GENERAL ZOOLOGY

or

SYSTEMATIC NATURAL HISTORY

by

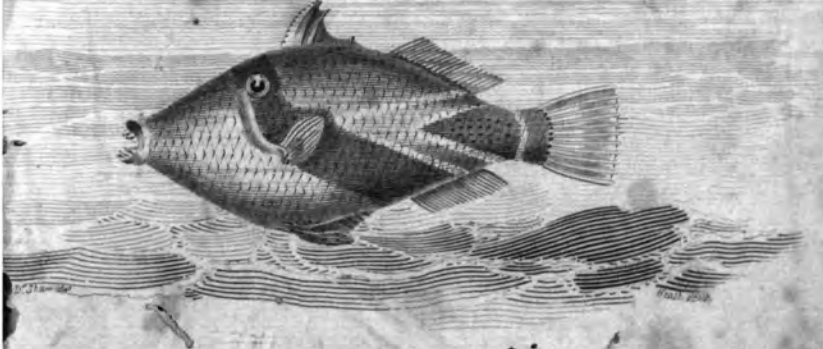
GEORGE SHAW, M.D. F.R.S. &c

WITH PLATES

from the first Authorities and most select specimens

Engraved principally by

Mr HEATH.



VOL. V. Part II.

PISCES.

London Printed for G. Kearsley Fleet Street.

1801

GENERAL ZOOLOGY.

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PRINTED FOR GEORGE KEARSLEY, FLEET-STREET;
BY THOMAS DAVISON, WHITE-FRIARS.

1804.

CONTENTS

OF

VOL. V.—PART II.

Directions for placing the Plates in vol. V. part II.

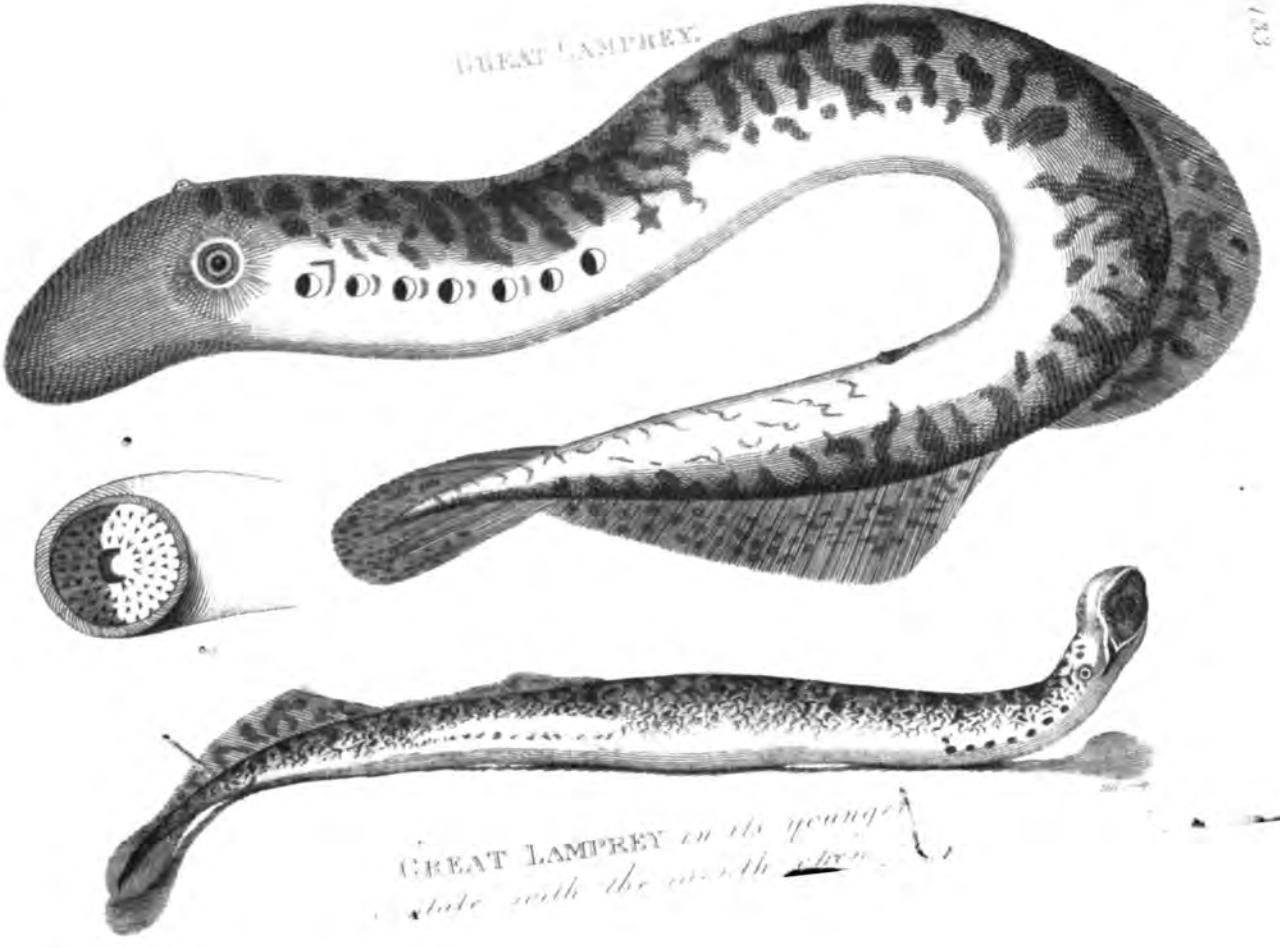
The Vignette represents a diminished view of the Fasciated File-Fish. See p. 409.

Plate	133	to face page	251
	134	———	264
	135	———	269
	136	———	270
	137	———	275
	138	———	276
	139	———	278
	140	———	279
	141	———	284
	142	———	285
	143	———	286
	144	———	293
	145	———	294
	146	———	297
	147	———	317
	148	———	322
	149	———	327
	150	———	329
	151	———	331
	152	———	335
	153	———	337
	153*	———	340
	154	———	354
	155	———	356
	156	———	362
	157	———	365
	158	———	368
Plate	158*	to face page	369
	159	———	370
	160	———	376
	161	———	379
	162	———	382
	163	———	383
	164	———	384
	165	———	386
	166	———	388
	167	———	390
	168	———	399
	168*	———	407
	169	———	414
	170	———	423
	171	———	426
	172	———	428
	173	———	429
	174	———	432
	175	———	437
	176	———	439
	177	———	441
	178	———	444
	179	———	451
	180	———	456
	181	———	458
	182	———	461

ERRATA.—VOL. V. PART II.

P. 291, in the specific character of the Demon Ray, for *dilata* read *dilatata*.

N.B. In Vol. 4, at p. 569, in the generic character of BODIANUS, for *serrata* read *non serrata*, and for *serrated* read *unserrated*.



GREAT LAMPREY in its younger
state with the mouth close

FISHES.

ORDER

CARTILAGINEI.

PETROMYZON. LAMPREY.

Generic Character.

Corpus anguilliforme.	*Body* Eel-shaped.
Os subtus, dentibus numerosis circulatim dispositis.	*Mouth* beneath, with numerous teeth in circular rows.
Spiracula utrinque septem ad latera colli.	*Spiracles* seven on each side the neck.

GREAT LAMPREY.

Petromyzon Marinus. *P. olivaceus, albido fuscoque varius, pinnis subaurantiis, cauda subcærulea.*
Olive Lamprey with brown and whitish variegations, somewhat orange-coloured fins, and blueish tail.
Petromyzon marinus. *P. ore intus papilloso, pinna dorsali posteriore a cauda distincta. Lin. Syst. Nat. p.* 394.
Petromyzon maculosus, ordinibus dentium circiter viginti. *Art. gen.* 64. *Syn.* 90.
Petromyzon ordinibus dentium acutorum plurimis. *Bloch t.* 77.
Sea Lamprey. *Penn. Brit. Zool.*

IN its general appearance this fish makes a near approach to the Eel tribe, and particularly to the

Muræna: it arrives at a considerable size, and to the length of more than three feet: the generality of the British specimens however are of inferior magnitude: the usual colour of the Lamprey is a dull brownish olive, clouded with yellowish white variegations: the back, as in most fishes, is darker than the other parts, and the abdomen paler: the fins are tinged with dull orange, and the tail with blue: the eyes are rather small: the mouth large, oval, situated beneath, deeply concave, and lined or paved as it were with several circular rows of sharp, triangular orange-coloured teeth: the tongue, which is short and crescent-shaped, is also furnished with a row of very small teeth round its edge: on the top of the head is a small orifice or spout-hole, through which is discharged the superfluous water taken in at the mouth and gills: near each eye are two rows of much smaller foramina, one row consisting of five, and the other of six: these are supposed to be the orifices of the glands which secrete the viscid moisture necessary for lubricating the skin: on each side the neck, commencing at a small distance beyond the eyes, is a row of seven pretty large, equidistant, round spiracles or breathing-holes, each leading to a deep sacculus lying in an oblique direction towards the head: these seven sacculi on each side are lined with a red pleated membrane, and have no communication with each other, but pass by their respective double ducts to the inside of the mouth: towards the lower part of the back commences the first dorsal fin, which is rather shallow, with a rounded outline: the second, which

commences at a very small distance from it, is nearly of the same extent, but with a subtriangular outline: the tail is short and slightly rounded.

The Lamprey is an inhabitant of the ocean, ascending rivers chiefly during the latter end of winter and the early months of spring; and after a residence of a few months in fresh water, again returns to the sea: it is viviparous, and the young are observed to be of slow growth; contrary to the assertions of some writers, who have supposed the Lamprey to be a short-lived fish. When in motion this fish is observed to swim with considerable vigour and rapidity, but it is more commonly seen attached by the mouth to some large stone or other substance, the body hanging at rest, or obeying the motion of the current: so strong is the power of adhesion exerted by this animal, that a stone of the weight of more than twelve pounds may be raised without forcing the fish to forego its hold. The general habits of the Lamprey seem pretty much to resemble those of the Eel, and it is supposed to live principally on worms and young fish. Like the Eel it is remarkably tenacious of life; the several parts, when cut in pieces, will long continue to move; and the head will strongly attach itself, for several hours, to a stone, though by far the greater part of the body be cut away from it.

Among the cartilaginous fishes none is so destitute of all appearance of real bone as the Lamprey, in which the spine itself is no other than a mere soft cartilage, without any processes or protuber-

ances whatsoever. Among other particulars in its anatomy, it is remarkable that the heart, instead of being inclosed in a soft pericardium, as in other animals, is guarded by a strong cartilaginous one: the liver, which is of an oblong form, is of a fine grass-green colour, somewhat deeper in the female fish, and may be used for the purpose of a pigment.

A vulgar error, arising from inattentive inspection, and total ignorance of the nature of the animal, is said sometimes to prevail; viz. that the Lamprey is furnished with nine eyes on each side: this mistake appears to have excited unusual indignation in Sir Thomas Brown, who in his Pseudodoxia Epidemica thus expresses himself on the subject:

"Whether Lampries have nine eyes, as is received, we durst refer it unto Polyphemus himself, who had but one, to judge it. An error concerning eyes occasioned by the error of eyes; deduced from the appearance of divers cavities or holes on either side, which some call eyes that carelessly behold them; and is not only refutable by experience, but also repugnant unto reason. For besides the monstrosity they fasten unto Nature, in contriving many eyes, who hath made but two unto any animal, that is one of each side, according to the division of the brain; it were a superfluous inartificial act to place and settle so many in one plane; for the two extreams would sufficiently perform the office of sight without the help of the intermediate eyes, and behold as much as all the seven together. For the visible base of an object

would be defined by these two; and the middle eyes, although they behold the same thing, yet could they not behold so much thereof as these; so were it no advantage unto man to have a third eye between those two he hath already; and the fiction of Argus seems more reasonable than this; for though he had many eyes, yet were they placed in circumference and positions of advantage, and so are they placed in several lines in spiders. Again, these cavities which men call eyes are seated out of the head, and where the gills of other fish are placed; containing no organs of sight, nor having any communication with the brain, and that being placed (as Galen observeth) in the upper part of the body, for the fitter situation of the eyes, and conveniency required unto sight, it is not reasonable to imagine that they are any where else, or deserve that name which are seated in other parts. And therefore we relinquish as fabulous what is delivered of *Sternopthalmi*, or men with eyes in their breast; and when it is said by Solomon, a wise man's eyes are in his head, it is to be taken in a second sense, and affordeth no objection. True it is that the eyes of animals are seated with some difference, but in sanguineous animals in the head, and that more forward than the ear or hole of hearing. In quadrupedes, in regard of the figure of their heads, they are placed at some distance; in latirostrous and flat-billed birds they are more laterally seated; and therefore when they look intently they turn one eye upon the object; and can convert their heads to see

before and behind, and to behold two opposite points at once. But at a more easy distance are they situated in man, and in the same circumference with the ear; for if one foot of the compass be placed upon the crown, a circle described thereby will intersect or pass over both ears. The error in this conceit consists in the ignorance of these cavities, and their proper use in nature; for this is a particular disposure of parts, and a peculiar conformation whereby these holes and sluices supply the defect of gills, and are assisted by the conduit in the head; for like cetaceous animals and whales, the lamprie hath a fistula, spout, or pipe at the back part of the head, whereat it spurts out the water; nor is it only singular in this formation, but also in many other."

As an article of food the Lamprey has for many ages maintained its credit as an exquisite dainty; and has uniformly made its appearance at the most splendid of our ancient entertainments. The death of King Henry the first, it is well known, is attributed to a too luxurious indulgence in this his favourite dish. It still continues to be in high esteem, and we are told by Mr. Pennant that the city of Glocester continues to send yearly, at Christmas, a present of a rich lamprey pye to the King. It sometimes happens that the Lampries at that season are so rare that a guinea is demanded for the price of a single fish. They are most in season during March, April, and May, and are observed to be much more firm when fresh arrived from sea than when they have been a considerable

time in fresh water. They are found in several of the British rivers, but that which is most celebrated for them is the Severn. In the mouths of some of the larger European rivers they are sometimes taken in such quantities that it is impossible to use them in their fresh state; they are therefore grilled and moderately salted, and afterwards barrelled up for sale, with the addition of vinegar and spices.

LAMPERN.

Petromyzon Fluviatilis. *P. subfuscus, subtus subargenteus, pinnis subviolaceis.*

Brownish Lamprey, silvery beneath, with somewhat violet-coloured fins.

Petromyzon fluviatilis. *P. pinna dorsali posteriori angulata. Lin. Syst. Nat. p.* 394.

Petromyzon unico ordine denticulorum minimorum in limbo oris, præter inferiores majores. *Art. gen.* 14. *syn.* 89. *sp.* 99.

Petromyzon ordine dentium unico. *Bloch. t.* 78. *f.* 1.

Lesser Lamprey. *Penn. Brit. Zool.*

Length, when full-grown, from ten to fifteen inches: on each side the mouth three * rows of very minute teeth; on the lower part seven teeth, of which the outmost on each side is the largest; and in the upper part of the mouth a large bifurcated † tooth: colour of the back brown or dusky, sometimes clouded or mixed with blue: whole under sides silvery: body marked on the upper part by numerous annular lines: on the lower part of the back a narrow fin, beyond which rises a

* Dr. Bloch considers these as a single row.

† According to Bloch two teeth.

second, which at its beginning is high and angular, and afterwards grows narrow, surrounds the extremity of the fish, forming the tail, and is continued beneath to the vent. This species is, according to Dr. Bloch, an inhabitant of the sea, and ascends in spring-time most of the European rivers, in which it is found much more frequently and plentifully than the great lamprey. With us it is found in great quantities in the Thames, the Severn, and the Dee. It is often potted with the larger lamprey, and is by some preferred to it, as being milder tasted. Mr. Pennant informs us that vast quantities are taken about Mortlake, and sold to the Dutch, as baits for their Cod and Turbot fisheries: according to this author above four hundred and fifty thousand have been sold in a season, at forty shillings per thousand, and about an hundred thousand have been occasionally sent to Harwich for the same purpose. The Dutch, it is added, have the secret of preserving them till the time of the Turbot-fishery. Great quantities, says Dr. Bloch, are taken in the March of Brandenburgh, and in Pomerania, Silesia, and Prussia; and after frying, are packed in barrels by layers, between each of which is a layer of bay-leaves, and spices, sprinkled over with vinegar. In this state they are sent into many other parts of the German empire. In the river Bauster in Courland, great quantities are taken from beneath the ice with nets; they are much larger than those found elsewhere, and are packed in snow, and sent to any distance; and when put into cold water recover themselves. This

species spawns in March and April, and is a prolific fish. It is so tenacious of life that it will live many days out of water.

PLANER'S LAMPREY.

Petromyzon Planeri. *P. pallidus, corpore annulato, oris margine papilloso.*

Pale Lamprey, with annulated body, and the edges of the mouth papillose.

Petromyzon Planeri. *P. corpore annulato, ore papilloso. Bloch. t. 78. f. 3.*

Length from five or six to ten inches: general resemblance that of the Lampern: colour olive above, pale or white beneath: second dorsal fin of an angular outline: tail shaped like that of the Lamprey and Lampern; mouth furnished with small teeth: native of the rivers of Thuringia and other parts of the German Empire: like most of the genus, tenacious of life, living for the space of a quarter of an hour when immersed in spirits of wine, and moving with violence during the whole time: when thus killed in spirits, the mouth remains open, but when the fish dies in water it is shut. First observed and described by Professor Planer of Erford.

MINUTE LAMPREY.

Petromyzon Branchialis. *P. pallidus, corpore annulato, ore subtus lobato.*

Pale Lamprey, with annulated body, and mouth lobated beneath.

Petromyzon branchialis. *P. pinna posteriore lineari, labio oris posteriore latere lobato. Lin. Syst. Nat. p.* 394.

Lampetra coeca. *Will. ichth. t. g.* 3. *f.* 11.

Pride. *Plot Hist. Ox. p.* 182. *t.* 10.

Pride. *Penn. Brit. Zool.*

Length from four or five to six or seven, and sometimes, though rarely, eight inches: body cylindric, somewhat tapering at each end, and marked with numerous annular lines or transverse streaks on each side, giving it somewhat of a worm-like aspect: beneath the body, from head to tail, a continued middle line: mouth toothless, and marked on each side the lower part by a kind of small lobe: fins very shallow: tail lanceolate and sharpish at the tip: inhabits the European rivers: in England more frequent in the Isis than elsewhere: instead of concealing itself under stones this species lodges itself among the mud, and is not observed to adhere to any other body like the rest of the genus: it is used as a bait for other fish: it seems to have been first distinctly described, as an English species, by Dr. Plot, in his History of Oxfordshire.

RED LAMPREY.

Petromyzon Ruber. *P. ruber, dorso subfusco.*
Red Lamprey, with brownish back.
Petromyzon ruber. *Cepede.*

General appearance that of the minute lamprey: colour red, deepest about the gills or respiratory foramina: upper parts tinged with a dusky hue: found in some parts of the Seine, where it was observed by Mons^r. Noel, who communicated it to the Count de Cepede.

LEECH LAMPREY.

Petromyzon Sanguisuga. *P. ore amplo, dentibus minimis aurantiis, pinnis angustis.*
Lamprey with large mouth, very small orange-coloured teeth, and shallow fins.
Petromyzon Sanguisuga. *Cepede.*

General length about seven inches: habit that of the minute and red lampries: body cylindric: mouth very wide: teeth very numerous, orange-coloured, and a semicircular range of nine double teeth near the throat: both the dorsal fins shallow, the second extending nearly to the tail: eyes larger than in the minute lamprey: observed in the river Seine by Mons^r. Noel. It seems in many points so nearly to resemble the common Lamprey as to leave some suspicion of its being the young of that species: yet Mons^r. Noel seems convinced of its

being specifically different: it is said to be found only at those times in which the Shad (Clupea Alosa) is in the river: these fishes it persecutes, by fastening beneath their bellies, and sucking their blood with the avidity of a Leech; its body being constantly found full of that fluid alone: they sometimes attack Salmon in a similar manner, but, from the greater thickness of the skin in those fishes, are able to obtain but a small quantity of blood from them.

SILVERY LAMPREY.

Petromyzon Argenteus. *P. corpore argenteo nitido, dorso subflavescente.*
Lamprey with bright silvery body, and slightly yellowish back.
Petromyzon corpore argenteo. *Bloch. t.* 415. *f.* 2.

Length of the specimen described by Dr. Bloch about six inches: general appearance that of the minute lamprey: colour bright silvery, with a yellowish brown tinge on the upper parts: mouth large: teeth orange-coloured, and situated in the fore part of the mouth: eyes very large, with silvery irides: both the dorsal fins very shallow, and without any angular outline: lateral line very distinct: tail lanceolate. Native of the Indian seas.

LEAD-COLOURED LAMPREY.

Petromyzon Plumbeus. *P. plumbeus, subtus albo-flavescens, cauda spatuliformi.*
Lead-coloured Lamprey, yellowish-white beneath, with spatule-shaped tail.
Petromyzon Septoeil. *Cepede. 4. p. 667.*

Body decreasing from head to tail in a conical manner: mouth large: dorsal fins rounded: tail spatule-shaped: colour of the upper part of the animal leaden-grey; of the under yellowish white: size not mentioned: observed by Mons^{r}. Noel in the Seine, where it is very plentiful.

BRILLIANT LAMPREY.

Petromyzon Bicolor. *P. supra niger, subtus argenteus.*
Lamprey with black back, and silvery abdomen.
Petromyzon niger. *Cepede. 4. p. 667.*

This species is easily distinguished by its colours, the upper part being of a fine black, and the under of a brilliant silver-colour: the mouth is very small: both the dorsal fins rounded, and each nearly as short as the caudal, which is spatule-shaped: first described by Mons^{r}. Noel, by whom it was communicated to the Count de Cepede: found in the Seine, and said to be sometimes taken in great plenty: size not mentioned.

Generic Character.

Corpus anguilliforme.	*Body* Eel-shaped.
Os subtus, dentibus numerosis, pectinatis.	*Mouth* beneath, with numerous pectinate teeth.
Spiracula duo ventralia.	*Spiracles* two, beneath the abdomen.

