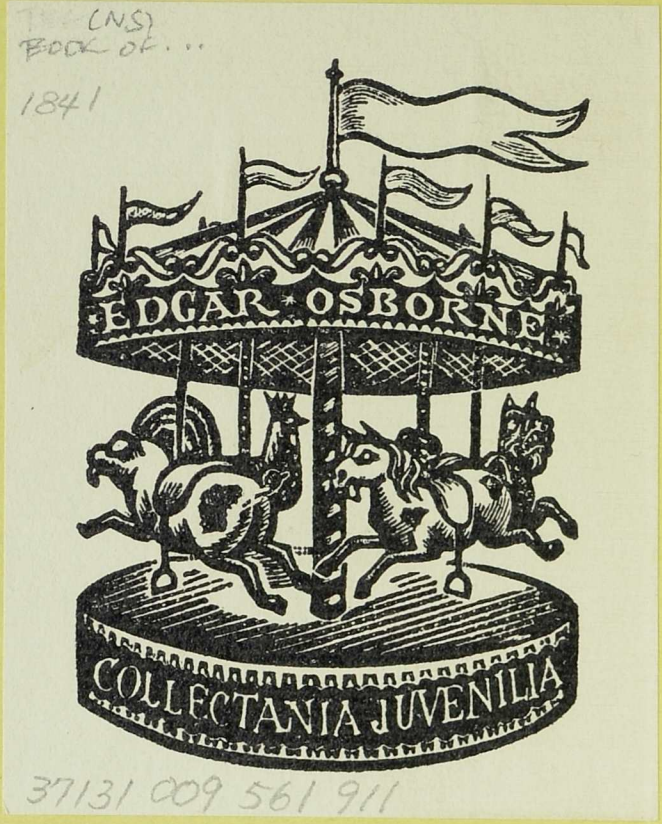
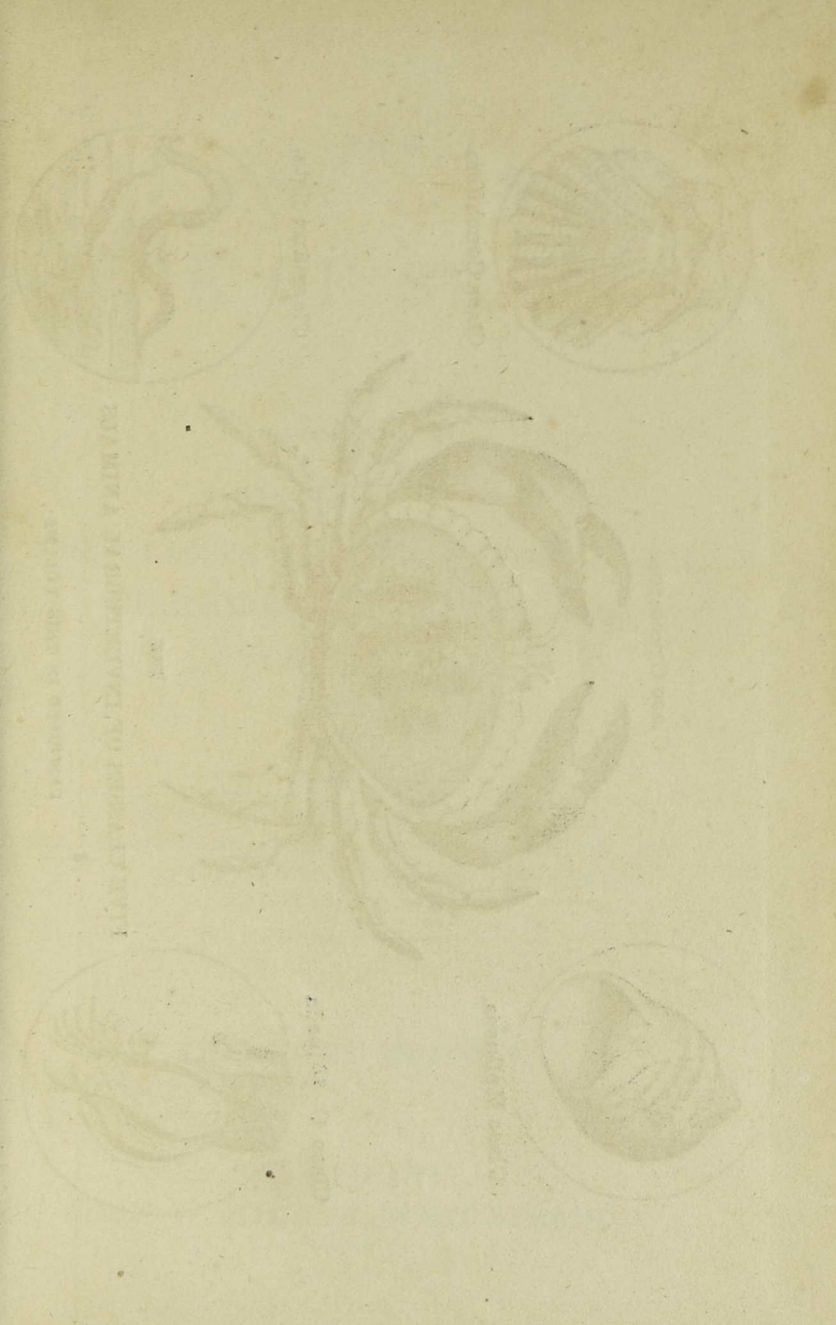
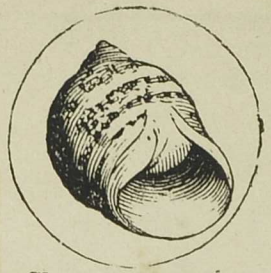
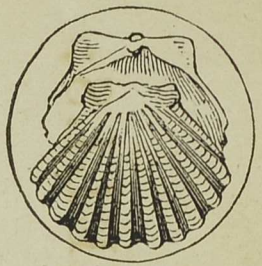






