsal surface, others two or more, even to a series of five or six along the median line.

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

3. Genus TÆNIURA, Müll. & Henle.

Disk oval or rhomboidal; tail elongated and tapering. Nasal valves coalescent, forming a quadrangular flap. Pectoral fins united anteriorly; tail with a broad lower cutaneous fold continued

to its extremity. Body and tail either smooth or furnished with tubercles.

Geographical Distribution. From the Red Sea and east coast of Africa through the seas of India to the Malay Archipelago and tropical America.

61. (1.) Tæniura melanospilos *.

Tæniura melanospilos, *Bleeker, Nat. Tyds. Ned. Ind.* 1853, iv, p. 513; *Day, Fish. India*, p. 740 (see synon.).

Jiluga tirike, Tel.

Disk rather broader than long; its upper surface smooth. Tail very thick at its base, with two strong flattened elongated spines (upper $9\frac{1}{2}$, lower $5\frac{1}{2}$ inches long) serrated externally. From opposite these spines on the lower surface of the tail commences a broad cutaneous fold, which is continued to the extremity of the tail, and on its upper surface are numerous tubercles of the same character as on the tail. The colours have not been noted.

Two examples were captured in 1853 off the Coromandel coast, where they were said by the fishermen to be very rare. One had its disk 4 ft. 11 in. long and 5 ft. 11 in. broad; the other disk was 4 ft. 1 in. long by 5 ft. 11 in. wide. Inside the stomach of the latter were found the remains of some small crabs and a squilla. It was, however, expressly stated that the body was smooth, but the tail covered with rough tubercles, all of which had a stellated base.

Hab. Red Sea and Coromandel coast of India to Batavia.

4. Genus **PTEROPLATEA**, Müll. & Henle.

Syn. *Ætoplatea*, Müll. & Henle.

Body at least twice as broad as long; tail thin, generally shorter than the body, with or without a rudimentary fin, but having a serrated spine; spiracles with or without a tentacle; nasal valves confluent, and forming a quadrangular flap. No papilla at bottom of the mouth. Teeth with from one to three cusps. Pectoral fins united in front. Skin smooth or tubercular.

Geographical Distribution. Tropical and temperate seas.

62. (1.) Pteroplatea micrura. (Fig. 23.)

Raja micrura, *Bl. Schn. Syst. Ich.* p. 360.
Pteroplatea micrura, *Day, Fish. India*, p. 741, pl. cxciv, fig. 2.

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* Tæniura lymma, Forskål.

Disk rather longer than broad; a few spines along the middle of the back. Two long papillæ at the bottom of the mouth. *Colour* – grey, with round blue dark-edged spots; a bluish band along either side of the tail.

Hab. Red Sea, coast of Africa to the Malay Archipelago; this ray consequently may probably be found off the coast of India.

Peroom tirik, or *Tappor kooti tiriki*, Tamil; *Tappu cooti* and *Tenkee kunsul*, Tel.; *Lek kyouk temengnee*, Burmese.

Disk about twice as wide as long; tail as long as disk in young, but shorter in adults. No tentacle to spiracle. *Teeth*—with a single pointed cusp. *Fins*—one or two small spines on caudal fin. Skin smooth. *Colour*—reddish brown; tail annulated with white and brown; superiorly, in the centre of each light ring, there is generally a brown spot. The young are covered all over with small brown spots. A figure exists amongst Sir Walter Elliot's drawings of Madras fish of an example covered with light round spots.

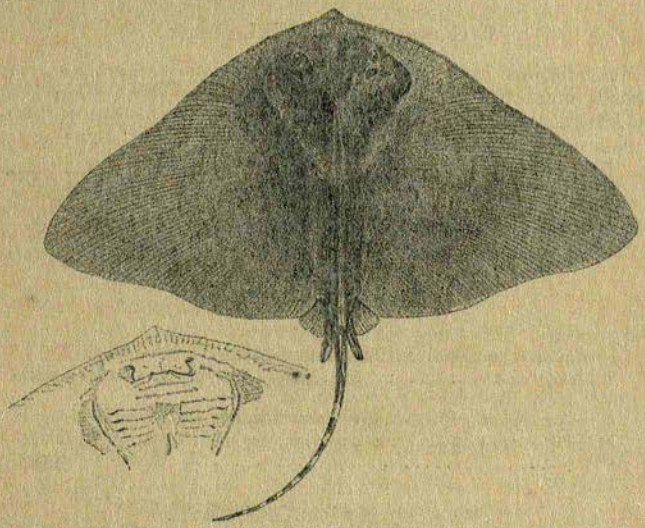

Fig. 23.—*Pteroplatea micrura.*

Hab. Seas of India to the Malay Archipelago, and beyond. Jerdon obtained one in which the disk was 6 feet across and 3 feet long.

Family VI. MYLIOBATIDÆ.

Pectoral fins large, developed along the sides of the body, occasioning the latter to appear very broad; these fins are not present on the sides of the head, but reappear at the end of the snout as a pair of detached fins.

These fish, many of which attain to a large size, are variously known as "Devil-fishes," "Sea-devils," "Bat-fishes," "Eagle-rays," &c.