BLIND GASTROBRANCHUS.

Gastrobranchus Cœcus. *G. lividus, subtus pallidior, ore cirris octo.*

Livid Gastrobranchus, paler beneath, with eight beards at the mouth.

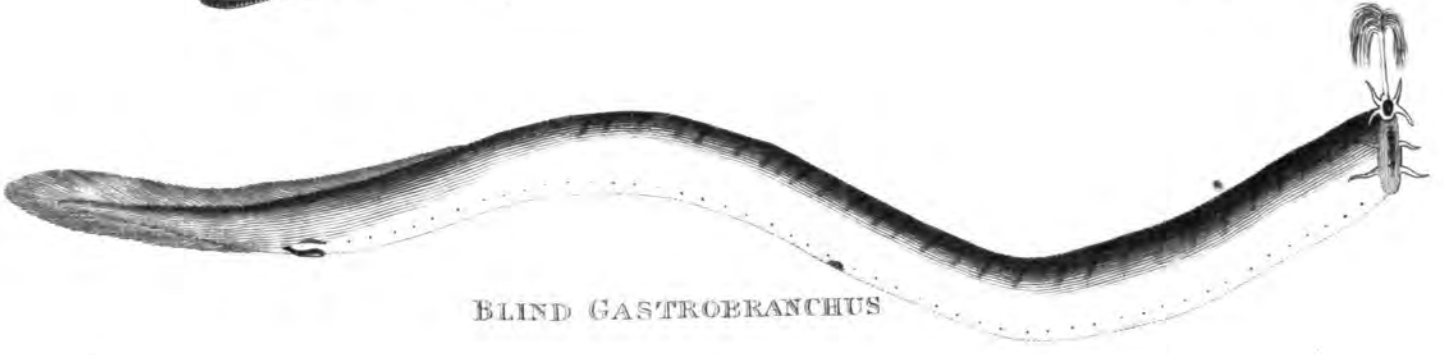
Gastrobranchus coecus. *G. oculis carens. Bloch. t.* 413.

Myxine glutinosa. *Lin. Syst. Nat. p.* 1080. *Müll. prodr. Z. D. p.* 227. *Schrift. der Berl. Gesselsh. naturf. Fr.* 10. *p.* 193. 244. *t.* 4.

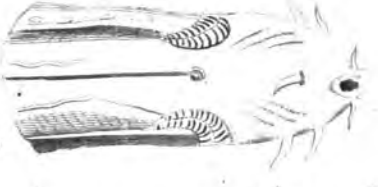
Pihraol. *Kalm. it. Amer.* 1. *p.* 118.

THE fish which constitutes this genus has long since been described by Linnæus and others under the title of *Myxine glutinosa*, and considered as belonging to the tribe of Vermes, in which situation it ranks in the latest editions of the Systema Naturæ. Dr. Bloch however, from accurate examination both of its external and internal structure, has very justly considered it as a legitimate cartilaginous Fish. The usual length of the

DOMBEYAN GASTROBRÄNCHUS



BLIND GASTROBRANCHUS



Under view of thoracic

European specimens is from four to six inches, but in the Indian ocean it appears to arrive at a far superior size, nearly equalling in this respect the common Eel. In its general appearance it bears a near resemblance to the Lampries, with which by Kalm, its first describer, it has been associated. It is remarkable for the total want of eyes, not the least vestige of any such organs being discoverable by the most attentive examination: the mouth, which is situated beneath, as in the Lampries is of an oblong form: on each side are two beards or cirri, and on the upper part four: in front of the top of the head is a small spout-hole, furnished with a valve, by which it can at pleasure be closed: the teeth, which are situated very deep in the mouth, and are of an orange-colour, as in the Lamprey, are disposed on each side into a double row, in form of a pectinated bone; each upper row consisting of nine and each lower row of eight teeth; and in the middle of the roof of the mouth is a single, sharp-pointed, and curved tooth: no nostrils are discoverable: the body is destitute of scales, lateral line, and every kind of fin, except that which forms the tail: this fin is shallow, and commencing at the lower part of the back, runs round the extremity of the body, and is continued beneath as far as the vent: the extremity of the body, where it is surrounded by the caudal fin, is taper or pointed: beneath the body, from head to tail, runs a double row of pretty conspicuous, equidistant pores, through which, on pressure, exsudes a viscid fluid, and at somewhat more than a third

of the animal from the head, are situated, beneath the body, the two spiracula, which consist of a pair of oval apertures. On laying open the fish, it appears that each of these apertures communicates with a series of globular red cells or vesicles, disposed, to the number of six, on each side the body: every one of these twelve cells or vesicles communicates on its exterior side, by a short branch, with the duct leading from the spiracle; and on its interior side with another duct leading into the mouth: below these cells is situated the heart, which is of a roundish or but slightly cordate shape: the liver is large, and consists of two lobes or divisions, of which the upper is smallest: the ovarium is of a lengthened form, and the ova appear to arrive at a very considerable size before they are excluded from the body, and it is doubtful whether they may not hatch internally, as in some other fishes, before exclusion. The general colour of the animal is whitish with a dusky blueish cast above, and reddish towards the head and tail: the fin surrounding the tail-part is yellowish-brown.

The manners of this fish are represented as highly singular: it is said to enter into the bodies of such fishes as it happens to find on the fishermen's hooks, and which consequently have not the power of escaping its attack, and by gnawing its way through the skin, to devour all the internal parts, leaving only the bones and the skin remaining. Another particularity in this animal consists in its uncommonly glutinous nature: if put into a large vessel of sea-water, it is said in a very short space to

render the whole so glutinous as easily to be drawn out into the form of threads: when taken out of water the Gastrobranchus is said to be incapable of living more than three or four hours. It is an inhabitant of the Northern seas, and appears also to occur in those of the Southern Hemisphere, where, as before mentioned, it arrives at a much larger size than in the northern regions *.

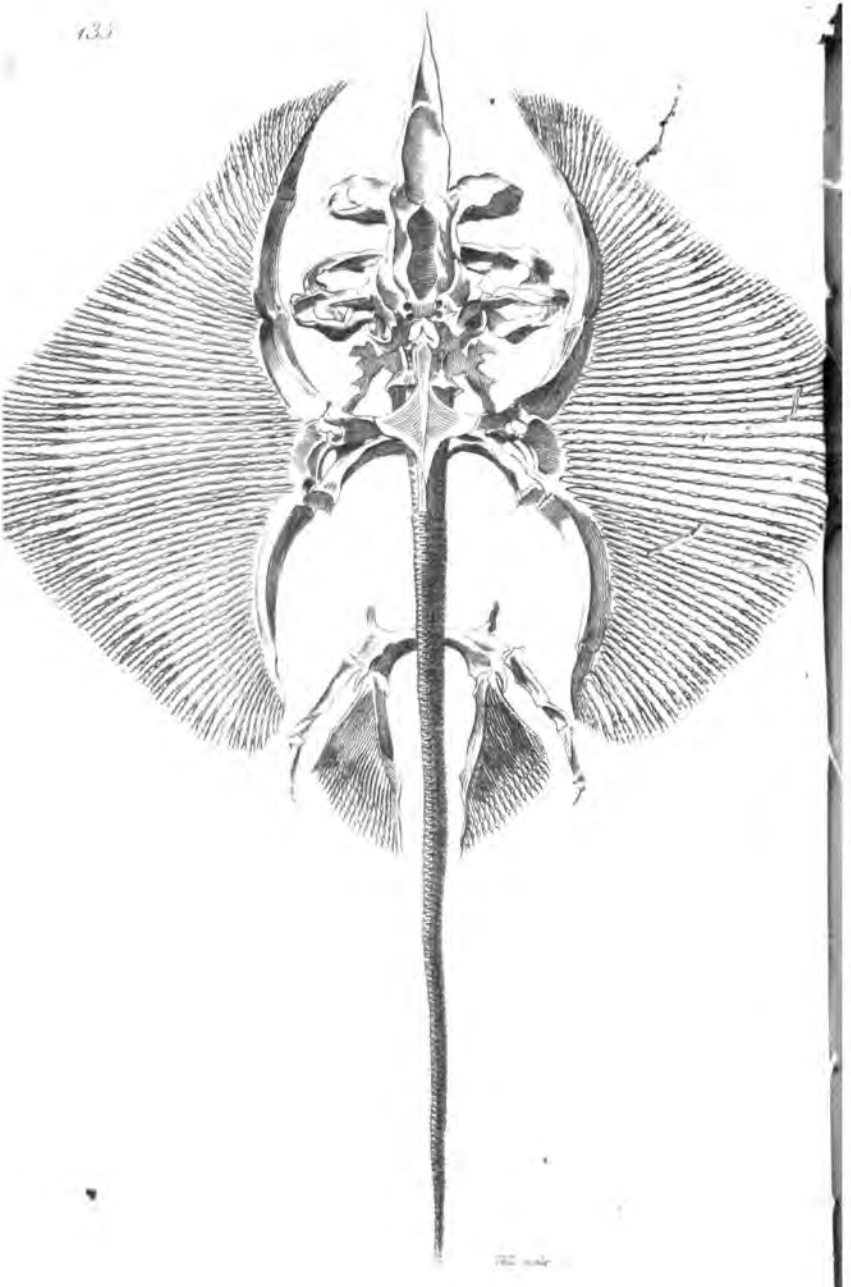
DOMBEYAN GASTROBRANCHUS.

Gastrobranchus Dombeyi. *G. capite tumido.*
Gastrobranchus with tumid head.
Gastrobranchus Dombey. *Cepede.*

Size much larger than the European specimens of the Gastrobranchus cœcus: head rounded: and broader than the body: on the upper lip four beards; number of those on the lower uncertain, the specimen being described in a dried state: teeth pointed, compressed, triangular, and disposed in two circular ranges, the exterior of which is composed of twenty-two, and the interior of fourteen teeth: a single tooth longer than the rest, and of a curved form in the roof of the mouth, as in the

* This idea is grounded on a drawing by Dr. Forster, preserved, among those of several other Southern fishes, &c. in the collection of Sir Joseph Banks, and which appears to represent a gigantic specimen of the Gastrobranchus coecus. In the British Museum is also a specimen of equal size, but not in such a state as to admit of very accurate examination. Perhaps it may be rather the Dombeyan Gastrobranchus.

European species: eyes and nostrils imperceptible: colour uncertain: tail rounded at the extremity, and terminated by a very shallow fin united with the anal. Native of the South-American seas: observed by Mons^r. Dombey, and described by Cepede from the dried skin in the Paris Museum.



SKELETON OF THORNBACK.

RAJA. RAY.

Generic Character.

Os sub capite, transversum, dentibus obsitum.	*Mouth* situated beneath the head, transverse, beset with teeth.
Spiracula subtus ad collum utrinque quinque.	*Spiracles* beneath, five on each side the neck.
Corpus depressum, plerisque subrhomboideum.	*Body* in most species subrhomboidal.

THIS genus is distinguished by the remarkable breadth and thinness of the body, the pectoral fins appearing like a continuation of the sides themselves, being covered with the common skin: their rays are cartilaginous, strait, and furnished with numerous swellings or knots: the teeth are very numerous, small, and placed in ranges over the lips or edges of the mouth: the eyes are furnished with a nictitating membrane or skin, which can at pleasure be drawn over them like an eyelid, and at some distance above the eyes are situated the nostrils, each appearing like a large and somewhat semilunar opening edged with a reticulated skin, and furnished internally with a great many laminated processes divided by a middle partition: they are guarded by an exterior valve: behind the eyes are also a pair of holes communicating with the

mouth and gills: these latter, taken together, present a vast extent of surface: the young are contained in oblong square capsules with lengthened corners, and are discharged at distant intervals, the young animal gradually liberating itself from its confinement, and adhering for some time by the umbilical vessels. The Rays in general feed on the smaller kind of crabs, testacea, marine insects, and fishes: they are constant inhabitants of the sea, lying concealed during part of the winter among the mud or sand, from which they occasionally emerge and swim to unlimited distances.

Of a rhomboid shape.

SKATE.

Raja Batis. *R. cinerea nigro-varia, subtus alba nigro-punctata, dorso glabro, cauda unico aculeorum ordine.*

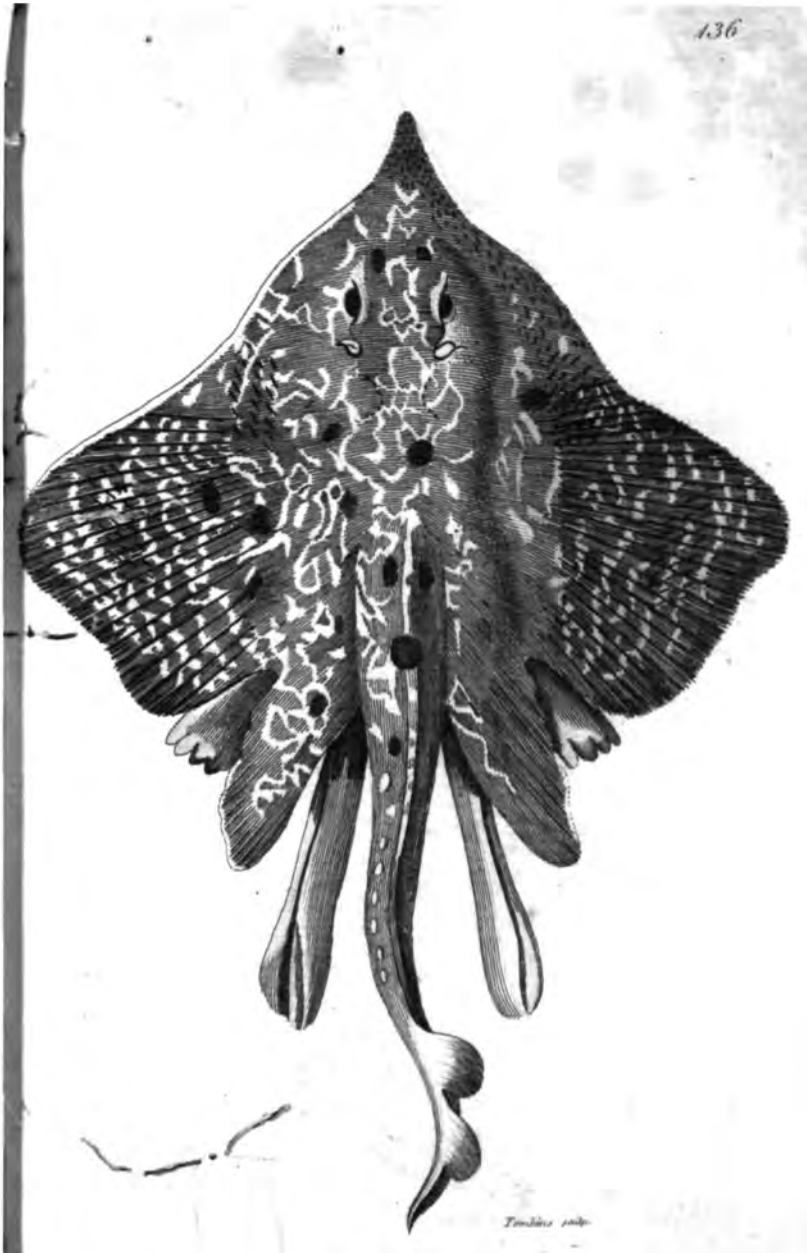
Cinereous Ray, with dusky variegations, beneath white with black points, with smooth back, and a single row of spines on the tail.

Raja Batis. *R. varia, dorso medio glabro, cauda unico aculeorum ordine. Lin. Syst. Nat.*

Raja cauda tantum aculeata. *Bloch. t. 79.*

Skate. *Penn. Brit. Zool.*

The Skate is one of the largest of the European Rays, sometimes weighing from one to two hundred pounds, and even, according to some accounts, not less than three: its general colour on the upper parts is a pale cinereous brown, varied with several darker or blackish undulations: the under part is



SKATE.

1804 June 1 London Published by G. Kearsley Fleet Street.

white, marked with numerous, distant, black specks: in the male the pectoral fins are beset towards their tips or edges with numerous small spines: on each side the tail, at some distance from the base, is a sharp spine: several very strong ones run down the back of the tail, and in some specimens a row of smaller ones is visible on each side. As an edible fish the Skate is considered as one of the best of its tribe, and is an established article in the European markets, being found in great plenty in the adjoining seas, where it usually frequents the shores in the manner of flat-fish: it breeds in the month of March and April, and deposits its ova from May to September. We are informed by Mr. Willughby that a Skate of two hundred pounds weight was sold in the fish-market at Cambridge to the cook of St. John's College in that university, and was found sufficient to dine the whole society, consisting of more than 120 persons. In October the Skate is usually poor and thin; begins to improve in November; and grows gradually better till May, when it is considered as in its highest perfection.

ROUGH RAY.

Raja Rubus. *R. griseo-varia aspera, rostro subacuto, ordine aculeorum in dorso simplici, in cauda triplici.*

Variegated-grey, rough Ray, with subacute snout, a single row of dorsal, and a triple row of caudal spines.

Raja Rubus. *R. ordine aculeorum in dorso unico, tribusque in cauda. Bloch. t. 84. Lin. Gmel. p. 1507.*

Rough Ray. *Penn. Brit. Zool.*

Greatly allied to the Thornback, but covered with more numerous spines, every part of the skin on the upper surface being muricated with sharp curved aculei of different sizes: of these one row of the largest runs down the middle of the back, and three, or, sometimes, five, along the tail: others are dispersed about the region of the eyes and the flaps of the pectoral fins: the general colour is a yellowish or whitish grey, sometimes variegated with dusky or brownish clouds and streaks: the under side is white, and beset with very numerous scattered spines, but less strong than those on the upper side: the general size of this species is the same with that of the Thornback. A specimen observed by Mr. Pennant measured nearly three feet from the nose to the tip of the tail. It is a native of the Mediterranean and other seas. The teeth in this fish are sharp-pointed; in the Thornback obtuse.

TUBERCULATED RAY.

EGLANTINE RAY.

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FULLER'S RAY.

Raja Fullonica. *R. griseo-varia, dorso toto aculeato, aculeorum ordine simplici ad oculos, duplici in cauda.*

Variegated-grey Ray, with the whole back aculeated, a single row of spines at the eyes, and a double one on the tail.

Raja fullonica. *R. dorso toto aculeato, aculeorum ordine simplici ad oculos, duplici in cauda. Lin. Syst. Nat.*

Raja fullonica? *Rond. Gesn.*

This seems, from the descriptions of authors, to be very nearly allied to the R. Rubus, but is still more strongly roughened with spines; the back being entirely covered with those processes, but the tail furnished with only a double row: in the present genus however such is the close alliance of several species, and so great the differences which take place in specimens of a smaller or larger growth, that it is hardly possible to assign distinctive characters sufficiently accurate; and it may perhaps be doubted whether this fish be any thing more than a variety of the preceding kind.

EGLANTINE RAY.

Raja Eglanteria. *R. dentibus obtusis, corpore aculeis minutis obsito, cauda bipinnata, spinis numerosis muricata.*

Ray with obtuse teeth, body beset with minute prickles, and bipinnate tail muricated with numerous spines.

Raja Eglanteria. *Cepede.*

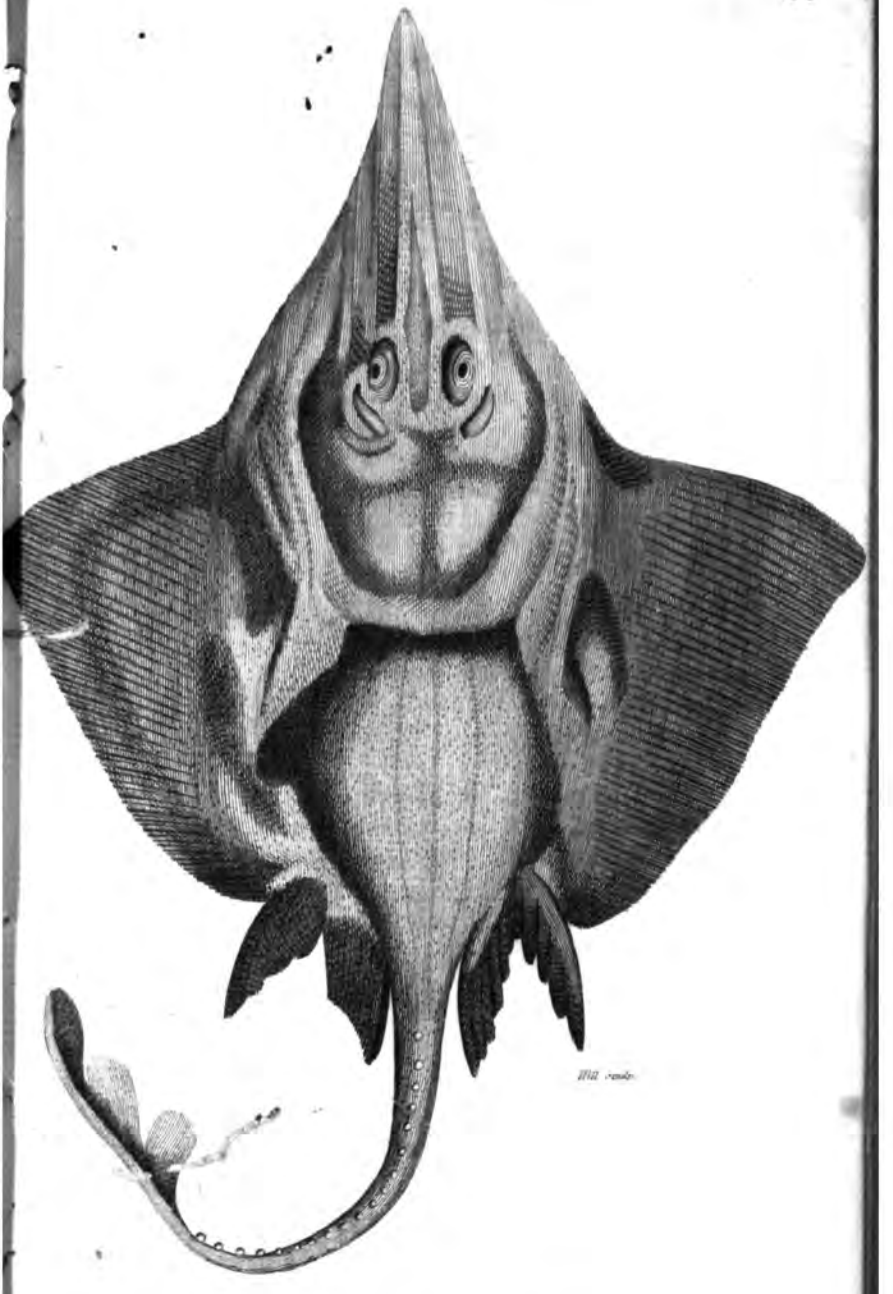
The present species is described by Cepede, who informs us that it was first observed by Citizen

Bosc, and is a native of the North American seas: its form is somewhat obtusely rhomboidal, and its upper surface is covered with very small and short spines, which are even scarce perceptible in some specimens except on the middle of the back, which is furnished with a range of much longer ones: this range is continued down the whole length of the tail, the sides of which are beset with several rows of differently-sized spines. The colour of this Ray is brownish above, and white beneath: it is said to be not uncommon in the bay of Charles-Town.