Class Mollusca.

Class Crustacea.



Class Conchifera.

Class C rhipeda

Class Annulata.

THE

FIVE CLASSES OF INVERTEBRAL ANIMALS

DESCRIBED IN THIS VOLUME

THE

BOOK OF SHELLS;

CONTAINING

THE CLASSES MOLLUSCA, CONCHIFERA, CIRRHIPEDA, ANNULATA, AND CRUSTACEA.

PUBLISHED UNDER THE DIRECTION OF
THE COMMITTEE OF GENERAL LITERATURE AND EDUCATION,
APPOINTED BY THE SOCIETY FOR PROMOTING
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TO THE READER.

In describing that portion of the system of Natural History which embraces the Vertebral Animals,—namely, the Mammalia, the Birds, the Reptiles, and the Fishes,—the arrangement of the Baron Cuvier was adopted. In the present little volume, as well as in the others that are to follow, and which, together, will comprise the Invertebral Animals, the method of M. Lamarck will be adhered to. It is true, that, since the works of that naturalist were published, many deviations from certain parts of his system have taken place, some of which have received the sanction of the highest names; but still, *as a whole*, Lamarck's System remains unrivalled, and the young naturalist can readily add to the information it contains, by reference to the works of more recent authors, in case he has sufficient inclination and industry to follow out the subject.

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BOOK OF SHELLS.

Introductory Chapter.

In reviewing the first Division of the animal kingdom, namely, the vertebral animals, we cannot fail to have been delighted with the wonderful and appropriate faculties bestowed upon each individual: but, beautiful and well adapted to the use of their possessors as these faculties may have appeared, our pleasure must be still greater in tracing the powers bestowed upon those creatures which constitute what we have been accustomed to call the lower orders of animated nature.

When contemplating the graceful form of the horse or the stag, or the beautiful plumage of the feathered tribes, or when we notice the terrific appearance of the crocodile, or the elaborate finish and metallic lustre of the scales of fishes, we are led to expect that equal care has been bestowed upon the rest of the organization of the different individuals, and that equal attention has been paid to the various instincts and powers necessary to their preservation; but when we observe a snail, or a worm, and compare their more simple appearance, and the perfect absence of what we have been accustomed to consider the organs of motion, namely, feet and hands, we are apt to look on them as having been created for some very subordinate purpose, and therefore less carefully formed than the vertebral animals. How much greater then must be our delight when we find them possessed of every power necessary to their state of

existence, as beautifully developed, and as carefully adapted to their necessities, as the highest instincts of other classes are to their possessors. Nor is their organization to be considered less perfect because we are unable to trace it in all its ramifications: the minute branches of the nerves of the human body are not only invisible to the naked eye, but even to the most acute observer, even when assisted by the magnifying power of the microscope, but we are certain that they do exist, from the pain we feel when they are injured. Until lately, the *Infusoria*, those microscopic animals which are found in infusions of vegetable substances in water, were supposed to be possessed of neither nerves nor stomach, and to be fed by absorption; but the ingenious experiments of a learned foreigner have proved, that, instead of being without a stomach, they are provided with as many as five or six: it is true that the nerves have not yet been detected, but we have a right to infer their existence from their effects; so that these minute creatures, which we have been accustomed to consider as nearly destitute of organs, are, in fact, beautifully formed, and as perfect in their kind as any other of the Creator's works.