SHARP-NOSED RAY.

Raja Oxyrinchus. *R. cinerea, rostro subacuto producto, serie aculeorum dorsali caudalique simplici.*
Cinereous Ray, with subacute produced snout, and a single row of spines down the back and tail.
Raja oxyrinchus. *R. varia, dorso medio tuberculis decem aculeatis. Lin. Syst. Nat.*
Raja oxyrinchos major. *Will. ichth. p.* 71.
Raja aculeorum ordine unico in dorso caudaque. *Bloch. t.* 80.
Sharp-Nosed Ray. *Penn. Brit. Zool.*

Similar in shape to the Skate, but with a longer and sharper snout, not ill resembling the shape of a spontoon: colour of the whole upper part cinereous, with several pale, or whitish spots intermixed with a few slight dusky streaks or variegations: beneath white, with dusky or blueish streaks: down the back and tail runs a single row of spines, and a few others are placed about the region of the eyes: the sides of the tail are also sometimes furnished



SHARP-NOSED RAY.

with a row of smaller or weaker spines than those on the upper part: the eyes are large, as is also the mouth. This species, like the Skate, often arrives at a very considerable size, though it is, in general, of smaller dimensions than either that fish or the Thornback. It is a native of the Mediterranean and Northern seas.

NEEDLE-NOSED RAY.

Raja Acus. *R. rostro acutissimo, maculis quatuor dorsalibus nigris.*
Ray with very sharp snout, and four black dorsal spots.
Raja Acus. *Cepede.*

Size not mentioned: head ovate: snout extremely sharp: teeth obtuse: on the back four black spots placed in such a manner as to form a portion of a circle: a single row of spines down the tail, on the upper part of which is placed the dorsal fin: no caudal fin: native of the European seas.

MIRROR RAY.

Raja Miraletus. *R. fusco-grisea varia, supra utrinque macula magna ocellata, cauda triplici serie aculeorum.*

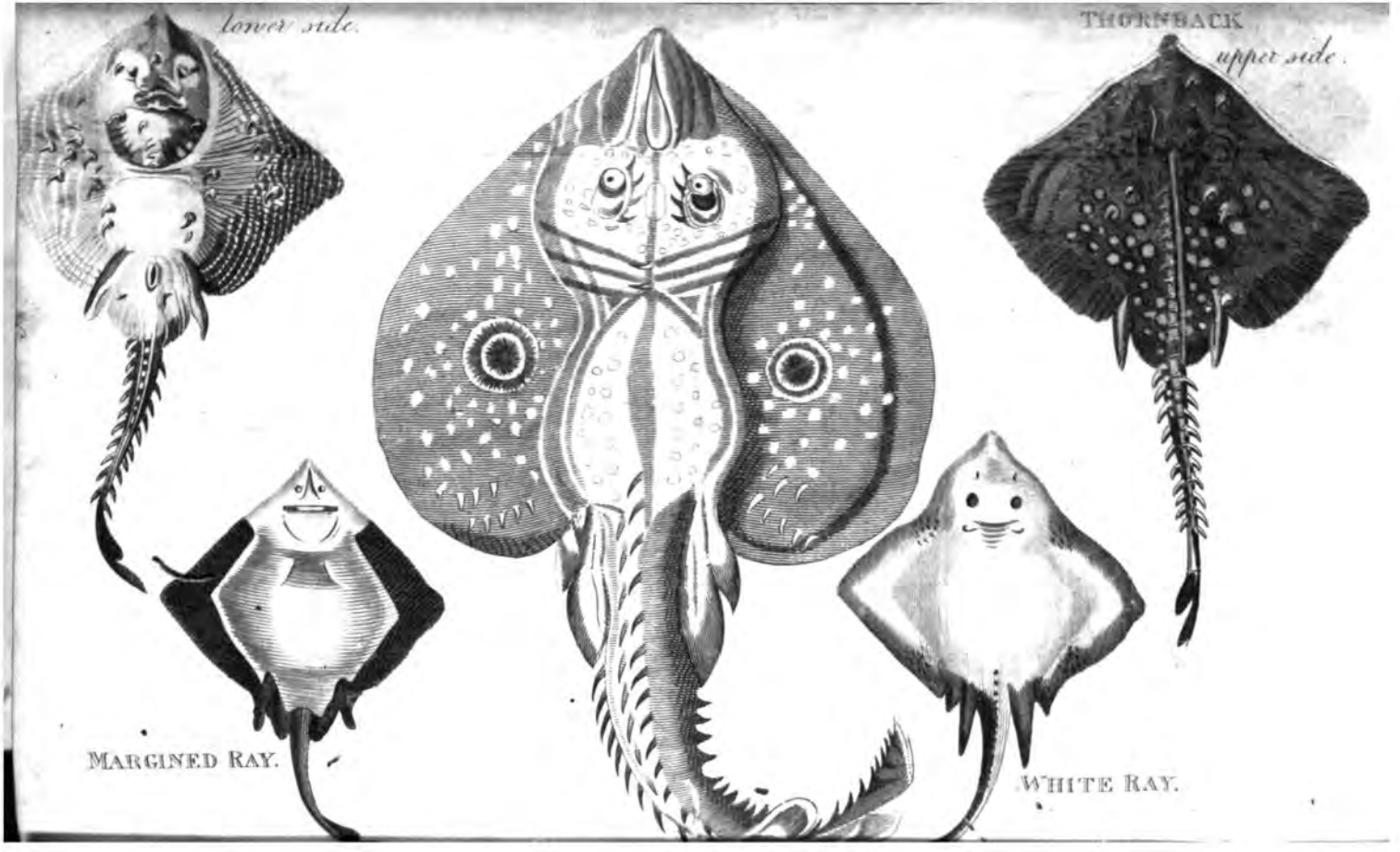
Grey-brown variegated Ray, marked above on each side by a large ocellate spot, with a triple row of caudal spines.

Raja Miraletus. *R. dorso ventreque glabris, aculeis ad oculos, ternoque eorum ordine in cauda. Lin. Syst. Nat.*

Raja oculata. *Salv. Ray. Will.*

Described by Rondeletius: general appearance similar to that of the Thornback and some others: surface comparatively smooth, being chiefly furnished with spines about the region of the eyes, and with a triple row along the tail; but the principal distinctive character seems to consist in each of the pectoral fins being marked about the middle, or near the body, with a large, circular, eye-shaped spot, consisting of a purplish or dusky circle, with a whitish or yellowish centre *: the general colour of the upper parts is a dull brownish grey. This fish is an inhabitant of the Mediterranean.

* These spots are said to differ occasionally in colour, being sometimes purple with a blueish centre, and with the exterior circle surrounded with yellow, and at other times blackish.


lower side.
THORNBACK
upper side.
MARGINED RAY.
WHITE RAY.

UNDULATED RAY.

PAINTED RAY.

Heath sculp

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BLACK RAY.

Raja Nigra. *R. nigra, subtus alba, spinarum dorsalium serie simplici, caudalium triplici.*
Ray with the body black above, white beneath, with a single row of dorsal, and a triple row of caudal spines.
Raja nigra. *Cepede.*

SHAPE rhomboid: snout pointed: from the middle of the back to the end of the tail a row of spines; and on each side the tail a row of more distant ones: tail very thin: whole fish on the upper surface black, more or less deep in different specimens: beneath quite white: native of the European seas; sometimes taken in the mouth of the Seine, among Thornbacks and other Rays: grows to a considerable size.

PAINTED RAY.

Raja Picta. *R. flavescens, seriebus tortuosis guttarum albarum ornata.*
Yellowish Ray, marked with tortuous rows of white spots.
Raja picta. *Cepede.*

SHAPE rhomboid: snout rather produced: from the head to the end of the tail a row of spines: two or three spines before each eye; and a row of five or six on each side the beginning of the tail: colour above yellowish, with very numerous, small, round, white spots, many of which are symmetrically arranged in a double tortuous series on each

side: the most elegant of all the Rays: native of the European seas, and found occasionally above the French and English coasts.

UNDULATED RAY.

Raja Undulata. *R. grisea, strigis subtransversis undulatis nigricantibus.*
Grey Ray, with subtransverse undulated blackish streaks.
Raja undulata. *Cepede.*

Shape like that of the Thornback: snout somewhat pointed: from the head to the end of the tail a row of spines; and a pair before and behind each eye: another near the head, and one on each side the dorsal series: colour pale grey-brown, with numerous undulating dusky streaks, chiefly in a transverse direction: beneath pale or whitish. Native of the European seas.

WHITE RAY.

Raja Alba. *R. supra albida, subtus nivea.*
Whitish Ray, milk-white beneath.
Raja alba. *Cepede.*

Shape like that of the Thornback: size moderate: colour above whitish; beneath milk-white: body pretty thick: snout pointed: head more distinctly marked off from the breast than in most other Rays: tail of middling length, with two fins above, and one at the extremity: in the male is a single

row of spines along the tail, and a groupe at the four angles of the body: in the female three rows on the tail: native of the Mediterranean.

MARGINED RAY.

Raja Marginata. *R. testacea, subtus albida margine lato nigro.*
Pale-ferruginous Ray, white beneath with a broad black border.
Raja marginata. *Cepede.*

Size rather small: shape like that of the preceding: colour above pale bay; beneath whitish, with a very broad black margin: on the tail three rows of spines, and behind each eye a single spine. Native of the Mediterranean.

SHAGREEN RAY.

Raja Chagrinea. *R. supra tuberculata, rostro caudaque serie aculeorum triplici.*
Ray with the body tuberculated above, and with a triple row of spines on the tail.
Shagreen Ray. *Penn. Brit. Zool.*

Body less broad in proportion than in most others of this division: snout long and pointed, and furnished with two rows of spines: several others are placed in a semicircle towards the eyes, of which the iris is sapphire-coloured: both sides of the tail are armed with numerous smaller ones: the whole upper surface of the animal is roughened by numerous small granules like those on the skin of some of the shark-tribe, and particularly of the

Great Dog-Shark, of the skin of which is prepared the substance known by the name of shagreen: colour above cinereous brown, beneath white. Native of the European seas.

With slender tail, generally armed with a spine.

STING RAY.

Raja Pastinaca. *R. subolivacea, subtus albida, cauda tenui, apterygia, armata.*

Subolivaceous Ray, whitish beneath, with slender, finless, armed tail.

Raja Pastinaca. *R. corpore glabro, aculeo longo anterius serrato in cauda et dorso apterygio. Lin. Syst. Nat.*

Raja cauda apterygia, aculeo sagittato. *Bloch, t.* 82.

Sting Ray. *Penn. Brit. Zool.*

Shape subrhomboidal, but somewhat approaching to ovate, the pectoral fins being less pointed than in some of this division: snout pointed: body more convex than in the preceding rays: colour of the whole animal above yellowish olive, with the back darkest, and approaching, in some specimens, to a blueish brown: beneath whitish: tail without fin, of considerable length, very thick at the base, and gradually tapering to the extremity, which is very slender: near the middle it is armed, on the upper part, with a very long, flattened, and very sharp-pointed bone or spine, finely serrated in a reversed direction on both sides: with this the animal is capable of inflicting very severe wounds on such as incautiously attempt to handle it; and it answers

the purpose both of an offensive and defensive weapon: it is annually cast, and as it frequently happens that the new spine has arrived at a considerable size before the old one has been cast, the animal is occasionally found with two, in which state it has been sometimes erroneously considered as a distinct species. This fish is said not to grow to so large a size as many others of the genus: it is an inhabitant of the Mediterranean, Atlantic, and Indian seas, and is numbered among the edible Rays. On account of the danger attending the wounds inflicted by the spine, it is usual with the fishermen to cut off the tail as soon as the fish is taken; and it is said to be illegal in France and some other countries to sell the animal with the tail still adhering. It is hardly necessary to observe that the spine is perfectly void of any venomous quality, though formerly supposed to contain a most active poison; and that the effects sometimes produced by it are entirely those arising from deep puncture and laceration, which, if taking place in a tendinous part, or among the larger nerves and blood-vessels, have often proved fatal. Oppian, Ælian, Pliny, and others have related in terms of considerable luxuriance the effects of this animal's powerful weapon: and a general description may be found in Aldrovandus: it was supposed to be not only poisonous in the living animal, but to preserve its poison when taken from the fish and affixed to the head of an arrow or a spear: it was said to wither the most flourishing plant by its touch, and even to cause trees to die, by striking the bark with its

point. It formed the head of the fatal spear presented by the enchantress Circe to her son Telegonus, by which he was rendered superior to all his enemies, and with which he at length unconsciously slew his father Ulysses.

The general habits of the animal are similar to those of the rest of the genus, often lying flat, and in ambuscade on the soft mud at the bottom of the shores which it frequents, and seizing its prey by surprise, and at other times pursuing it through the depths of the ocean.

EAGLE RAY.

Raja Aquila. *R. rhombeo-dilatata cinerea, subtus pallida, cauda tenus, pinnata, armata.*

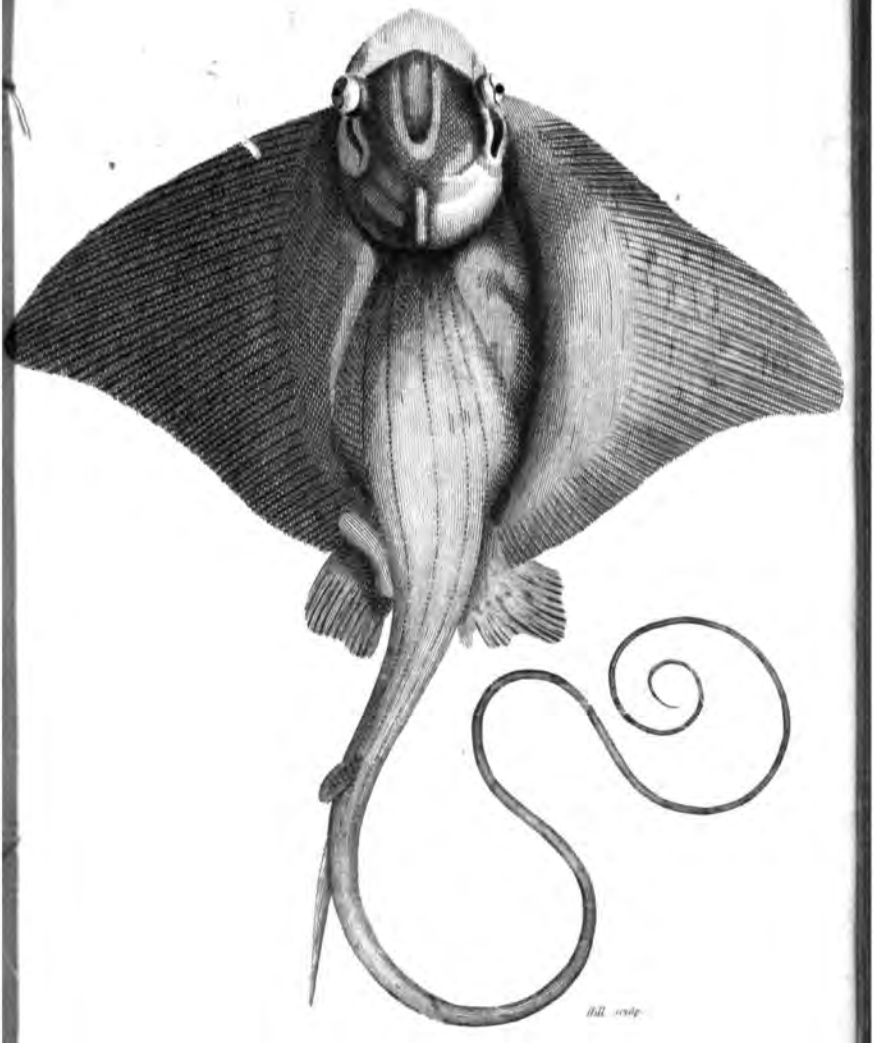
Rhombic-dilated cinereous Ray, pale beneath, with slender, pinnated, armed tail.

Raja Aquila. *R. corpore glabro, aculeo longo serrato in cauda pinnata. Lin. Syst. Nat.*

Raja cauda pinnata, aculeoque unico. *Bloch. t.* 81.?

Aquila. *Will. ichth. p.* 64. *t. C.* 2.

Shape rhomboid, but with a considerable dilatation; the pectoral fins approaching to a subfalcated form: colour cinereous above; pale or whitish beneath: head rather large: snout somewhat produced: eyes large and prominent, with yellow irides: tail long, slender, sharp-pointed, and furnished, about the middle, with a spine similar to that of the Sting Ray. This species grows to a very great size, sometimes measuring ten, twelve, or even fifteen feet in length, and weighing upwards



EAGLE RAY.

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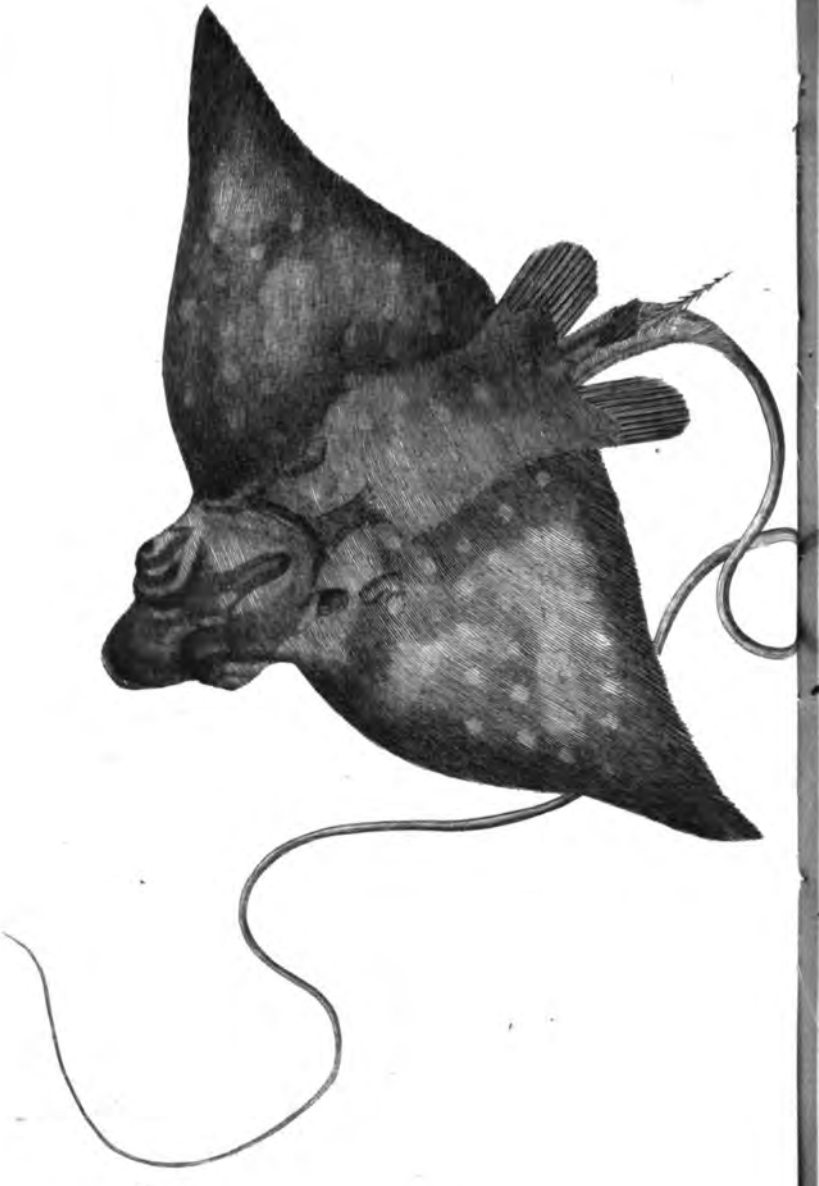

GUTTATED RAY.

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of three hundred pounds. It inhabits the Mediterranean, Atlantic, and Indian seas, and is said to swim in a slower manner than most other Rays: like the rest of the genus it preys on the smaller fishes, &c. and is supposed to strike and kill, or at least disable its prey with the caudal spine: when taken it is observed to vibrate the tail with great strength and rapidity in all directions. It is not numbered among edible fishes, being tough and of a bad flavour, but the liver, which is very large, is said to be sometimes eaten, though it is more frequently used for the purpose of preparing from it a clear oil, which it affords in great plenty.

GUTTATED RAY.

Raja Guttata. *R. subrhombeo-dilatata cinerea, albo guttata, capite subproducto, subtus alba, cauda tenui armata.*

Subrhombic-dilated cinereous Ray, spotted with white, with subproduced head, body white beneath, and slender, armed tail.

Marinari. *Marcgr. Bras. Will. p. 66. t. C. 1. f. 5.*

Eel Tenkee. *Russ. ind. t. 8.*

Greatly allied to the R. Aquila in appearance, but with a more produced head or snout: colour above deep cinereous, pretty thickly marked with small, round, white or whitish spots: tail-fins and spine placed nearer the body than in the preceding, of which however it has been sometimes considered as a variety rather than as truly distinct: native of the Indian and African seas: observed by Commerson about the coasts of Madagascar, by

Dr. Russel about those of Coromandel, and long ago by Marcgrave about those of Brasil. The last-mentioned author informs us that it grows to a very large size, is in considerable esteem as a food, and that one fish is sufficient to dine forty persons.

FASCIATED RAY.

Raja Fasciata. *R. grisea, falcato-dilatata, fasciis transversis cæruleis, cauda longa tenui inermi.*

Grey Ray, of a falciform-dilated shape, with transverse blue bands, and long, slender, unarmed tail.

Aquilæ marinæ species. *Will. append. t.* 10. *f.* 3.

Mookarah Tenkee. *Russ. ind. t.* 7.

Of similar shape and appearance with the *Aquila* and *guttata*, but rather more dilated towards the tips of the pectoral fins, which, as in the two preceding, are sharp-pointed and subfalcated: colour above cinereous, with several broad, transverse, blue bands, of different shades: beneath pale brown: tail of similar shape with that of the *Aquila* and *guttata*, but, so far as hitherto observed, not furnished with a spine.

FASCIATED RAY.

LYMNA RAY.

Raja Lymna. *R. testacea, cæruleo-maculata, cauda pinnata armata.* Subferruginous Ray, with blue spots, and pinnated armed tail.
R. Lymna. *R. corpore ovali lævi testaceo, maculis cæruleis, cauda pinnata aculeo uno. Lin. Syst. Nat. Gmel. Forsk. Arab. p.* 17.

This, according to Forskal, its first describer, is much allied to the Eagle-Ray and the Fire-Flaire, and is of a reddish brown colour above, besprinkled with numerous oval blue spots of different sizes: the tail is somewhat longer than the body, marked above, for half its length, with two longitudinal blue stripes, and is furnished about the middle with one, and sometimes with two large and serrated spines, which are covered at their base by a blueish-brown skin: the under part of the body is pale or whitish. Native of the Red Sea.

CUCKOW RAY.

Raja Cuculus. *R. fusco-cærulescens, subtus albida, capite brevi, cauda armata.*
Blueish-brown Ray, whitish beneath, with short head, and armed tail.
Raja Cuculus. *Cepede.*
Pastinaca marina altera. *Will. ichth. t. C. 1. f. 3.* ?

Allied to the *oxyrhinchus*, but never grows to so large a size: colour above either blueish or brown-bay: beneath whitish: head small and short: teeth sharp: across the roof of the mouth a

kind of denticulated cartilage: snout and upper part of the body without spines: on the tail, which is very slender, one or more long denticulated spines. This species is said by Cepede to be caught about the coasts of Cherburgh, and sometimes in the mouth of the Seine. It seems to approach the nearest to the *Pastinaca marina altera* of Fabius Columna, represented on Plate C. 1. f. 3. of Willughby's Ichthyology. It is said by Columna to be called *Altavela* by the Neapolitans, and seems to have been considered by the generality of succeeding ichthyologists as a variety of the *R. Pastinaca.*

PEARLED RAY.

Raja Sephen. *R. fusco-cinerea, subtus albida, corpore supra tuberculato, tuberculis dorsalibus tribus mediis majoribus.*
Cinereous-brown Ray, with the body tuberculated above, with the three middle tubercles larger than the rest.
Raja Sephen. *R. corpore suborbiculato, cauda duplo longiore subtus alata, &c. Lin. Gmel. Forsk. Arab. p.* 17.

Shape subrhomboid; the upper part of the body, measured from the tips of the pectoral fins, which are obtuse, forming a half-rhomb: the lower part, from the tips of the pectoral fins to the tail, forming a half-circle: snout small and slightly pointed: ventral fins rather small and rounded: tail more than twice the length of the body, gradually tapering to a fine point, furnished beneath the middle part with a shallow fin running to a considerable distance, and above with a strong and sharp spine, as in the Sting Ray and many others, and some-

times two spines are found instead of one: back, from between the eyes to some distance beyond the base of the tail, covered with pretty close-set tubercles or granules, three of which, in the middle of the back, are far larger than the rest, and resemble three pearls disposed in a longitudinal direction on that part: colour of the whole animal deep cinereous brown above, and reddish white beneath: grows to a large size, sometimes measuring eleven feet from the snout to the end of the tail. Native of the Red Sea.

It is from the skin of this species, according to Cepede, that the beautiful substance called *Galuchat* by the French is prepared, and which being coloured with blue, green, or red, according to the fancy of the artist, and afterwards polished, is so frequently used for various kinds of cases, telescope-tubes, &c. &c. For this purpose the smaller or younger specimens are preferred; the tubercles in the more advanced or full-grown animals being too large for the uses above-mentioned.

Var.

Wolga Tenkee. *Russ. pisc. ind. t.* 3.

This seems to be a variety of the preceding: the length of the specimen described by Dr. Russel was about nine inches and a half, the tail about two feet nine inches: colour of the whole animal dull leaden above, with deep-blue tail: beneath dusky white: on the middle of the back only two

pearl-formed tubercles instead of three: tail furnished with a sharp spine and a fin beneath, as in the former. Native of the Indian seas.

TUBERCULATED RAY.

Raja Tuberculata. *R. dorso caudaque aculeis subobtusis, depressis, distantibus nitidis.*

Ray with subobtuse, distant, depressed, glossy spines down the back and tail.

Raja tuberculata. *Cepede.*

Described by Cepede: general form like that of the Thornback, &c. along the back, and down the tail, at considerable distances from each other, run several strong but short spines, with very broad bases, which have a kind of glossy or enamelled appearance: on the region of the fins are disposed pretty numerous small round tubercles: the tail, which is long and slender, is furnished, exclusive of the distant short spines before-mentioned, with a very long and serrated one, as in the Sting Ray, but with larger and more distinctly marked serratures, resembling the teeth of a saw: colour uncertain. Native of the South-American seas.

RING-TAILED RAY.

Raja Poecilura. *R. subrhombeo-dilatata, cinerea, subtus alba, cauda brevi, tenui, inermi, albo nigroque annulata.*
Subrhombic-dilated cinereous Ray, white beneath, with short, slender, unarmed tail, annulated with black and white.
Tenkee Kunsul. *Russ. ind. t.* 6.

Shape very broad in proportion to its length: pectoral fins obtuse: head indistinct: snout very small: eyes rather small: whole animal smooth, and of a deep cinereous colour above, whitish beneath: tail shortish, slender, and annulated by alternate circles of black and white. Native of the Indian seas.

With bilobate front.

DEMON RAY.

Raja Diabolus. *R. falcato-dilata fusca, subtus albida, capite lato bilobo, cauda inermi.*
Falciformly-dilated brown Ray, whitish beneath, with broad bilobate head, and unarmed tail.
Eereegoodee Tenkoo. *Russel ind. t.* 9.

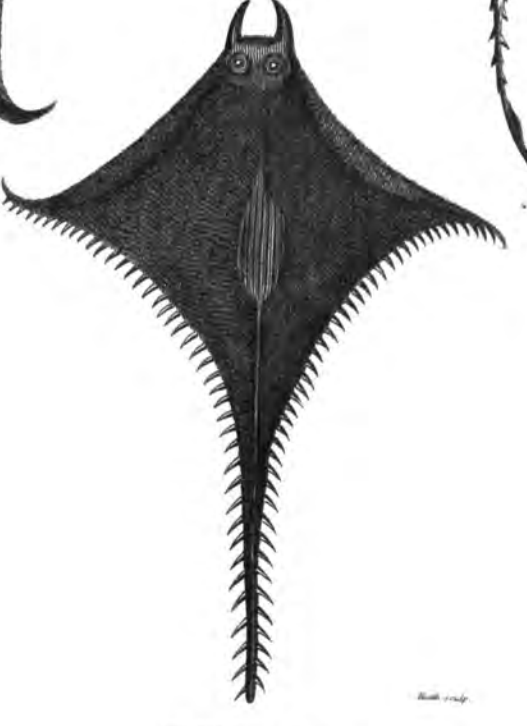
This highly singular animal appears to have been first described by Duhamel, from a specimen taken in the year 1723 near Marseilles, measuring about ten feet and a half in length, and weighing six hundred pounds. In point of general shape it is allied to the Eagle and Fasciated Rays, but with a much greater extent of pectoral fins; appearing

extremely broad in proportion to its length: the head, which is of moderate size, is strait or rectilinear in front, each side projecting into a vertically flattened and slightly pointed lobe or wattle of nearly two feet in length, and giving somewhat the appearance of a pair of horns: the eyes, which are large and prominent, are situated on each side the head, nearly at the base of each of the processes above described, and the mouth, which is very wide, is placed as in others of this genus, beneath, measuring about fifteen inches in width: the pectoral fins are of a subtriangular figure, curving downwards on each side, and terminating in a point: the back is very slightly elevated into a somewhat pyramidal form; and at its lower part is situated the dorsal fin, which is of a lengthened shape, and inclines backwards: the ventral fins, in the specimen observed by Duhamel, were somewhat more than a foot in length, and the tail, which was destitute of any fin, was very slender, and measured about four feet six inches in length: the whole animal was every where covered by a smooth skin, without any tubercles or spines: the colour was a cinereous brown above, and paler or more inclining to whitish beneath. This species is an inhabitant of the Mediterranean, Atlantic, and Indian seas: it is said to be chiefly observed about the Azores, where it is known by the name of *Mobular*.

BLACK RAY

ANATIA RAY

CUVIER'S



FRINGED RAY

MANATIA RAY.

Raja Manatia. *R. rhombea nigricans, subtus alba, capite bilobo, cauda inermi, apice pinnata.*

Rhomboid blackish Ray, white beneath, with bilobate head, and unarmed tail, finned at the tip.

Raja Manatia. *Cepede.*

A SPECIES of gigantic magnitude: allied in general appearance to the Demon Ray; length about fifteen feet and a half: breadth about nine feet: the body and pectoral fins, taken together, forming the appearance of a lozenge: each pectoral fin, separately taken, representing an isosceles triangle: the head is rather small in comparison with the body, and of similar shape with that of the former species, being furnished with a flattened, extended process on each side, of the length of about six inches: mouth about ten inches wide: back elevated on the middle into a large tubercle: ventral fins small, and in part covered by the pectoral fins: dorsal fin wanting: tail as in the former species, but terminating in a divided fin: whole animal smooth: colour above black or very deep brown; beneath milk-white: native of the South-American seas, where it is called *Manatia.*

GIORNA RAY.

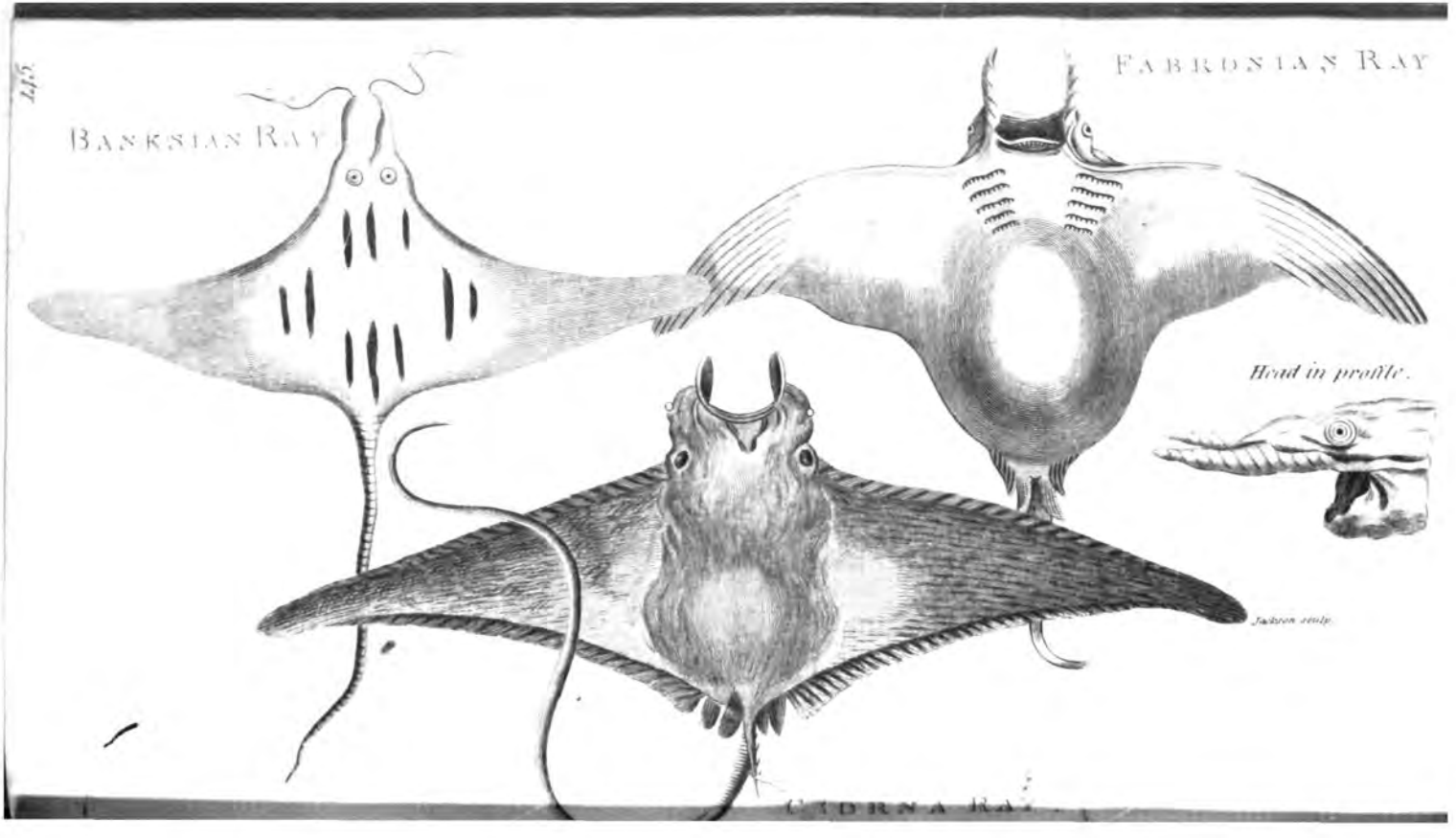
Raja Giorna. *R. subrhombea fusca, subtus alba, capite bilobo, cauda longa, versus apicem utrinque tuberculata.*
Subrhomboid brown Ray, white beneath, with bilobate head, and long tail, tuberculated on each side towards the tip.
Raja Giorna. *Cepede.*

Similar in general appearance to the two preceding: size very large: colour brown above, with an olivaceous cast on each side; beneath white: head large: horns or appendages blackish, longitudinally striated, and marked with eight rows of tubercles: dorsal and pectoral fins shaped like an isosceles triangle: tail thrice the length of the rest of the animal; smooth for about a fourth of its length, and afterwards tuberculated on both sides: length of the frontal appendages about a tenth part that of the tail. An individual of this species was taken near the coast of Nice, and described by Signior Giorna of Turin.

FABRONIAN RAY.

Raja Fabroniana. *R. falcato-dilatata fusca, subtus albida, capite bilobo, lobis pinniformibus.*
Falciformly-dilated brown Ray, whitish beneath, with bilobate head, with fin-like lobes.
Raja Fabroniana. *Cepede.*

Size very large: pectoral fins very narrow and falciform: frontal processes long, moveable, and in some degree resembling a kind of fins, composed


Pl. 17
BANKSIAN RAY
FABRONIAN RAY
Head in profile.
Jackson sculp.

of small cartilaginous processes united by a membrane or softer intermediate substance: tail slender, but somewhat mutilated in the specimen described: colour brown, paler or whitish beneath. Native of the Mediterranean sea: observed about the coast of Tuscany, and described by Dr. Fabroni of Florence.

BANKSIAN RAY.

Raja Banksiana. *R. subrhombea cinerea, strigis longitudinalibus nigris, capite bilobo, cauda tenui inermi.*

Subrhomboid cinereous Ray, with longitudinal black streaks, bilobate head, and slender unarmed tail.

Diabolus marinus. *Will. ichth. append. t. 9. f. 3.*

Raja Banksiana. *Cepede.*

Size very large: pectoral fins still narrower than in the Fabronian Ray: colour above cinereous, with several unequal, black, lanceolate streaks disposed over the back between the eyes and pectoral fins: eyes not situated, as in the preceding kinds, at the corners of the head, but on the upper part of the front: the disposition of the black stripes is as follows; viz. three behind the eyes; three similar ones towards the origin of the tail; and two at the base of each of the pectoral fins.

A drawing of this species was sent some years ago from the East Indies, to Sir Joseph Banks, under the name of the Sea-Devil: in the drawing the horn-shaped processes on each side the head were represented as furnished with a very long fibre or process, in one of which a small fish was

represented as entangled: this circumstance appearing very doubtful, it was supposed to have been rather a pictorial licence than a real representation; the processes being probably simple, as in others of this particular tribe: this seems confirmed by a figure given in Willughby's Ichthyology, evidently representing the same species, in which the processes are represented as unfurnished with any filament. Willughby's figure is taken from Nieuhoff, and represents the tail about twice the length of the rest of the animal, seemingly furnished along its under part with a series of small acuminated processes. This species is said to occur in both the Indian oceans, and to be occasionally observed about the coasts of Barbadoes, where a specimen was once taken of so enormous a size as to require seven yoke of oxen to draw it along.

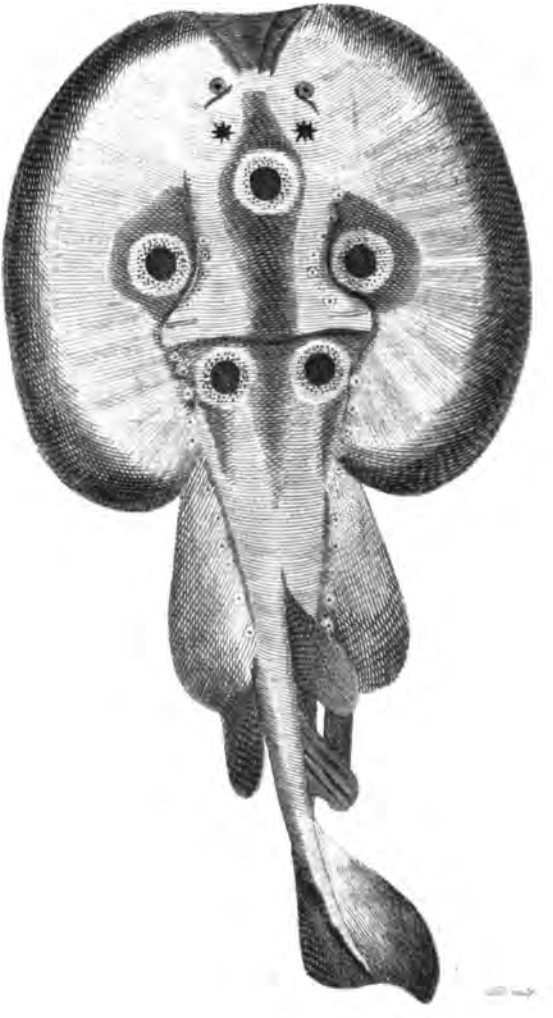
FRINGED RAY.

Raja Fimbriata. *R. subrhombea nigricans, capite bilobo, cauda utrinque fimbriata.*

Subrhomboid blackish Ray, with bilobate head, and tail fimbriated on each side.

Raie frangé. *Cepede.*

Size very large: colour above very deep brown; beneath whitish: eyes situated on the upper part of the head, as in the major part of the genus: pectoral fins terminating in a moveable tip, and together with the body, forming a rhomboidal outline: tail long, slender, and fringed along each side



TORPEDO RAY.

1804 June 1 London Published by G. Kearsley Fleet Street.

with a row of small processes or appendages, extending some distance up the sides of the body and edges of the pectoral fins. Native of the American seas.

It may be doubted whether this be any thing more than a variety, or, perhaps, sexual difference of the preceding Ray; and it is remarkable that in Willughby's figure of the Sea-Devil the tail, as before observed, is marked by a series of small appendages, though it does not clearly appear whether they are meant to be represented as belonging to one side of the tail or to the under part.

Of a rounded shape.

TORPEDO RAY.

Raja Torpedo. *R. subfusca lævis, dorso utrinque poris pertusis sparsis.*

Brownish smooth Ray, with the back marked on each side by scattered pores.

Raja Torpedo. *R. tota lævis. Lin. Syst. Nat.*

Torpedo. *Plin. Bellon. Gesn. Rondel. Aldr. Jonst. Redi. Will. &c. &c.*

Cramp Ray. *Penn. Brit. Zool.*

The Torpedo has been celebrated both by ancients and moderns for its wonderful faculty of causing a sudden numbness or painful sensation in the limbs of those who touch or handle it. This power the ancients, unacquainted with the theory of electricity, were contented to admire, without attempting to explain; and, as is usual in similar cases, magnified it into an effect little short of what

is commonly ascribed to enchantment. Thus we are told by Oppian that the Torpedo, conscious of his latent faculty, when caught by a hook, exerts it in such a manner that, passing along the line and rod, it benumbs the astonished fisherman, and suddenly reduces him to a state of helpless stupefaction.

" Ναι μεν κι ναρκη," &c.

The hook'd Torpedo, with instinctive force
Calls all his magic from its secret source:
Quick thro' the slender line and polish'd wand
It darts; and tingles in th' offending hand*.
The palsied fisherman, in dumb surprise,
Feels thro' his frame the chilling vapours rise:
Drops the lost rod, and seems, in stiffening pain,
Some frost-fix'd wanderer on the polar plain.

It is affirmed by Pliny that the Torpedo, even when touched with a spear, or stick, can benumb the strongest arm, and stop the swiftest foot.

It is well observed by Dr. Bloch that these exaggerations on the part of the ancients are the less to be wondered at when we reflect on similar ones in modern times. Thus, when Muschenbrook happened accidentally to discover and feel the effect of the electric shock from what is called the Leyden vial, he represented it of so terrible a nature as to affect his health for several days afterwards, and declared that he would not undergo a second for

* There are not wanting some who insist that this is no exaggeration, and that the electricity of the Torpedo is really conducted in this manner.

the whole kingdom of France. Yet this is now the common amusement of philosophical curiosity.