The second DIVISION of the objects of natural history, namely, the INVERTEBRAL animals, which we have now to describe, are placed by themselves, on account of their being without an internal skeleton, consisting of a series of vertebræ, or bones of the back. This distinction is explained in the introductory chapter to the Book of Animals. They have been separated, by Lamarck, into Eleven CLASSES, namely:—

1. MOLLUSCA, (*soft-bodied animals,*) in general covered with a shell: as, for instance, a snail; or without a shell, as a slug.

2. CONCHIFERA, (*shell-bearing animals,*) with a shell, consisting of two valves, as an oyster or mussel.
3. CIRRHIPEDA, (*with feet like cirri, or hairs.*) The inhabitant of the acorn shell, found on the back of the larger kind of shell-fish, &c., is an instance of this class.
4. ANNELIDA, (*with body formed of rings;*) of this class the leech and the earth-worm are instances.
5. CRUSTACEA, (*covered with a hard case,*) crabs, lobsters, &c.
6. ARACHNIDÆ, *Spiders.*
7. INSECTA, *Insects.* A perfect insect has always six legs.
8. TUNICATA, (*enclosed in a case of a leathery consistence.*)
9. VERMES, *Worms.* With lengthened body without divisions; for instance, worms found in the intestines.
10. RADIARIÆ, (*radiated animals,*) with the different parts of which they are formed arranged like rays round one common centre; as, for instance, the star-fish.
11. POLYPI, (*many feet.*) The animal that forms the Coral is a Polypus.
12. INFUSORIA, (*Infusory animals.*) These are found in infusions of vegetable substances in water, and are, in general, too small to be visible to the naked eye.

In the present little book we shall treat of the first five of these Classes.

The Molluscous animals are, on account of their organization, placed first among the invertebral animals, a few of the species resembling, in some respects, the more simply-formed fishes.

The systematic arrangement of the Molluscous animals, considered not only as regards their shells, but having reference also to the anatomical distinctions of the creatures themselves, is a modern study. In ancient authors we merely find a few scattered facts, the beauty of the shells attracting their notice more than the value or nature of the animals.

Although, at the first glance, the inhabitants of shells

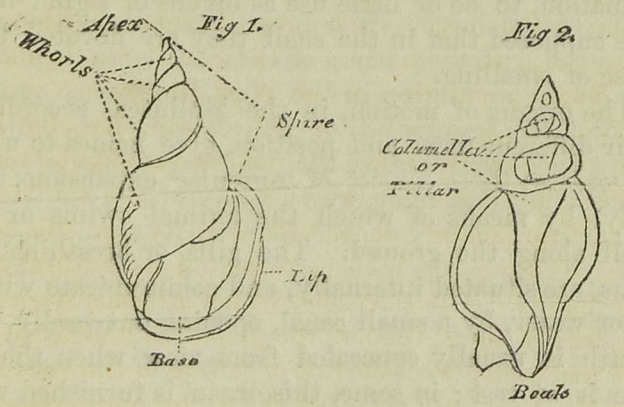
appear to be beings of a very uninteresting nature, a due consideration of the valuable properties of many, and the usefulness of all, will enable us to perceive, that, regarding them merely in an interested point of view, they are worthy of the strictest attention of the naturalist. In the first place, the whole of them afford food for the different species of fish, and other inhabitants of the deep. The Tyrian dye, the royal purple of the ancients, was produced by the inhabitant of a small univalve shell, of the genus Purpura. That beautiful ornament in dress, the oriental pearl, is the consequence of disease in a species of mussel, and the inner portion of the shell of the same animal is the well-known substance, mother-of-pearl. A kind of silk is obtained from the beard of the pinna, which, in some places, is made into gloves. As an article of food we may mention the well-known oyster, the mussel, scallop, &c., and some of the larger kinds form no small portion of the subsistence of the natives of the South-Sea Islands, and the Negro population in the West Indies.