The observations of the learned Redi and others in the 17th century, had tended, in some degree, to elucidate the peculiar actions and anatomy of the Torpedo; but it was reserved for more modern times, and for our own ingenious countrymen in particular, to explain in a more satisfactory manner the particulars of its history; and to prove that its power is truly electric. The first experiments of this kind were made by Mr. Walsh of the Royal Society of London, at Rochelle in France, in the year 1772.

"The effect of the Torpedo," says Mr. Walsh, "appears to be absolutely electrical, forming its circuit through the same conductors with electricity, and being intercepted by the same non-conductors, as glass and sealing-wax. The back and the breast of the animal appear to be in different states of electricity, I mean in particular the upper and lower surfaces of the two assemblages of pliant cylinders engraved in the work of Lorenzini *. By the knowledge of this circumstance we have been able to direct his shocks, though they were small, through a circuit of four persons, all feeling them, and likewise through a considerable length of wire held by two insulated persons, one touching his lower surface, and the other his upper. When the wire was exchanged for glass or sealing-wax no effect could be obtained: but as soon as it was re-

* Observazioni intorno alle Torpedini. 1678.

sumed the two persons became liable to the shock. These experiments have been varied many ways, and repeated times without number, and they all determined the choice of conductors to be the same in the Torpedo as in the Leyden phial. The sensations likewise, occasioned by the one and the other in the human frame, are precisely similar. Not only the shock, but the numbing sensation, which the animal sometimes dispenses, expressed in French by the words *engourdissement* and *fourmillement*, may be exactly imitated with the phial, by means of Lane's electrometer: the regulating rod of which, to produce the latter effect, must be brought almost into contact with the prime conductor which joins the phial. It is a singularity that the Torpedo, when insulated, should be able to give us, insulated likewise, forty or fifty successive shocks from nearly the same part; and these with little, if any diminution of their force. Each effort of the animal to give the shock is conveniently accompanied by a depression of his eyes, by which even his attempts to give it to non-conductors can be observed: in respect to the rest of his body he is in a great degree motionless, though not entirely so. I have taken no less than fifty of the above-mentioned successive shocks from an insulated Torpedo in the space of a minute and half. All our experiments confirm that the electricity of the Torpedo is condensed, in the instant of its explosion, by a sudden energy of the animal; and as there is no gradual accumulation, or retention of it, as in case of charged glass, it is not at all sur-

prising that no signs of attraction or repulsion were perceived in the pith balls. In short the effect of the Torpedo appears to arise from a compressed elastic fluid, restoring itself to its equilibrium in the same way and by the same mediums as the elastic fluid compressed in charged glass. The skin of the animal, bad conductor as it is, seems to be a better conductor of his electricity than the thinnest plate of elastic air. Notwithstanding the weak spring of the torpedinal electricity, I was able, in the public exhibitions of my experiments at La Rochelle, to convey it through a circuit formed from one surface of the animal to the other, by two long brass wires, and four persons, which number, at times, was encreased even to eight. The several persons were made to communicate with each other, and the two outermost with the wires, by means of water contained in basins properly disposed between them for that purpose."

This curious and convincing experiment is thus related by Mons^{r}. Seignette (mayor of La Rochelle, and one of the secretaries of its academy), published in the French gazettes for the month of October in the above year.

"A live Torpedo was placed on a table. Round another table stood five persons insulated. Two brass wires, each thirteen feet long, were suspended to the ceiling by silken strings. One of these wires rested by one end on the wet napkin on which the fish lay: the other end was immersed in a basin full of water placed on the second table, on which stood four other basins likewise full of water. The

first person put a finger of one hand in the basin in which the wire was immersed, and a finger of the other hand in a second basin. The second person put a finger of one hand in this last basin, and a finger of the other hand in the third; and so on successively, till the five persons communicated with one another by the water in the basins. In the last basin one end of the second wire was immersed; and with the other end Mr. Walsh touched the back of the Torpedo, when the five persons felt a commotion which differed in nothing from that of the Leyden experiment, except in the degree of force. Mr. Walsh, who was not in the circle of conduction, received no shock. This experiment was repeated several times, even with eight persons; and always with the same success. The action of the Torpedo is communicated by the same mediums as that of the electric fluid. The bodies, which intercept the action of the one, intercept likewise the action of the other. The effects produced by the Torpedo resemble in every respect a weak electricity. This exhibition of the electric powers of the Torpedo, before the Academy of La Rochelle, was at a meeting, held for the purpose in my apartments, on the twenty-second of July 1772, and stands registered in the Journals of the Academy."

Mr. Walsh, in his paper on this subject, in the Philosophical Transactions, thus continues the account of these interesting experiments. "The effect of the animal, in the above experiments, was transmitted through as great an extent and variety

of conductors as almost at any time we had been able to obtain it, and the experiments included nearly all the points in which its analogy with the Leyden phial had been observed. These points were stated to the gentlemen present, as were the circumstances in which the two effects appeared to vary. It was likewise represented to them, that our experiments had been almost wholly with the animal in air: that its action in water was a capital desideratum: that indeed all as yet done was little more than opening the door to inquiry: that much remained to be examined by the electrician as well as the anatomist: that as artificial electricity had thrown light on the natural operation of the Torpedo, this might in return, if well considered, throw light on artificial electricity; particularly in those respects in which they now seemed to differ. The Torpedo in these experiments dispensed only the distinct, instantaneous stroke, so well known by the name of the electric shock. That protracted but lighter sensation, that torpor or numbness which he at times induces, and from which he takes his name, was not then experienced from the animal; but it was imitated with artificial electricity, and shewn to be producible by a quick consecution of minute shocks. This, in the Torpedo, may perhaps be effected by the successive discharge of his numerous cylinders, in the nature of a running fire of musketry: the strong single shock may be his general volley. In the continued effect, as well as in the instantaneous, his eyes, which are usually prominent, are withdrawn into their sockets."

"A large Torpedo, very liberal of his shocks, being held with both hands by his electric organs above and below, was briskly plunged into water to the depth of a foot, and instantly raised an equal height in air; and was thus continually plunged and raised, as quick as possible, for the space of a minute. In the instant his lower surface touched the water in his descent, he always gave a violent shock, and another, still more violent, in his ascent; both which shocks, but particularly the last, were accompanied with a writhing in his body, as if meant to force an escape. Besides these two shocks from the surface of the water, which may yet be considered as delivered in the air, he constantly gave at least two when wholly in the air, and as constantly one, and sometimes two, when wholly in the water. The shocks in water appeared, as far as sensation could decide, not to have near a fourth of the force of those which took place at the surface of the water, nor much more than a fourth of those intirely in air."

"The shocks received in a certain time were not, on this occasion, counted by a watch, as they had been on a former, when fifty were delivered in a minute and half, by the animal in an insulated and unagitated state: but from the quickness with which the immersions were made, it may be presumed there were full twenty of these in a minute; from whence the number of shocks in that time must have amounted to above an hundred. This experiment therefore, while it discovered the comparative force between a shock in water and one

in air, and between a shock delivered with greater exertion on the part of the animal and one with less, seemed to determine, that the charge of his organs with electricity was effected in an instant, as well as the discharge."

"The Torpedo was then put into a flat basket, open at the top, but secured by a net with wide meshes, and in this confinement was let down into the water about a foot below the surface: being there touched through the meshes, with only a single finger, on one of his electric organs, while the other hand was held at a distance in the water, he gave shocks which were distinctly felt in both hands."

"The circuit for the passage of the effect being contracted to the finger and thumb of one hand, applied above and below to a single organ, produced a shock, to our sensation, of twice the force of that in the larger circuit by the arms."

"The Torpedo still confined in the basket, being raised to within three inches of the surface of the water, was there touched with a short iron bolt, which was held half above and half in the water, by one hand, while the other hand was dipped, as before, at a distance in the water; and strong shocks, felt in both hands, were thus obtained through the iron."

"A wet hempen cord being fastened to the iron bolt, was held in the hand above water, while the bolt touched the Torpedo, and the shocks were obtained through both these substances."

"A less powerful Torpedo, suspended in a small

net, being frequently dipped into water and raised again, gave, from the surface of the water, slight shocks, through the net, to the person holding it."

"These experiments in water manifested, that bodies, immersed in that element, might be affected by immediate contact with the Torpedo; that the shorter the circuit in which the electricity moved, the greater would be the effect; and that the shock was communicable, from the animal in water, to persons in air, through some substances."

"How far harpoons and nets, consisting of wood and hemp, could in like circumstances, as it has been frequently asserted, convey the effect, was not so particularly tried as to enable us to confirm it. I mention the omission in hope that some one may be induced to determine the point by express trial."

"We convinced ourselves, on former occasions, that the accurate Kæmpfer, who so well describes the effect of the Torpedo, and happily compares it with lightning, was deceived in the circumstance, that it could be avoided by holding in the breath, which we found no more to prevent the shock of the Torpedo, when he was disposed to give it, than it would prevent the shock of the Leyden phial."

"Several persons, forming as many distinct circuits, can be affected by one stroke of the animal, as well as when joined in a single circuit. For instance, four persons, touching separately his upper and lower surfaces, were all affected; two persons likewise, after the electricity had passed through a wire into a basin of water, transmitted it from

thence, in two distinct channels, as their sensation convinced them, into another basin of water, from whence it was conducted, probably in an united state, by a single wire. How much further the effect might be thus divided and subdivided into different channels, was not determined; but it was found to be proportionably weakened by multiplying these circuits, as it had been by extending the single circuit."

The body of the Torpedo is of a somewhat circular form, perfectly smooth, slightly convex above, and marked along each side of the spine by several small pores or foramina: the colour of the upper surface is usually a pale reddish brown, sometimes marked by five large, equidistant, circular dusky spots with paler centres: the under surface is whitish or flesh-coloured. The Torpedo however is observed to vary considerably in the cast and intensity of its colours. The general length of the Torpedo seems to be about eighteen inches or two feet, but it is occasionally found of far larger dimensions, specimens having been taken on our own coasts of the weight of fifty, sixty, and even eighty pounds. A specimen weighing fifty-three pounds was found, according to Mr. Pennant, to measure four feet in length, and two and a half in breadth: the head and body, which were indistinct, were nearly round; about two inches thick in the middle, attenuating to extreme thinness on the edges: below the body the ventral fins formed on each side a quarter of a circle: the two dorsal fins were placed on the trunk of the tail: the eyes were

small, placed near each other: behind each was a round spiracle, with six small cutaneous rays on their inner circumference: the mouth was small; the teeth minute and spicular: the colour of the animal was cinereous brown above, and white beneath. The Torpedo is an inhabitant of most seas, but seems to arrive at a larger size in the Mediterranean than elsewhere. It is generally taken with the trawl, but has been sometimes known to take a bait, thus justifying the description of Oppian. It commonly lies in water of about forty fathoms depth, in company with others of this genus. It preys on smaller fish, and according to Mr. Pennant a surmullet and a plaise have been found in the stomach of two of them: the surmullet, as Mr. Pennant well observes, is a fish of that swiftness, that it would be impossible for the Torpedo to take it by pursuit: we must therefore suppose that it stupefies its prey by exerting its electric faculty. The Torpedo often inhabits sandy places, burying itself superficially, by flinging the sand over it, by a quick flapping of all the extremities. It is in this situation that it gives its most forcible shock, which is said to throw down the astonished passenger that inadvertently treads on the animal.

The Torpedo, with respect to its general anatomy, does not materially differ from the rest of the Ray tribe, except in its electric or Galvanic organs, which are thus accurately described by Mr. Hunter.

"These organs are placed on each side of the cranium and gills, reaching from thence to the

semicircular cartilages of each great fin, and extending longitudinally from the anterior extremity of the animal to the transverse cartilage, which divides the thorax from the abdomen; and within these limits they occupy the whole space between the skin of the upper and of the under surface: they are thickest at the edges, near the centre of the fish, and become gradually thinner towards the extremities. Each electric organ, at its inner longitudinal edge, is a convex elliptic curve. The anterior extremity of each organ makes the section of a small circle; and the posterior extremity makes nearly a right angle with the inner edge. Each organ is attached to the surrounding parts by a close cellular membrane, and also by short and strong tendinous fibres, which pass directly across, from its outer edge, to the semicircular cartilages. They are covered above and below by the common skin of the animal; under which there is a thin fascia spread over the whole organ. This is composed of fibres, which run longitudinally, or in the direction of the body of the animal: these fibres appear to be perforated in innumerable places; which gives the fascia the appearance of being fasciculated: its edges, all round, are closely connected to the skin, and at last appear to be lost, or to degenerate into the common cellular membrane of the skin. Immediately under this is another membrane, exactly of the same kind, the fibres of which in some measure decussate those of the former, passing from the middle line of the body outwards and backwards. The inner edge of this is lost with the first

described; the anterior, outer, and posterior edges are partly attached to the semicircular cartilages, and partly lost in the common cellular membrane. This inner fascia appears to be continued into the electric organ, by so many processes, and thereby makes the membranous sides or sheaths of the columns, which are presently to be described; and between these processes the fascia covers the end of each column, making the outermost or first partition. Each organ is about five inches in length, and, at the anterior end three in breadth, though it is but little more than half as broad at the posterior extremity. Each consists wholly of perpendicular columns, reaching from the upper to the under surface of the body, and varying in their lengths, according to the thickness of the parts of the body where they are placed; the longest column being about an inch and half, and the shortest about one fourth of an inch in length, and their diameters about two tenths of an inch. The figures of these columns are very irregular, varying according to situation and other circumstances. The greatest number of them are either irregular hexagons, or irregular pentagons; but from the irregularity of some of them it happens that a pretty regular quadrangular column is sometimes formed. Those of the exterior row are either quadrangular or hexagonal, having one side external, two lateral, and either one or two internal. In the second row they are mostly pentagons. Their coats are very thin, and seem transparent, closely connected with each other, having a kind of loose network of

tendinous fibres, passing transversely and obliquely between the columns, and uniting them more firmly together. These are mostly observable where the large trunks of the nerves pass. The columns are also attached by strong inelastic fibres, passing directly from the one to the other. The number of columns in different Torpedos of rather small size, appears to be about 470 in each organ, but the number varies according to the size of the fish; and in a very large Torpedo the number of columns in one electric organ was 1182. They must therefore increase, not only in size but in number, during the growth of the animal, new ones forming perhaps every year on the exterior edges, as they are much the smallest. This process may be similar to the formation of new teeth in the human jaw, as it increases. Each column is divided by horizontal partitions, placed over each other at very small distances, and forming numerous interstices, which appear to contain a fluid. These partitions consist of a very thin membrane, considerably transparent. Their edges appear to be attached to one another, and the whole is attached by a fine cellular membrane to the inside of the columns. They are not totally detached from one another; and I have found them adhering at different places, by blood-vessels passing from one to another. The number of partitions contained in a column of one inch in length, of a Torpedo which had been preserved in proof spirit, appeared, upon a careful examination, to be one hundred and fifty: and this number, in a given length of column

appears to be common to all sizes in the same state of humidity, for by drying they may be greatly altered; whence it appears probable that the increase in the length of a column, during the growth of the animal, does not enlarge the distance between each partition in proportion to the growth; but that new partitions are formed and added to the extremity of the column from the fascia. The partitions are very vascular; the arteries are branches from the veins of the gills, which convey the blood that has received the influence of respiration. They pass along with the nerves to the electric organ, and enter with them: then ramify, in every direction, into innumerable small branches upon the sides of the columns, sending in from the circumference all around upon each partition small arteries, which ramify and anastomose upon it; and passing also from one partition to another, anastomose with the vessels of the adjacent partitions. The veins of the electric organ pass out, close to the nerves, and run between the gills, to the auricle of the heart. The nerves inserted into each electric organ, arise by three very large trunks from the lateral and posterior part of the brain. The first of these, in its passage outwards, turns round a cartilage of the cranium, and sends a few branches to the first gill, and to the anterior part of the head, and then passes into the organ towards its anterior extremity. The second trunk enters the gills between the first and second openings, and after furnishing it with small branches, passes into the organ near its middle. The third trunk,

after leaving the skull, divides itself into two branches, which pass to the electric organ through the gills; one between the second and third openings, the other between the third and fourth, giving small branches to the gill itself. These nerves having entered the organs, ramify in every direction between the columns, and send in small branches upon each partition where they are lost. The magnitude and number of the nerves bestowed on these organs in proportion to their size, must on reflection appear as extraordinary as the phænomena they afford. Nerves are given to parts either for sensation or action. If we except the more important senses of hearing, seeing, tasting, and smelling, which do not belong to the electric organs, there is no part, even of the most perfect animal, which, in proportion to its size, is so liberally supplied with nerves; nor do the nerves seem necessary for any sensation which can be supposed to belong to the electric organs; and, with respect to action, there is no part of any animal with which I am acquainted, however strong and constant its natural actions may be, which has so great a proportion of nerves. If it be then probable that those nerves are not necessary for the purposes of sensation or action, may we not conclude that they are subservient to the formation, collection, or management of the electric fluid? especially as it appears evident from Mr. Walsh's experiments, that the will of the animal does absolutely control the electric powers of its body; which must depend on the energy of the nerves."

From the above description it appears that the electric organs of the Torpedo constitute a pair of Galvanic batteries, disposed in the form of perpendicular hexagonal columns. In the Gymnotus electricus on the contrary the Galvanic battery is disposed lengthwise on the lower part of the animal.

We are informed by the ingenious Dr. Ingenhouz, that on taking up some Torpedos about twenty miles from Leghorn, he observed that on pressing gently with the thumbs on the upper side of the two soft bodies on each side the head (the electric organs), in about the space of a minute or two he felt a sudden trembling in the thumbs, which extended no farther than the hands, and lasted about two seconds, perfectly resembling the sensation produced by a great number of very small electrical bottles discharged in quick succession through the hand. After some seconds the sensation returned, and again at more distant intervals. Sometimes it was so strong as almost to oblige the hand to let go the fish; and at other times was but weak, and after the fish had given one strong shock, it did not seem soon to lose the power of communicating one of similar strength; and it was sometimes found that when the shocks followed one another in quick succession, the last were stronger than the first.

The celebrated Spallanzani informs us that some few minutes before the Torpedo expires, the shocks which it communicates, instead of being given at distant intervals, take place in quick succession, like the pulsations of the heart: they are weak

indeed, but perfectly perceptible to the hand when laid on the fish at this juncture, and resemble very small electric shocks. In the space of seven minutes, no less than three hundred and sixty of these small shocks were perceived. Spallanzani also assures us of another highly curious fact, which he had occasion to verify from his own experience, viz. that the young Torpedo can not only exercise its electric faculty as soon as born, but even while it is yet a foetus in the body of the parent animal. This fact was ascertained by Spallanzani on dissecting a Torpedo in a pregnant state, and which contained in its ovarium several roundish eggs of different sizes, and also two perfectly formed foetuses, which, when tried in the usual manner, communicated a very sensible electric shock, and which was still more perceptible when the little animals were insulated by being placed on a plate of glass.

The electricity of the Torpedo is altogether voluntary, and sometimes, if the animal be not irritated, it may be touched, or even handled without being provoked to exert its electric influence.

SPOTTED RAY.

Raja Maculata. *R. rotundata glabra subfusca, nigro maculata, subtus alba.*

Rounded, smooth, brownish Ray, spotted with black, white beneath.

Temeree. *Russ. ind. t.* 1.

Shape rounded, nearly as in the Torpedo: colour above dusky-brown, thickly marked on all parts with moderately large, round, black spots: beneath white: head indistinct: eyes small: tail rather short and thick, with two fins above, and a terminal one: length, from the nose to the tip of the tail, about a foot and a half. Native of the Indian seas.

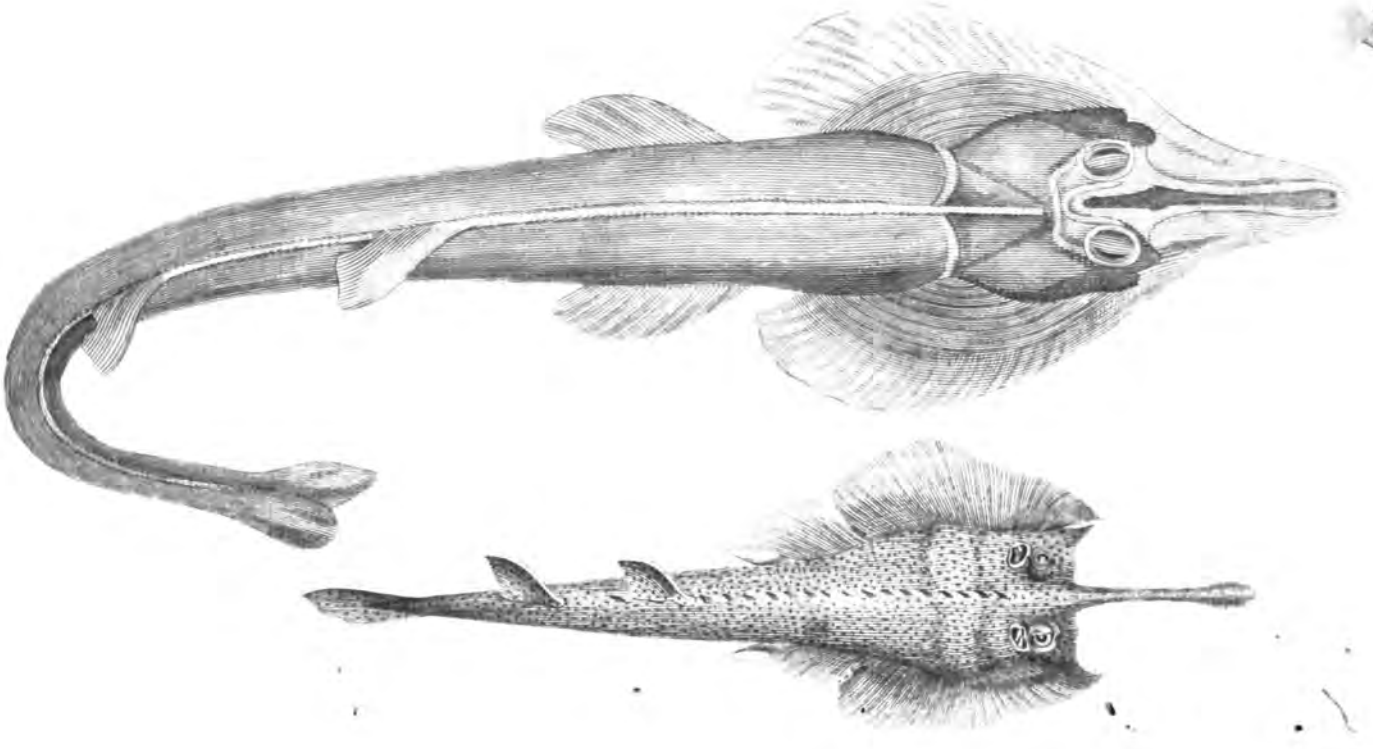
BLACK-AND-WHITE RAY.

Raja Bicolor. *R. rotundata, glabra, alba, nigro maculata, subtus alba.*

Rounded, smooth, white Ray, spotted with black, white beneath.

Nalla Temeree. *Russ. ind. t.* 2.

Of similar size and shape with the preceding, but differing in colour, being white above, marked on all parts with numerous, round, black spots: beneath white. This seems to be either a variety or a sexual difference of the preceding species. Native of the Indian seas.



CHINESE RAY.

Raja Sinensis. *R. rotundata, fusco-flavescens, subtus rosea, supra spinis parvis brevibus sparsis.*
Rounded, yellowish-brown Ray, rose-coloured beneath, marked above with small, short, scattered spines.
Raie Chinois. *Cepede.*

Described by Cepede on the authority of a Chinese drawing: outline nearly orbicular, or as in the Torpedo: head a little pointed: upper surface of the animal covered with small, short, scattered spines: colour above yellowish brown, beneath pale rose: tail furnished on each side with a row of short spines, and terminated by a lobed fin.

Of a lengthened shape.

Raja Rhinobatos. *R. elongata fusca, rostro producto, unico aculeorum ordine dorsali.*
Elongated brown Ray, with lengthened snout, and single row of dorsal spines.
Raja Rhinobatos. *R. oblonga, unico aculeorum ordine in medio dorso. Lin. Syst. Nat.*
Rhinobatos seu Squatino-Raja. *Salv. Will. &c.*

This remarkable species seems from its habit to connect in some degree the genera of Raja and Squalus, the body being much longer than in the preceding kinds of Ray: the snout is lengthened, but not very sharp, and the body, which is moder-

ately convex above, and flat beneath, gradually tapers from the shoulders to the tail, which is furnished above with two fins, of an oblong shape, and situated at a considerable distance from each other: the tip of the tail is also dilated into an oblong fin. The colour of the whole animal is a dull earthy brown, paler beneath, and the skin is every where roughened by minute tubercles. This fish is said to grow to the length of about four feet, and is a native of the European seas. It is observed to be more frequent about the coasts of Naples than elsewhere.

THOUINIAN RAY.

Raja Thouiniana. *R. elongata nigricans, subtus nivea, rostro elongato, capite utrinque niveo.*

Elongated brown Ray, with lengthened snout, head white on each side, and whole animal snow-white beneath.

Raja Thouin. *Cepede.*

Greatly allied to the preceding species, but rather wider across the upper part of the body, and with a thinner and sharper snout, and a flatter body: colour of the whole animal above black-brown, except on each side the head, where it is milk-white, the snout which is dark, like the body, forming a broad band between: the whole under surface of the animal is also milk-white: along the back, from between the eyes to the end of the tail, runs a series of pretty sharp simple spines, and the remainder of the skin is roughened by small pro-

tuberances. This elegant species is described by Cepede from a specimen preserved in the Museum of the Prince of Orange, now translated to Paris, and forming a part of the national Museum of France.

ARABIAN RAY.

Raja Djiddensis. *R. subelongata subcinerea scabra, maculis ovatis albidis.*

Subelongated, subcinereous, rough ray, with whitish, ovate spots.

Raja Djiddensis. *R. pinna caudæ biloba, &c. Forsk. Arab. p.* 18.

Of similar shape with the two preceding: length about two yards: colour pale cinereous, with the dorsal and anal fins of a more glaucous cast: skin roughish: back pretty convex, and marked on the widest part with ovate whitish spots: colour of the under parts whitish; varied beyond the vent with irregular dusky bars. Native of the Red Sea: observed by Forskal.

CUVIER'S RAY.

Raja Cuvieri. *R. subrhombeo-elongata, fusca, subnigro maculata, cauda triplici aculeorum serie.*

Subrhombic-elongated brown Ray, with blackish spots, and three rows of spines on the tail.

Raja Cuvier. *Cepede.*

Allied to the preceding species, but of a less lengthened shape, so as almost to resemble the first

division of the genus: first dorsal fin situated considerably nearer the head: snout long and pointed, and furnished, as well as the head, with a few spines: pectoral fins very large, and angular: ventral fins each marked into two portions or lobes: tail slender, and about twice the length of the head and body together: from the first dorsal fin, to the base of the tail, a row of spines: colour brown, marked above with numerous dusky spots: tail armed with a triple row of weak spines. Described by Cepede from Cuvier, who saw it in a dried state.

SQUALUS. SHARK.

Generic Character.

Os in anteriore et inferiore capitis parte, dentibus numerosis seriatis.	*Mouth* situated beneath the anterior part of the head, with numerous teeth disposed in rows.
Spiracula utrinque ad latera colli, plerisque quinque.	*Spiracles* on each side the neck, in most species five in number, of a semilunar shape.
Corpus oblongum, teretiusculum.	*Body* oblong, somewhat cylindric.

THE animals of this genus are altogether marine: and are said to be much rarer in the Baltic than in any other sea: they are viviparous, and are observed to produce more young at a time than the Rays, but each included, as in those fishes, in a quadrangular capsule or involucrum, each extremity of which is extended into a long, contorted, cartilaginous thread of great length. Many of the Sharks are said to emit a phosphoric light during the night: they are chiefly of a solitary nature, and, in general, devour with indiscriminating voracity, almost every animal substance, whether living or dead: some few species however are observed to feed chiefly on fuci and other marine vegetables.

WHITE SHARK.

Squalus Carcharias. *S. albido-cinereus, rostro subacuto, dentibus triangularibus serratis.*
Pale-cinereous Shark, with subacute snout, and triangular serrated teeth.
Squalus Carcharias. *S. dorso plano, dentibus serratis. Lin. Syst. Nat. Arted. gen.* 70. *syn.* 98.
Canis Carcharias seu Lamia. *Rondel. Gesn. Aldr. Will. &c.*
Lamia. *Arist. Plin. &c.*
White Shark. *Penn. Brit. Zool.*
Requin. *Bomare dict. d'hist. nat. Cepede. &c.*

The great or white Shark, so remarkable for its vast size and its powers of destruction, is an inhabitant of most parts of the globe, though much more frequently seen in the warmer than the colder latitudes: it is said to reside principally in the depths of the ocean, from whence it rises at intervals in order to prowl for prey, and is considered as the most voracious of all the inhabitants of the deep. It arrives at the length of more than thirty feet, and is of a somewhat thicker or broader form than most of the genus: the head is of a depressed shape, and broad; terminating in front in an obtusely pointed snout: the mouth is of vast width, and furnished on the margin of each jaw with from three to six rows of strong flat, triangular, sharp-pointed, and finely serrated teeth, which are so imbedded in their investing cartilage as to be either raised or depressed at pleasure: the tongue is broad, thick, and cartilaginous, and the throat extremely wide: the eyes, as in most of the genus, of

a blueish or greenish cast, rather small, and half overhung by their skinny veil: the pectoral fins are large, strong, broad, and pointed: the first dorsal fin moderately large, somewhat falcated behind, and pointed: the second is situated very low on the back, near the origin of the tail which is slightly lengthened, and of a bilobate shape, the upper lobe or division slightly pointed, and the lower or terminal lobe rather rounded: so great is the strength of this part, that even a young Shark of about six feet in length is able by a stroke of its tail to break a man's leg; it is usual therefore with sailors to cut off the tail the instant they drag a shark on board: the anal fin is placed somewhat beyond the middle of the abdomen, and is of moderate size, and of a somewhat square outline: the general colour of the whole animal is a pale or whitish ash, darker or browner on the upper parts: the mouth is situated considerably beneath the front, for which reason the animal is said, like most others of this genus, to be obliged to turn on its back in order to seize its prey; an observation as ancient as the days of Pliny, "*resupinati vorant: offert moram providentia Naturæ, quia nisi resupini atque conversi, non corripiunt.*" *Plin. lib.* 9. *c.* 8. This however is much doubted by Dr. Bloch, who rather supposes the Shark to seize its prey in a direct position, or like the generality of fishes. The skin of the Shark is very rough, and is used for a kind of shagreen, as well as for smoothing various kinds of wood-work, &c. and from the liver is drawn a great quantity of oil.

"Sharks (says Mr. Pennant), are the dread of sailors in all hot climates, where they constantly attend the ships, in expectation of what may drop overboard: a man that has that misfortune perishes without redemption: they have been seen to dart at him like gudgeons to a worm." They are said to attack Negroes in preference to Europeans, and are observed in particular to attend with unremitting assiduity the passage of the slave-ships from the coasts of Africa to the West-Indian islands, and, as Cepede very happily and justly observes, may be considered as forming a proper escort to the cruel conductors of those most accursed vessels. "A master of a Guinea-Ship (says Pennant) informed me that a rage of suicide prevailed among his new-bought slaves, from a notion the unhappy creatures had, that after death they should be restored again to their families, friends, and country. To convince them that at least they should not reanimate their bodies, he ordered one of their corpses to be tied by the heels to a rope, and lowered into the sea; and though it was drawn up again as fast as the united force of the crew could be exerted, yet in that short space the Sharks had devoured every part but the feet, which were secured at the end of the cord. Swimmers very often perish by them: sometimes they lose an arm or a leg, and sometimes are bit quite asunder, serving but for two morsels for this ravenous animal: a melancholy tale of this kind is recited in a West-Indian ballad, preserved in Dr. Percy's Reliques of ancient English poetry."

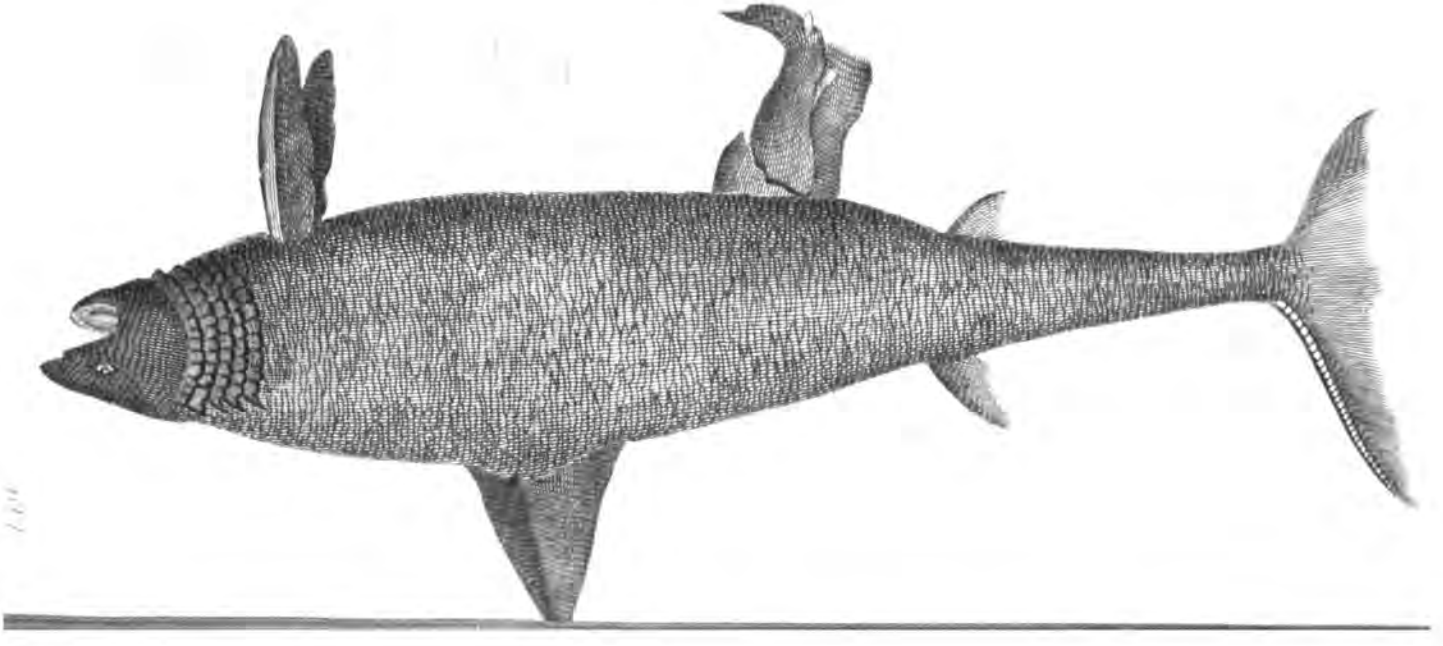
The size to which the Shark sometimes grows is far superior to that mentioned in the former part of the present description: we are informed by Gillius that a Shark was seen of the weight of four thousand pounds, and that in the belly of one was found an entire human body, and Müller asserts that in a Shark taken at the isle of St. Margaret, was found a horse*, which had probably been thrown overboard from some ship. The size of the fossil teeth of this species, so often found in the isle of Malta and elsewhere affords a convincing proof of the enormous specimens which have once existed. In the British Museum are teeth of this kind measuring at least four inches and a half from the point to the base, and six inches from the point to the corner: the animal therefore to which such teeth belonged must have been equal to the largest of the Cetacea in volume, and we may well admit the probability of a human body being swallowed by such a fish, not only entire, but even without a wound, and on this supposition it is that the Shark has been imagined by some to have been the fish ordained for the temporary confinement of the prophet Jonas†.

The internal parts of the Shark present many

* The Shark does not spare even its own species. A Laplander, according to Leems, had taken a Shark, and fastened it to his canoe; but soon missed it, without being able to guess how: in a short time afterwards he caught a second of much larger size, in which, when opened, he found the one he had lost.

† *Jonam prophetam, ut veteres Herculem trinoctem, in hujus ventriculo tridui spatio hæsisse verosimile est. Lin. Syst. Nat.*

remarkable particulars: the brain is small: the heart furnished with one ventricle and one auricle, which latter is of very large size, and receives the vena cava: the aorta and other arteries are of great strength: the throat is very short, and of a diameter not greatly inferior to that of the beginning of the stomach, which is of vast size, and dilatable to a great degree: the intestinal canal consists of two portions, one analogous to the small, and the other to the large intestines of quadrupeds, but this latter portion is very short in proportion, and is so composed as to compensate by its interior structure for its brevity, since instead of forming a mere continued tube, as in most animals, it consists rather of a large series of meshes or divisions, placed in a spiral direction throughout its length: the liver is large, and divided into two unequal lobes: in the stomach and intestines, according to Commerson, are usually found a great many tæniæ or tape-worms, which not only infest the cavities of these parts, but even penetrate into and lodge themselves between the interior coats: these animals therefore, by their vellication and motions, must be supposed to aggravate the natural voracity of the Shark, and to impel it to engorge a large quantity of food, in order to allay the sensations excited by these internal enemies: the milt, in the male fish is disposed into two portions, and equals the length of about a third of the whole animal; and in the female the ovaries are of similar length: during the breeding-season, which takes place at different periods in different climates, the Sharks are



observed to approach the shores, in order to deposit their young in the most favourable situations: these are discharged, to the number of two or three at a time, still adhering to the capsule in which they had been before inclosed, and are excluded before the young animal has had time to break from it. the length of the newly-hatched Shark does not exceed that of a few inches.

I must not conclude the present article without giving the reader the Count de Cepede's explanation of the French name *Requin*, by which this species is known. The word, according to this author, is a corruption of *requiem*. "Requin est, en effet, un corruption de *requiem*, qui designe depuis longtems, en Europe, la mort et le repos eternel."

BASKING SHARK.

Squalus Maximus. *S. plumbeo-fuscus, subtus albicans, dentibus parvulis conico-subulatis numerosissimis.*

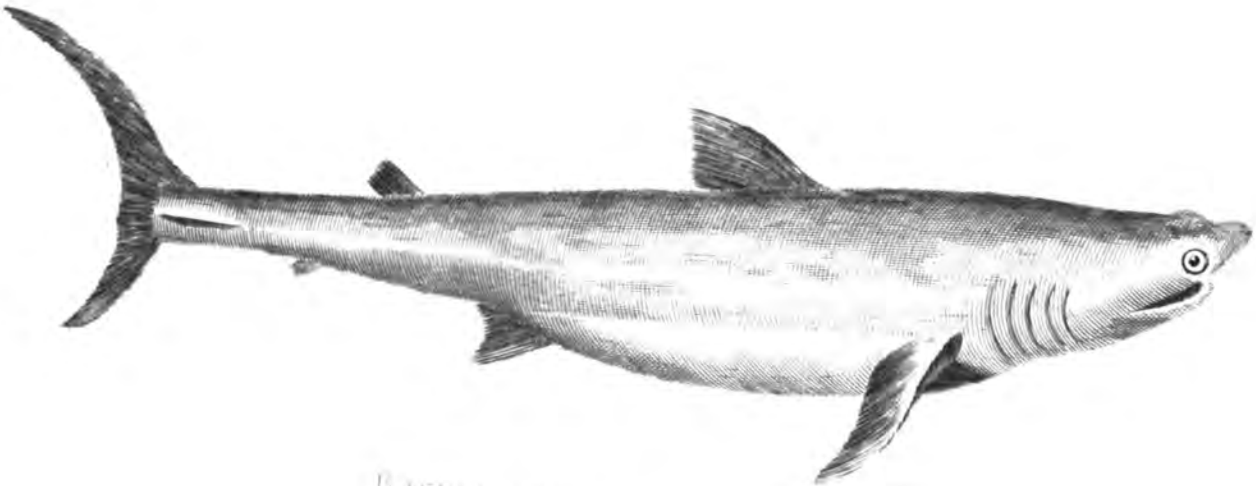
Leaden-Brown Shark, whitish beneath, with small conic-subulate very numerous teeth.

Squalus maximus. *S. dentibus conicis, pinna dorsali anteriore majore. Lin. Syst. Nat.*

Basking Shark. *Penn. Brit. Zool.*

This is a very large species, scarcely, if at all, inferior in size to the white Shark; its length, according to Mr. Pennant, being from three to twelve yards, and even sometimes more. The measurements of one observed by that author on the shore of Loch Ranza in the Isle of Arran were as follow: viz. The whole length twenty-seven feet, four

inches: first dorsal fin three feet: second one foot: pectoral fins four feet: ventral two feet: upper lobe of the tail five feet; lower three. Great numbers of this species of Shark were observed to visit the bays of Caernarvonshire and Anglesea in the summers of 1756, and a few succeeding years; continuing there only during the hot months, and quitting the coast about Michaelmas. They appear in the Firth of Clyde, and among the Hebrides in the month of June, in small shoals of seven or eight, but more frequently in pairs; and depart again in July. "They had nothing (says Mr. Pennant), of the fierce and voracious nature of other Sharks, and were so tame as to suffer themselves to be stroked: they generally lay motionless on the surface, commonly on their bellies, but sometimes, like tired swimmers, on their backs: their food seemed to consist entirely of sea-plants, no remains of fish being ever discovered in the stomachs of numbers that were cut up, but the half digested parts of Algæ, &c. Linnæus says they feed on Medusæ. At certain times they were seen sporting on the waves, and leaping with vast agility several feet out of the water. They swam very deliberately, with the dorsal fins above the water: their length was from three to twelve yards or more: their form slender, like others of the Shark kind: the upper jaw was much longer than the lower, and blunt at the end: the mouth placed beneath, and each jaw furnished with numbers of small teeth: those before were much bent, those more remote in the jaw were conic and sharp-



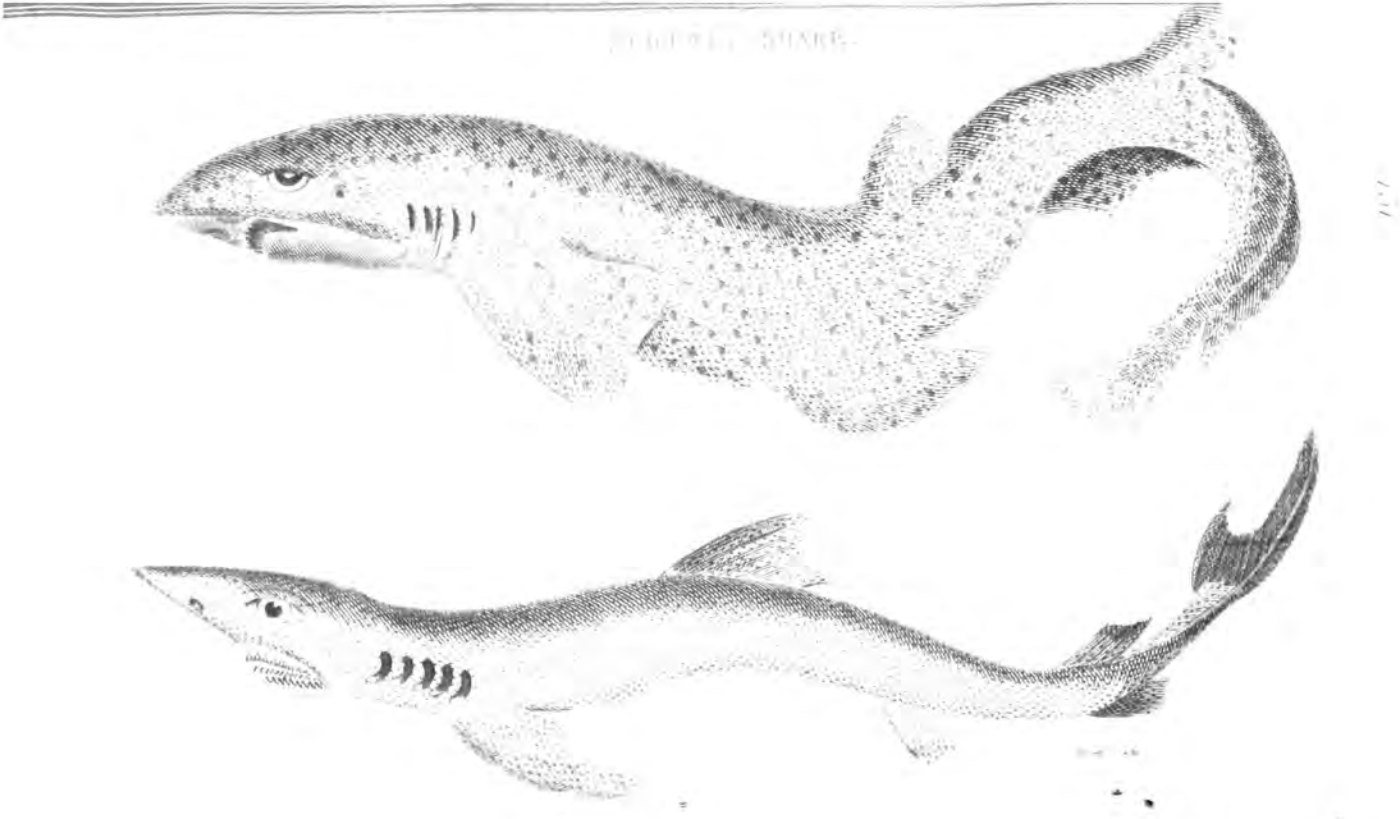
BASKING SHARK *female*

pointed: on the sides of the neck were five large transverse apertures to the gills: on the back were two fins, the first very large, not directly in the middle, but rather nearer the head; the other small, and situated near the tail: on the lower part were five others, viz. two pectoral fins; two ventral fins, placed just behind the fin of the back, and a small anal fin: the tail was very large, and the upper part remarkably longer than the lower: the colour of the upper part of the body was a deep leaden, the belly white: the skin was rough, like shagreen, but less so on the belly than the back: within the mouth, towards the throat, was a very short sort of whalebone: the liver was of a great size, but that of the female was the largest: some weighed above a thousand pounds, and yielded a great quantity of pure and sweet oil, fit for lamps, and also much used by the people who took them, to cure bruises, burns, and rheumatic complaints: a large fish has afforded the captors a profit of twenty pounds: they were viviparous, a young one of about a foot in length being found in the belly of a fish of this kind."