The *Teredo navalis*, or ship-worm, has, by its destructive powers, ruined the noblest vessels, and rendered useless the timbers on which many of the constructions in harbours mainly depend for security; on this account great attention has been bestowed on its natural history and habits. The barnacle, which attaches itself to the bottoms of ships, renders the planks so foul as to interfere materially with the rate of sailing of the vessel itself. But these are only a few of the useful and noxious qualities of these inhabitants of the deep.

The shell with which a Molluscous animal is covered, is absolutely necessary to protect its delicate body from injury: this shell is, in general, composed of much the

same material as bone; but the bone of a bird, or quadruped, is formed by the agency of the blood, and the particles of which it is composed are deposited by that fluid, and again taken up and restored to the circulation, a circumstance which does not take place in the substance of a shell. The shell is formed by the deposition of layer upon layer, in the course of the growth of the animal, and the ridges we perceive on many shells point out their periodical increase.

It will be necessary, when describing the distinctions between shells of different genera, to use several terms, which will, unless properly defined, be perhaps unintelligible to young people. The annexed diagrams will explain the meaning of those of most frequent occurrence among the Mollusca. Fig. 1 represents a univalve shell; fig. 2 another shell, of the same division,



cut through the middle, for the purpose of showing the columella, or pillar. Many shells, as, for instance, the periwinkle, (*Turbo vulgaris*,) have what is called an operculum, (*a lid*,) which closes the opening, and

protects the inhabitant from injury. In the case of the periwinkle, this lid is of a horny nature, but, in many species it is hard and solid, like the shell itself.

CLASS MOLLUSCA.

In noticing the animal of a univalve shell, the part most readily attracting attention is the mantle, which covers the head of the creature, something like a hood: it varies much in form and size in different genera. The eyes, which in the sepia are amazingly large and brilliant, are very minute in most of the other tribes, although they are frequently visible, and would appear, from their formation, to be of little use as organs of sight: indeed, it is supposed that in the snail they are devoted to the sense of smelling.

The organs of motion, in the Mollusca, according to their different form and position, give names to most of the orders: these consist of muscular expansions of the body, by means of which the animal swims or drags itself along the ground. The gills, or breathing apparatus, are situated internally, and communicate with the air or water, by a small canal, opening outwardly. The mouth is usually concealed from view when the creature is at rest: in some, this organ is furnished with a hard substance, which supplies the place of teeth, while, in others, it is in the form of a projecting tube. The greatest portion of the Mollusca are produced in the water, the tribes that inhabit that element exceeding by far those found upon the land.

The Molluscous animals have been separated into the five following Orders:—

1. Heteropoda, (*with feet, or organs of motion, not uniform, in all species.*)
2. Cephalopoda, (*with feet, or organs of motion, attached to the head.*)
3. Trachelipoda, *with feet, or organs of motion, attached to the neck, near the gills.*)
4. Gasteropoda, (*with feet, or organs of motion, attached to the stomach.*
5. Pteropoda, (*with feet, or organs of motion, like wings.*)

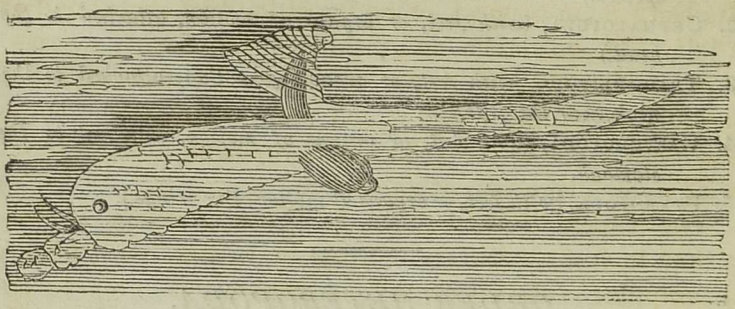
ORDER HETEROPODA.

The creatures belonging to this order, says Lamarck, may be considered as the first vestiges of the appearance of a series of marine animals, intermediate in their formation between the fishes and the Cephalopods: they are all natives of hot climates, and possess a body of a jelly-like substance, and so transparent as to be seen with difficulty when floating in the water. They do not all possess shells, and are less known than they otherwise would be, on account of the great difficulty there is in preserving them.