Mr. Pennant adds, that a shoal of this species will permit a boat to follow them without accelerating their motion till almost within contact, when it is usual for the harpooner to strike his weapon into them as near the gills as possible; but that they are often so insensible as not to move till the united strength of two men have forced in the harpoon deeper; as soon as they perceive themselves wounded, they fling up their tail, and plunge

headlong to the bottom, and frequently coil the rope round them in their agonies, attempting to disengage the harpoon from them by rolling on the ground; for it is often found greatly bent. As soon as they discover that their efforts are in vain, they swim away with amazing rapidity, and with such violence, that there has been an instance of a vessel of seventy tons having been towed away against a fresh gale: they sometimes run off with two hundred fathom of line, and with two harpoons in them, and will employ the fishers for twelve, and sometimes for twenty-four hours before they are subdued: when killed, they are either hawled on shore, or, if at a distance from land, to the vessel's side: the liver (the only useful part) is taken out, and marked out, and melted into oil in kettles provided for the purpose. A large fish will yield eight barrels of oil, and two of useless sediment. The fishers observed on these Sharks a sort of leech, of a reddish colour, and about two feet long, but which fell off when the fish was brought to the surface of the water, and left a white mark on the skin.

A male of this species was taken in the year 1801 at Abbotsbury in Dorsetshire, entangled in a fishing-seine, and, after a violent resistance, was dragged ashore. It is said to have received seventeen musket-balls before it expired: its length was twenty-eight feet, and its circumference in the thickest part about twenty feet: its tail, from point to point, near eight feet: the teeth, according to its proprietor, who took the pains to count them, amounted to the number of four thousand.



BLUE SHARK.

Squalus Glaucus. *S. cæruleus, gracilis, subtus albidus, fronte acuminata.*
Blue, slender Shark, whitish beneath, with pointed front.
Squalus glaucus. *S. fossula triangulari in extremo dorso, foraminibus nullis ad oculos. Lin. Syst. Nat.*
Squalus absque foraminibus ad oculos. *Bloch. t.* 86.
Blue Shark. *Penn. Brit. Zool.*

Of a more slender and elegant shape than most others of the genus: colour above deep glaucous or blue-green, beneath white: head rather large, with the snout very long and pointed, and the mouth wide, and placed very far beneath: teeth nearly triangular, lengthened, sharp-pointed, and disposed in three or four rows: eyes large: first dorsal fin seated about the middle of the back, the second very near the tail, opposite the anal fin: tail of moderate size, deeply bilobate, with the lower lobe much larger and longer than the upper. This species, which is the most beautiful of all the Sharks, in point of colour, grows to the length of ten, twelve, or even fourteen feet, and is an inhabitant of almost all parts of the globe. It is a very voracious and bold fish, and scarcely less dreaded by sailors than the common or white Shark. It is said principally to prey on herrings, shads, and tunnies; it frequents several of the British coasts, particularly those of Cornwall, during the pilchard-season, and is at that time taken with large iron hooks prepared for the purpose.

TOPE.

Squalus Galeus. *S. cinereus, subtus pallidior, fronte acuminata, dentibus subtriangularibus.*

Cinereous Shark, paler beneath, with pointed front, and subtriangular teeth.

Squalus Galeus. *S. naribus ori vicinis, foraminibus ad oculos. Lin. Syst. Nat.*

Milandre. *Broussonet. act. Paris.* 1780.

Tope. *Penn. Brit. Zool.*

This species arrives at a considerable size, often measuring several feet in length, though the specimens usually seen about the British coasts scarcely exceed the length of about five feet. In its habits it resembles the white Shark, being a very bold and rapacious fish, attacking such as happen to be accidentally exposed to it with great violence and rapidity: its shape is rather slender; its colour pale cinereous above, and whitish beneath: the nose long, flat, and pointed: the nostrils are situated near the mouth; and behind each eye is a small orifice: the teeth are numerous, disposed in three rows, small, very sharp, triangular, and serrated on their inner edge: the first dorsal fin is placed about the middle of the back, and is rather large: the second is small, and situated near the tail, which is small, and terminates in two unequal lobes, of which the lower is by much the broadest. According to Rondeletius this fish is so bold as to pursue its prey to the very edge of the shore, and to attack those who are walking near the water's side. It

is supposed to be the Canicula of Pliny, which that writer describes as highly dangerous to those employed in diving for corals, sponges, &c.

FOX SHARK.

Squalus Vulpes. *S. plumbeus, subtus albidus, capite brevi conico, cauda prælonga.*
Lead-coloured Shark, whitish beneath, with short conic head, and very long tail.
Squalus Vulpes. *S. caudæ lobo superiore longitudine corporis. Lin. Syst. Nat. Gmel. p.* 1496.
Vulpes. *Rondel.*
Vulpecula. *Salv. Will. &c.*
Long-tailed Shark. *Penn. Brit. Zool.*

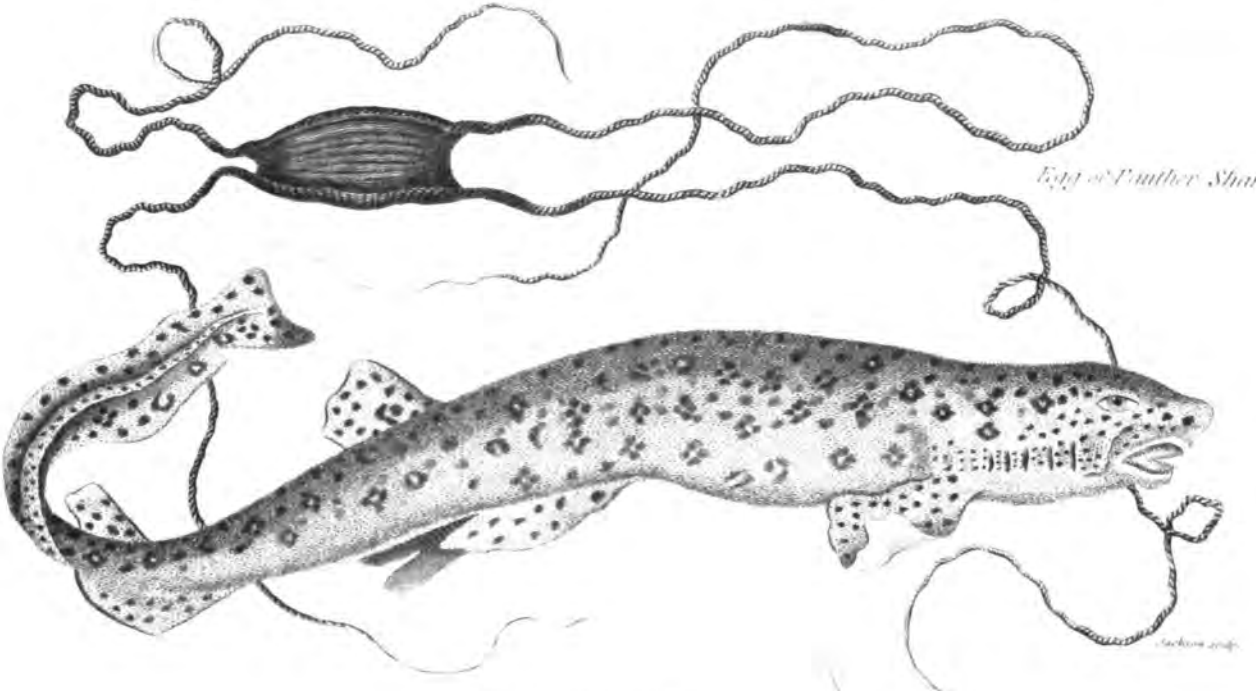
This is distinguished by its plump, short, subovate body, and very long, tapering tail: the head is small and pointed: the first dorsal fin triangular, and placed on the middle of the back; the second above the beginning of the tail, which gradually tapers to the tip, and is furnished with a shallow fin or process beneath, running from the base to the tip, which is sharp, and slightly bilobate: the pectoral fins are of considerable size: the eyes large: the mouth small: the teeth triangular, small, and disposed in three rows. The colour of the fish is dusky ash above, and whitish beneath. It grows to the length of more than thirteen feet, the tail measuring more than half the length of the whole animal. It is an inhabitant of the Mediterranean and other seas, and is considered as a voracious and

artful fish, but the name of sea-fox is applied to it rather from the length of its tail than from its character of sagacity.

SPOTTED SHARK.

Squalus Catulus. *S. rufescens maculis numerosis parvis nigricantibus, naso subacuminato, pinnis ventralibus connatis.*
Reddish Shark, with numerous small blackish spots, somewhat pointed snout, and connate ventral fins.
Squalus Catulus. *S. varius, pinnis ventralibus concretis. Bloch. t.* 114.
Lesser Spotted Dog-Fish. *Penn. Brit. Zool.*

Habit rather slender: length from two to three feet: head large: snout prominent, and slightly pointed: skin rough: body cylindric: colour pale brick-red, marked with very numerous, small, rounded, blackish or dusky spots: abdomen whitish: both the dorsal fins placed much nearer to the tail than the head: ventral fins connate, large, and of a slightly pointed form: anal fin small: tail long, bilobate, with the lower lobe continued to a considerable distance beneath. Native of the European seas: a very voracious animal, preying on the smaller fishes, crabs, &c. According to Pennant it breeds from nine to thirteen young at a time, is very numerous on our own coasts, and very injurious to the fisheries: the liver is said to be highly noxious, causing long-continued stupor, succeeded by an universal itching, with a total desquamation of the cuticle.



PANTHER SHARK

Female?

PANTHER SHARK.

Squalus Canicula. *S. cinereo-rufescens, maculis ocellaribus nigricantibus, capite brevi, naso subacuminato, pinnis ventralibus discretis.*

Cinereo-rufescent Shark, with ocellated blackish spots, short head, slightly pointed snout, and distinct ventral fins.

Squalus Canicula. *S. varius, pinnis ventralibus discretis. Bloch. t.* 112.?

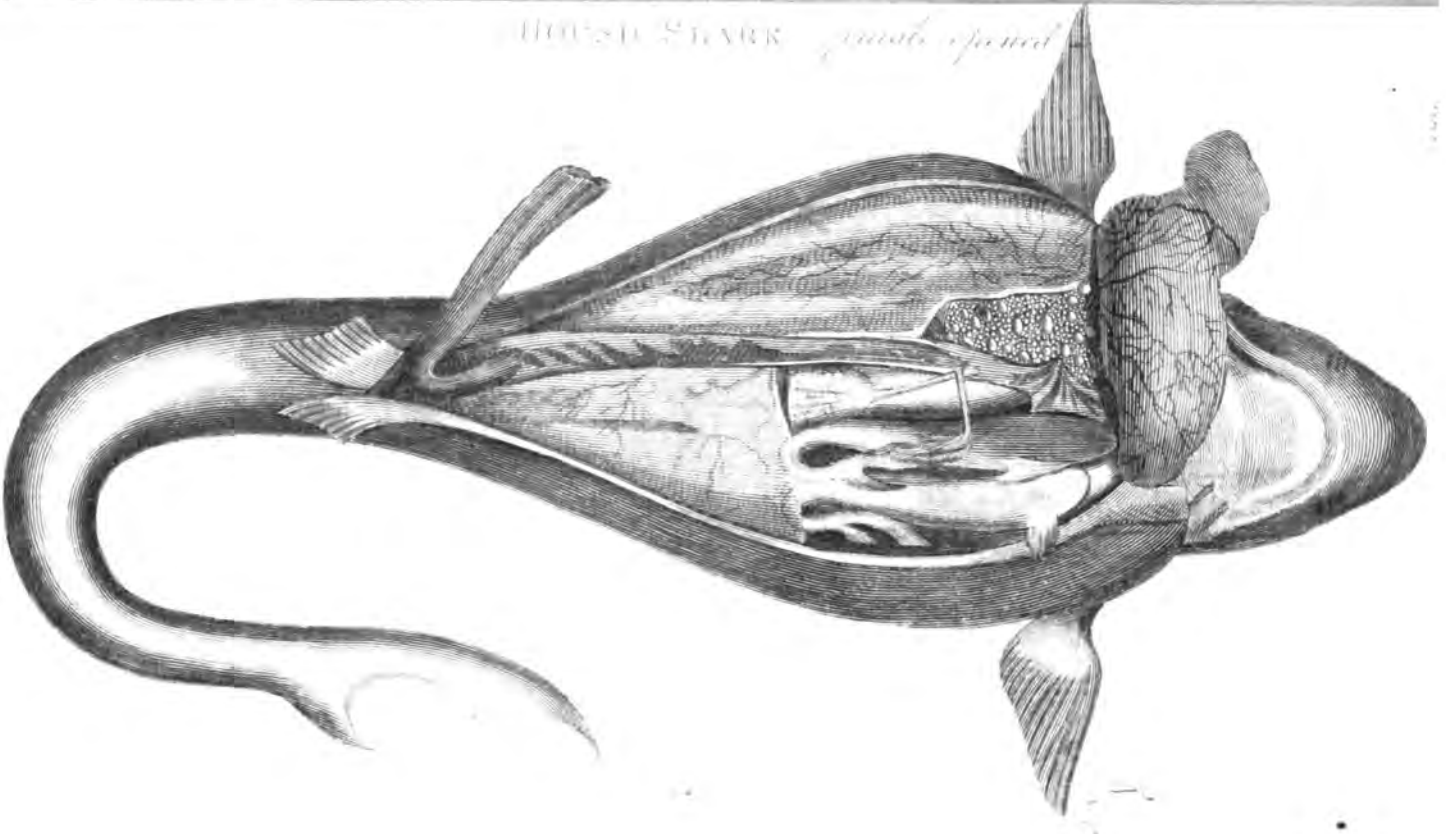
Spotted Dog-Fish. *Penn. Brit. Zool.*

Length from three to four feet: habit rather more slender than that of the preceding fish: head rather small: snout prominent and slightly pointed: body cylindric: skin rough: colour of the whole animal pale brown, with a slight rufous cast, and marked with numerous groupes of blackish or dusky spots, not ill resembling in their form those on the skin of a panther: abdomen whitish, with a slightly silvery cast: both dorsal fins situated at a vast distance from the head: ventral fins separate, and rather broad, with a squarish outline: tail as in the preceding. Native of the European seas, preying on the smaller fishes, crabs, &c. in the same manner as the preceding species, of which it is by some considered as the female.

ROCK SHARK.

Squalus Stellaris. *S. cinereo-rufescens, maculis nigricantibus, inæqualibus, lobo utrinque nasali duplici.*
Cinereo-rufescent Shark, with unequal blackish spots, and double-lobed nostrils.
Le Rochier. *Cepede.*
Catulus maximus. *Will. p. 63.*
Greater Spotted Dog-Fish. *Penn. Brit. Zool.*

GREATLY allied to the preceding, with which it appears to have been frequently confounded by authors; the male and female differing from each other nearly in the same manner and proportion as in the *Squalus Catulus*, and having a nearly similar disposition of colours. In the present species, which is larger than the preceding, and arrives at the length of six feet, the nostrils are half closed by a pair of lobes, the exterior of which is larger than the interior, and of a roughened surface: the snout is rather more elongated, and the tail somewhat shorter than in the *S. Catulus*: the first dorsal fin is nearer to the extremity of the tail than to the snout: the second, which is nearly of similar size with the first, is placed almost opposite to the anal fin. The general colour of the animal is a reddish-grey, with round, unequal, blackish spots scattered over the whole body, and larger in proportion than in the *Catulus*. The male and female are said to differ as to the disposition of spots in the same manner as in that species. Native of the European seas, generally frequenting



rocky places, and preying on various Mollusca and Crustacea: it is much less frequently taken than the preceding species, though said to be more prolific, producing not less than nineteen or twenty young at a time. Its skin is used in commerce for the same purposes as those of other small Sharks, and the flesh is esteemed somewhat more eatable than that of the former species. In Edwards's figure of the young of this fish, the body is represented as barred across the back with several broad brown bands.

HOUND SHARK.

Squalus Mustelus. *S. subfuscus, subtus albidus, dentibus parvis numerosis obtusis, pinnis pectoralibus brevibus.*
Brownish Shark, whitish beneath, with numerous small obtuse teeth, and short pectoral fins.
Squalus Mustelus. *S. dentibus obtusis. Lin. Syst. Nat.*
Smooth Hound. *Penn. Brit. Zool.*

Habit slender: snout slightly sharpened, and lengthened: first dorsal fin large, and placed nearly in the middle of the back: the second nearly opposite the anal fin: tail shaped as in most others of this tribe, or slightly bilobate, the lower lobe continued to some distance beneath: teeth very numerous, small, slightly convex, and set as in the Rays: general colour of the animal greyish brown, paler or white beneath: sometimes varies in being marked above by numerous white spots. The

stomach in this fish is furnished with several appendices situated near the pylorus: it is found both in the European and Indian seas, growing to the length of about two feet.

PICKED SHARK.

Squalus Acanthias. *S. fusco-cinereus, subtus albus, dentibus numerosis parvis acutis, pinnis dorsalibus spinosis.*
Ash-Brown Shark, white beneath, with numerous small sharp teeth, and spiny dorsal fins.
Squalus Acanthias. *S. pinna anali nulla, dorsalibus spinosis, corpore teretiusculo. Lin. Syst. Nat.*
Squalus corpore teretiusculo, dorso biaculeato. *Bloch. t.* 85.
Picked Dog-Fish. *Penn. Brit. Zool.*
Aiguillat. *Broussonet. act. Paris.* 1780.

Habit similar to that of the *S. Mustelus*, from which it is readily distinguished by a very strong, bony spine, situated before each dorsal fin, and connected at its base with the fin itself: teeth small and sharp, and disposed in rows along the jaws: upper lobe of the tail longer or more projecting than the lower, which is continued to some distance beneath: colour of the whole animal brownish ash above, white beneath: length from three to four feet: inhabits the European seas: very common about the coasts of Scotland, where it is taken in order to be prepared for sale by splitting and drying, and is then much used as a food among the lower orders of the people. Mr. Pennant informs us that it forms a sort of internal commerce, being

carried on women's backs fourteen or sixteen miles up the country, and either sold or exchanged for various necessaries.

Molina, in his Natural History of Chili, describes what appears to be a variety of this species, in which the body is marked by ocellated spots, and the spines of the dorsal fins recurved at the tip.

DUSKY SHARK.

Squalus Spinax. *S. fuscus, subtus nigricans, pinnis dorsalibus spinosis.*
Brown Shark, blackish beneath, with spiny dorsal fins.
Squalus Spinax. *S. subtus nigricans. Lin. Gmel.*
Sagre. *Broussonet. act. Paris.* 1780.
Galeus Acanthias sive Spinax fuscus. *Will. p. 57.*

Greatly allied to the preceding, with which it has been often confounded; but differs in being of a much darker colour, with the singular circumstance of the abdomen being still darker than the upper parts, or nearly black: back broader than in the preceding fish: dorsal fin spined in the same manner. Native of the European seas.

CENTRINA SHARK.

Squalus Centrina. *S. fuscus, subtus pallidior, corpore subtrigono, pinnis dorsalibus spinosis.*

Brown Shark, paler beneath, with subtrigonal body, and spiny dorsal fins.

Squalus Centrina. *S. pinna anali nulla, dorsalibus spinosis, corpore subtriangulari. Lin. Syst. Nat.*

Centrina. *Gesn. Salv. Aldr. Will. &c.*

Squalus unica serie dentium inciscrum in maxilla inferiore. *Bloch. t.* 115.

Length from three to four feet: habit thick and short: body of a somewhat triangular shape, the sides shelving down from the back, and the abdomen being flattish: head somewhat small: snout blunt: in the upper jaw three rows of teeth, in the lower a single row; all rather slender and sharp-pointed: first dorsal fin very large, commencing at a small distance from the head, subtriangular, and furnished in front with a strong and sharp spine projecting through the skin at some distance from the tip, and pointing rather forwards than backwards: second dorsal fin much smaller, situated near the tail, and furnished with a similar spine, but pointing backwards: tail rather small, short, and obscurely bilobate: colour dusky brown, paler beneath: skin rough, and beset with tubercles: native of the European seas, but a rare species in comparison with many others of the genus.

(CESTRINA) SHARK

PHILIPPIAN SHARK.

Squalus Philippinus. *S. fuscus, subtus albidus, capite utrinque lobo elongato.*

Brown Shark, whitish beneath, with a lengthened lobe on each side of the head.

Squale Phillip. *Cepede.*

Habit slender: colour brown above, whitish beneath: near each eye an appendicle or skinny projection, equalling near an eighteenth part of the whole length of the animal: mouth wide, and paved with sharp teeth disposed in ten or eleven rows: some of the teeth are rather rounded than pointed: before each of the dorsal fins a very strong and sharp spine: anal fin placed at an equal distance from the ventral fins and the tail, which is bilobate, the upper lobe projecting beyond the lower: inhabits the Southern Pacific Ocean: observed during the voyage of Capt. Phillips to Botany-Bay. The individual described in the above-mentioned voyage measured about two feet in length.

PEARLY SHARK.

Squalus Cinereus. *S. griseo-perlaceus, dentibus magnis, compressis, acutis, distinctis.*
Pearly-grey Shark, with large, compressed, sharp, separate teeth.
Squalus cinereus. *S. spiraculis utrinque septem.* *Lin. Gmel.*
Perlon. *Cepede.*

Allied to the Blue Shark: length about three feet: colour pearly grey: skin less rough than in the Blue Shark: eyes large: teeth large, compressed, sharp, and separate: spiracles large: dorsal fin single, situated in the middle of the back, and larger than the anal: tail bilobate. Native of the Mediterranean: described in the Memoirs of the French Academy by Broussonet, from a specimen preserved in the British Museum.

SPINY SHARK.

Squalus Spinosus. *S. griseo-fuscus, subtus albidus, corpore tuberculis mucronatis inæqualibus sparsis muricato.*
Grey-Brown Shark, whitish beneath, with the body roughened by unequal scattered sharp-pointed tubercles.
Squale bouclé. *Cepede.*

Length about four feet: colour grey-brown above, whitish beneath: body roughened with scattered, unequal tubercles, consisting of a broad, round base and curved, sharp-pointed tip, in some bifid: eyes large: snout prominent and conic:

gape moderate: teeth of a squarish shape, compressed, cornered at the margins, and placed in several rows: dorsal fins placed near the tail: the first opposite the ventral, which are set at an unusual distance from the head, and are almost as large as the pectoral: tail angular. Described by Broussonet from a specimen in the Paris Museum. Native regions uncertain.

ISABELLA SHARK.

Squalus Isabella. *S. subflavescens, dentibus compressis brevibus triangularibus basi lobatis.*

Yellowish Shark, with short compressed triangular teeth lobed at the base.

Squalus Isabella. *S. pinna dorsali prima abdominalibus opposita. Lin. Gmel. Brouss. act. Par.* 1780.

Allied in point of habit to the *S. Canicula*, but with a broader head, and an obtuse snout: length of the specimen observed, about two feet and a half: colour as mentioned in the specific character: teeth compressed, short, triangular, furnished on each side the base with an accessorial or smaller lobe, and disposed in six rows: tongue very short and thick: dorsal fin subquadrangular; the second placed opposite the anal fin: pectoral fins very large: ventral separate, and pointed behind. Native of the Southern Pacific, and observed about the coasts of New Zealand, during the voyage of Sir Joseph Banks: described by Broussonet from the MSS. of Dr. Solander.

CIRRHATED SHARK.

Squalus Cirratus. *S. rufus, squamosus, narium appendice vermiformi.*
Rufous Shark, with a worm-shaped appendix at the nostrils.
Squalus cirratus. *S. narium appendice vermiformi. Lin. Gmel. Brouss. act. Paris.* 1780.

Allied in habit to the *Canicula:* length from one to five feet: colour rufous, in the young spotted with black: skin covered with moderately large, flat, shining scales: eyes very small: teeth numerous, sharp, and dilated at the base: first dorsal fin opposite the ventral; the second opposite the anal: tail about a fourth of the length of the whole animal, and terminating in a bilobate fin. Native of the American and Indian seas.

BEARDED SHARK.

Squalus Barbatus. *S. griseus maculis nigris albo marginatis, ore appendicibus vermiformibus barbato.*
Grey Shark, with black spots edged with white, and the mouth bearded with worm-shaped appendicles.
Squalus barbatus. *S. rictu oris appendicibus vermiformibus barbato. Lin. Gmel. Brouss. act. Paris.* 1780.

Length about three feet and a half: colour greyish: skin covered by minute, hard, shining scales, and variegated with black, rounded, and angular spots with whitish margins: head large, depressed, and smooth: teeth lanceolate, and placed in several rows: beards about half an inch

long, and subdivided or ramified. Native of the Southern Pacific: observed about the coasts of New Holland.

STRIPED SHARK.

Squalus Africanus. *S. griseus, fasciis septem longitudinalibus nigricantibus.*
Grey Shark, with seven longitudinal blackish bands.
Squalus Africanus. *S. fasciis septem nigricantibus parallelis longitudinalius pictus. Lin. Gmel. Brouss. act. Par.* 1780.

Length about two feet and a half: skin covered by minute, squarish scales: head rather broader than the body, and depressed: mouth semicircular: teeth compressed, elongated, sharp, and disposed in rows, which are transverse in the upper, and oblique in the lower jaw: palate and tongue covered with soft, unequal, scattered tubercles: pectoral fins horizontal: ventral subtriangular, and oblique at the tips: anal oblong, rounded in front, and pointed behind: first dorsal fin situated beyond the middle of the back; the second opposite the hind part of the anal: tail rounded: described by Broussonet: native of the African seas.

OCELLATED SHARK.

Squalus Ocellatus. *S. subfasciatus, fusco-maculatus, ocello utrinque nigro supra pinnas pectorales.*
Subfasciated Shark, with dusky spots, and a black ocellate spot on each side above the pectoral fins. *Nat. Misc. t.* 161.
Squalus ocellatus. *S. litura magna rotunda nigra, circulo albo cincta, ad utrumque colli latus. Lin. Syst. Nat. Gmel. Brouss. act. Par.* 1780.

Length about two feet and a half: colour ash-brown, with a few scattered dusky spots; back crossed by a few dusky bands: abdomen greenish grey: teeth numerous, small, sharp, compressed, and dilated at the base: pectoral fins rounded, and of a dusky or blackish colour, edged with white: first dorsal fin situated beyond the ventral, marked at its anterior edge with two black spots, and emarginated behind: second of similar shape, but smaller: anal fin placed very near the tail, which is slightly sublobate. Native of the Southern Pacific: observed about the coasts of New Holland during the first voyage of Sir Joseph Banks.

GREY SHARK.

Squalus Griseus. *S. spiraculis utrinque sex. Lin. Gmel. Brouss. act. Par.* 1780.
Grey Shark, with six spiracles on each side.

Length two feet and a half: colour pale brown: skin slightly rough, and covered with very small scales, each marked by a carina: head small, de-

pressed, and obtuse: gape wide: in the lower jaw several rows of very large, compressed, squarish, serrated teeth: in the upper jaw a single row of similar teeth on each side, and in front many smaller simple ones, of a narrower and sharper form than the others: dorsal fin single: pectoral fins horizontal: anal small, and situated midway between the ventral and tail. Native of the Mediterranean: described by Broussonet.

AMERICAN SHARK.

Squalus Americanus. *S. pinnis dorsalibus inermibus, posteriore majore, ventralibus magnis caudæ proximis. Lin. Gmel. Brouss. act. Par.* 1780.

Shark with unarmed dorsal fins, of which the hindermost is the largest, and large ventral fins situated near the tail.

Length about three feet: skin rough: scales small and angular: body cylindric: head large: snout short, and obtuse: teeth oblong, sharp, compressed, and disposed in several rows; the largest serrated on the edges: eyes large: first dorsal fin placed before the middle of the body; the other rather beyond the anal: pectoral fins suboval; tail lanceolate. Native of the American seas: described by Broussonet.

SCALY SHARK.

Squalus Squamosus. *S. squamis ovatis carinatis, pinnis dorsalibus spinosis, dentibus subquadratis, inferioribus majoribus.*
Shark with ovate carinated scales, spiny dorsal fins, and squarish teeth, largest in the lower jaw.
Squale eccaileux. *Cepede.*

Allied to the S. Centrina, but covered with pretty conspicuous ovate scales, of somewhat unequal size, and marked by a middle carina: length about three feet: eyes oblong: snout oblong, depressed: gape moderate: teeth squarish, with angular margins: dorsal fins oblong, occupying the greatest part of the back, and furnished with a spiny ray in the middle: the first dorsal fin is the largest; the second narrower and longer: the pectoral fins are middle-sized, and narrowed towards the base: the ventral semi-ovate, and placed near the caudal, which is rounded at the beginning, and dilated towards the tip. Native regions uncertain.

PORBEAGLE SHARK.

Squalus Cornubicus. *S. corpore crasso tereti, rostro conico prominente, cauda lunata.*

Shark with thick round body, prominent conic snout, and lunated tail.

Squalus Cornubicus. *S. plica longitudinali ad utrumque caudæ latus. Lin. Gmel.*

Porbeagle Shark. *Penn. Brit. Zool. Borl. Cornw.*

This species is slightly described by Mr. Pennant, in the British Zoology, from an engraving in Borlase's History of Cornwall, which was copied from a drawing by the Revd. Mr. Jago, Minister of Loo in Cornwall, and who appears to have been a very observant and skilful ichthyologist; since many of his communications are preserved in the works of Ray and Petiver.

A specimen observed in the year 1793, by the Revd. Dr. Goodenough, on the coast of Hastings, is described in the third volume of the Linnæan Transactions. Its length, from the tip of the snout to the extremity of the tail, was three feet ten inches: the colour of the body a deep blue on the back, and white or silvery beneath: the shape was round, except for about six inches from the tail, where it was depressed: at about an inch from the tail was a semicircular or lunar fossule or impression, the points of which were towards the tail: where the body was depressed the sides were raised into a sharp angle or elevated line of about eight inches in length, running into the middle of the tail or a little beyond: the nose was prominent

and sharp; and on either side, from the nose to the eyes were numerous perforations or minute pores: the tail was of a lunar form, the upper lobe nearly a third longer than the lower. From the number of teeth, which were two rows in each jaw, the fishermen concluded it to be two years old, and Dr. Goodenough was assured that they had been seen of the length of eight feet, with three rows of teeth.

BEAUMARIS SHARK.

Squalus Monensis. *S. corpore crasso tereti, rostro subconico, cauda lunata.*

Shark with thick round body, subconical snout, and lunated tail.

Beaumaris Shark. *Penn. Brit. Zool.*

Observed by the Revd. Hugh Davies of Beaumaris, in the Isle of Anglesea, who communicated its description to Mr. Pennant. The length was seven feet: the snout and body of a cylindric form: the greatest circumference four feet eight inches: the nose blunt: nostrils small: mouth armed with three rows of slender teeth, flattened on each side, very sharp, and furnished at the base with two sharp processes: the first dorsal fin was two feet distant from the snout, and of a triangular form: the second very small, and placed near the tail: the pectoral fins strong and large: the ventral and anal small: the space between the second dorsal and the tail much depressed, the sides forming an

acute angle: above and below was a transverse fossule or dent: the tail was of the form of a crescent, but the horns of unequal length; the upper* being thirteen inches, the lower ten: the whole fish was of a leaden colour, and the skin comparatively smooth, being far less rough than in most of the genus. This and the preceding fish seem very nearly allied, and perhaps may only constitute sexual differences of the same species.

DENTICULATED SHARK.

Squalus Denticulatus. *S. griseus, supra maculis magnis inæqualibus rufis, dorso elevato tuberculis denticulato.*

Grey Shark, marked above with large unequal rufous spots, with elevated back denticulated by tubercles.

Squale dentelé. *Cepede.*

Colour greyish or pale ash-brown, marked over the whole upper part with large, irregular, rufous spots: back much elevated, and appearing denticulated by a row of small tubercles, running from between the eyes to the first dorsal fin: all the fins, except the caudal, tipped with brown: first dorsal fin placed beyond the middle of the back: tail bilobate, the upper lobe longer than the lower, and indented by a partial division: teeth triangular: size not mentioned: described by Cepede from a dried specimen in the Prince of Orange's Museum.

* In the British Zoology the upper lobe is said to be ten, and the lower thirteen inches long; but it is clear from the plate, engraved from Mr. Davies's drawing, that this is an error.

PUNCTULATED SHARK.

Squalus Punctulatus. *S. supra rufus albo punctatus, subtus ferrugineus.*
Shark with the upper parts rufous, speckled with white, the lower parts ferruginous.
Squale pointillé. *Cepede.*

Habit similar to that of the Isabella Shark: colour rufous above, deep tawny beneath: upper parts marked with numerous, small, white specks: head rounded in front: teeth similar to those of the *Canicula:* spiracles small: pectoral fins rather large: tail deeply lobed. Native of the American seas: described by Cepede, but the size not particularized.

ZEBRA SHARK.

Squalus Zebra. *S. fuscus, rivulis transversis lacteis.*
Brown Shark, with transverse milk-white undulations.
Squalus tigrinus. *S. cauda elongata, spiraculis duobus postremis confluentibus. Lin. Syst. Nat. Gmel.*
Squalus varius, &c. *Seb. mus.* 3. *t.* 34. *f.* 1.
Squalus fasciatus. *Bloch. t.* 113.

The most elegant of the whole genus, being of a dark brown colour, beautifully barred with broad, milk-white, transverse, and somewhat undulating stripes, between which are here and there interspersed a few oval spots of similar colour: fins marked in the same manner: head large and rounded: mouth furnished with a pair of worm-like

beards or cirrhi: habit similar to that of *Canicula* and some others, but with the body shorter, and the tail longer in proportion: pectoral fins large: both the dorsal rather small: tail finned to a great distance beneath the tip, which is of an ovate shape. Native of the Indian seas, growing to the length of fifteen feet: said to feed chiefly on testaceous and crustaceous marine animals. Sometimes the variegations are rather of a pale rufous cast than white. First described by Artedi, from a specimen in the collection of Seba, in the third volume of whose Thesaurus it is elegantly figured.

GRONOVIAN SHARK.

Squalus Gronovianus. *S. griseus, supra nigro maculatus, rostro rotundato.*

Grey Shark, spotted above with black, and with rounded snout.

Squalus Indicus. *S. dorso vario inermi, dentibus acutis. Lin. Gmel. Gron. Mus.* 1. *n.* 133.

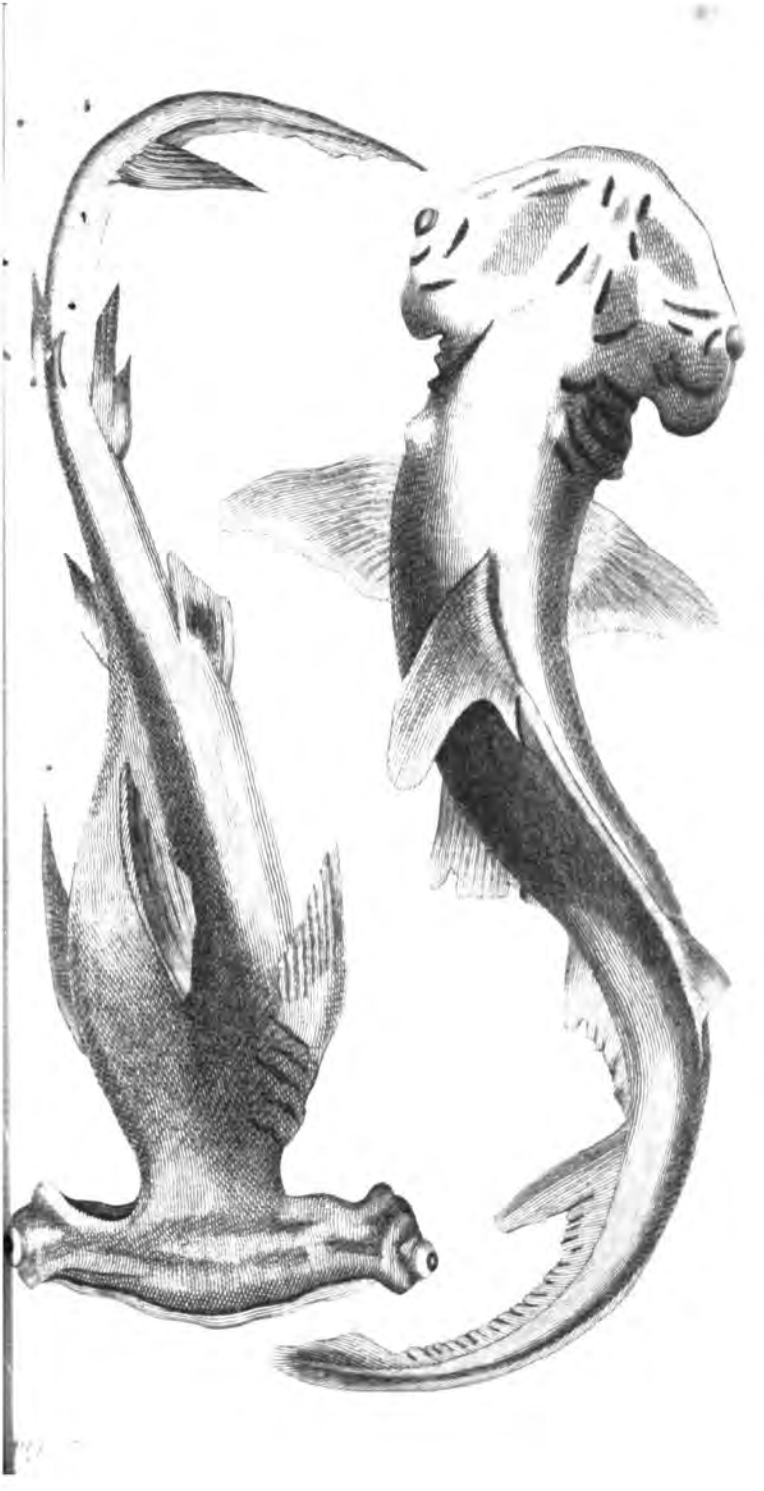
Colour grey, with the head and back spotted with black: dorsal fins nearer the tail than the ventral ones, and very distant from each other: snout rounded: teeth sharp, and placed in seven rows in both jaws: tail consisting of an undivided lobe: native of the Indian seas: described by Gronovius: size not mentioned.

With dilated head.

HAMMER-HEADED SHARK.

Squalus Zygæna. *S. capite transverso latissimo.*
Shark with very broad transverse head.
Squalus Zygæna. *S. capite latissimo transverso malleiformi. Lin. Syst. Nat.*
Zygæna. *Rondel. Gesn. Aldr. Will. &c.*
Squalus capite malleiformi. *Bloch. t.* 117.

Perhaps the most deformed of all the marine animals: length from five to fifteen or seventeen feet: habit rather slender: body subcylindric: head dilated on each side to a great extent: the eyes, which are very large, being placed at each extremity: mouth beneath, as in other Sharks; teeth sharp, denticulated on each side, and disposed in three rows in each jaw: first dorsal fin rather large, of a somewhat falcated shape, and placed towards the upper part of the back: the second much smaller, and situated near the tail, which is rather short than long, and lobed beneath, the fin running on nearly as far as the vent: colour brown above, paler or whitish beneath. Native of the Mediterranean and Indian seas, where it is scarcely less voracious and formidable than even the White Shark itself; attacking such as are accidentally exposed to its fury, or are incautiously bathing or swimming in its neighbourhood. It is observed about the coasts of the Southern Islands, and particularly of Otaheitee, where the natives, trusting to their dexterity in swimming, appear to hold it



in but little dread, since, according to the account of a gentleman on whose veracity I may safely depend, they bathe without apprehension in places known to be infested by it, and by their example have frequently excited a similar boldness in our own countrymen, insomuch that a ship's crew has bathed alongside the vessel for many evenings together. This fish is said to produce about ten or fourteen young at a birth.

HEART-HEADED SHARK.

Squalus Tiburo. *S. capite latissimo cordato.* *Lin. Syst. Nat.*
Shark with very broad heart-shaped head.
Tiburonis species minor. *Marcgr. Bras. p.* 181.
Zygænæ affinis capite triangulo. *Will. ichth. p.* 55.
Pantouflier. *Brouss. act. Paris.* 1780.

Greatly allied to the preceding, but a much rarer species: said to grow nearly to the same size: inhabits chiefly the South-American seas: sometimes, though very seldom, observed in those of Europe: first described by Marcgrave in his History of Brasil.

With rounded head.

ANGEL SHARK.

Squalus Squatina. *S. capite rotundato, ore terminali, nasibus cirrosis, pinnis pectoralibus maximis.*
Shark with rounded head, terminal mouth, bearded nostrils, and very large pectoral fins.
Squalus Squatina. *S. pinna anali nulla, caudæ duabus, ore terminali, naribus cirrosis. Lin. Syst. Nat.*
Squalus corpore depresso. *Bloch. t.* 116.
Squatina. *Gesn. Rondel. Will. &c.*
Angel-Fish. *Penn. Brit. Zool.*

Head large, flat, and rounded in front: mouth placed at the end of the head: teeth broad at their base, but slender and very sharp towards the end, and disposed in five rows all round the jaws: tongue large: eyes small, and of a pale green colour: body rather thick, but tapering towards the tail: pectoral fins very large, of a subquadrangular shape, and bearing some distant resemblance to a pair of wings, pectoral fins very large also, and of a shape not greatly dissimilar: dorsal fins very small, and situated pretty near each other at the end of the back: tail broad and lobated: whole body covered by a rough skin, and marked down the back by a prickly, tuberculated line: colour pale ash-brown above, whitish beneath. Native of the European seas, growing to a very large size, measuring from six to eight feet or more in length: extremely voracious, fierce, and dangerous. It chiefly frequenting