The Glassy Carinaria, (*Carinaria vitrea.*)

This singular animal is rarely taken, on account of its delicate and perishable substance: it is found in the Southern Ocean. It will be seen, on referring to the engraving, that the shell which it bears merely covers a portion of its body, that in which the most material organs of the animal are found, namely, the heart and the branchiæ, or organs of breathing. These are most curiously placed on the upper part of its body, projecting

from it, and protected by a delicately white and transparent shell, shaped like a little cap, and of a substance resembling glass. The creature is able to enlarge its body by filling it with water, and in swimming the back



THE GLASSY CARINARIA, (*Carinaria vitrea.*)

is undermost. The shell, which seldom exceeds an inch in length, has been sought after by collectors with great assiduity, and has, at times, fetched as much as ten guineas at a sale: a perfect specimen is very rarely met with. There is a wax model of one of these shells in the British Museum, nearly two inches wide.

ORDER CEPHALOPODA.

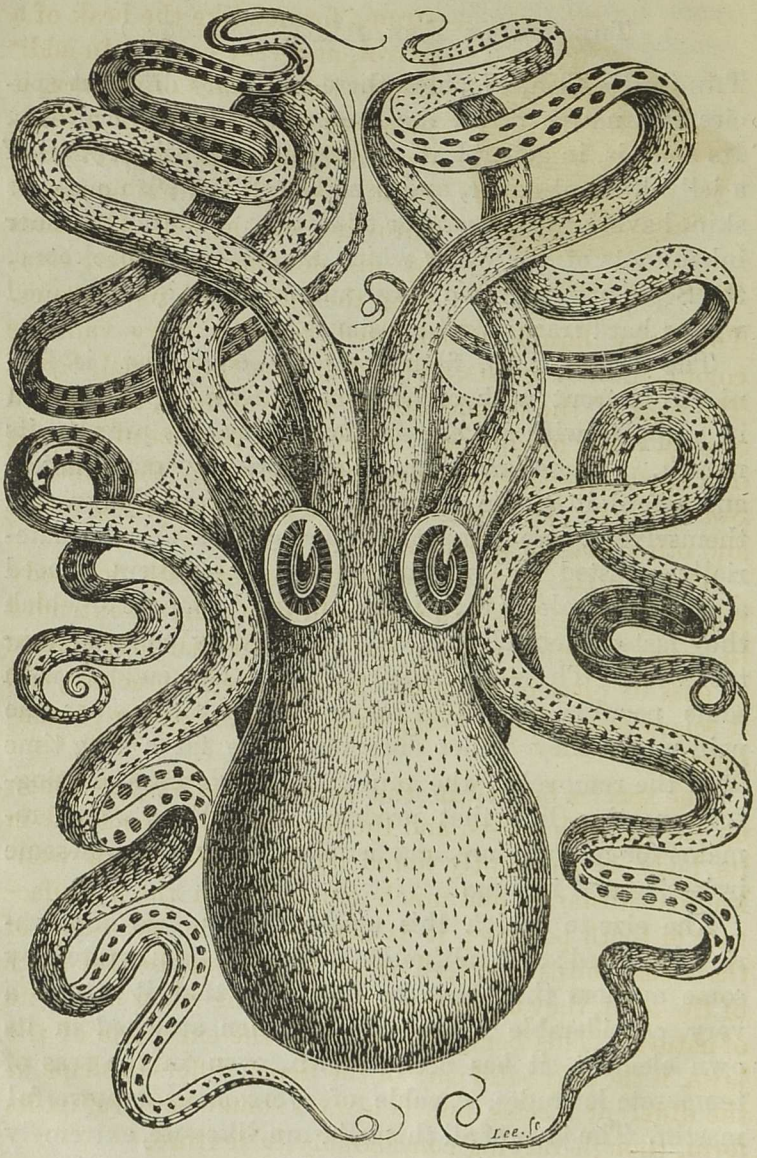
THE Cephalopods have been so named by Cuvier, from being furnished with a kind of inarticulated arms which surround the head. We find among this class some of the most singular productions of the waters: they differ materially from each other, and have been separated into three groups; first, those without any external shell, as the Sepia; secondly, the inhabitants of a shell without any divisions, as the Argonaut; and, thirdly, those whose shell is divided into numerous chambers, as the Nautilus.

The Cuttle Fish, *(Sepia officinalis.)*

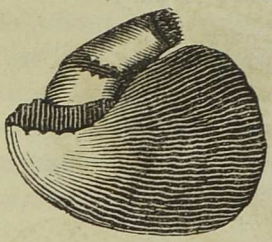
The Cuttle Fish, of which there are many different species, is a native of all the temperate and tropical seas. Its body is, in general, of an irregular oval shape, and of a jelly-like substance, and usually covered with a coarse skin, having the appearance of leather. Unlike all other inhabitants of the water which are without a backbone, the Sepia possesses two large and brilliant eyes, covered with a hard transparent substance.

The Cuttle Fish, figured in the engraving, is furnished in front with eight arms or feelers, with which it grapples with its enemy, or conveys its prey to its mouth. These arms are most curiously constructed, and afford it ample means of defence; they possess in themselves a strong muscular power, and this is materially assisted by numerous cups or suckers, placed along the whole of their inner surface, by means of which they fasten themselves to any object they come in contact with. These feelers appear to be also endued with some peculiar power, of an electric nature; since the pain which they inflict does not cease for a long time after the removal of the animal, leaving a kind of stinging sensation, like that produced by nettles, which remains for many hours, and is followed by a troublesome irritation and itching.

The size to which this creature grows has been variously stated; and, although evidently exaggerated by some authors there can be no doubt that it attains a very considerable magnitude. When attacked in its own element, it has been known, even in the seas of temperate latitudes, capable of overcoming a powerful mastiff. The jaws of all this tribe are, likewise, extremely



THE CUTTLE-FISH.



BEAK OF A CEPHALOPOD.

strong, formed like the beak of a parrot, and very hard. In addition to these means of defence, it possesses within its body a bladder, containing an inky-coloured fluid, which it has the power of throwing out at will, and, thus by discolouring the water, escaping the pursuit of its enemies. This inky liquid, when dried, forms a very valuable colour, used by artists, and called, after the animal, *Sepia*. The eggs of the female are of an oval form, and joined to each other in clusters. They are of the size of filberts, of a black colour, and commonly known by the name of *Sea Grapes*. They are found attached to seaweed, rocks, and other marine substances.

The Cuttle Fish is generally found with its body lodged in some hole in a rock, while its arms are extended in every direction to seize the wanderer that may chance to pass its place of ambush. Its appetite is voracious, and it seizes every living thing that it has the power to conquer.

The species figured in the engraving is very common on the English coasts, and the bone which is enclosed in its body is frequently found on the sands; it is a well-known substance, and much employed in the manufacture of tooth powder; it is also placed in the cages of those song-birds that feed on seeds, and supplies the place of the sand, they are in the habit of using when in a state of nature. This bone, which, with the exception of the jaws, is the only solid part in the Sepia, differs in shape in the different species, but is always somewhat oval in its form, though varying considerably in texture.

THE ARGONAUT, *(Argonauta Argo.)*

The tender Nautilus that steers its prow,
The sea-born sailor in its light canoe.

* * * * * *

He, when the lightning winged tornadoes sweep
The surge, is safe: his home is in the deep.
He triumphs o'er the armadas of mankind,
That shake the world, but tremble in the wind.

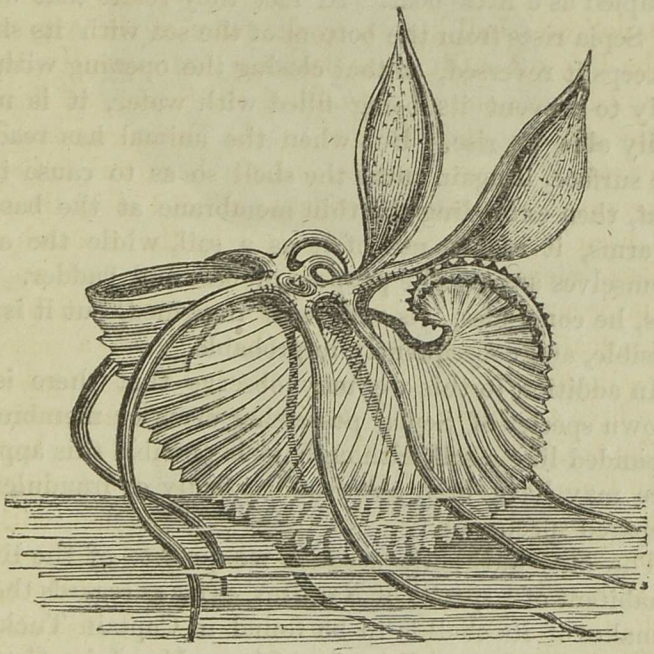
THE delicate shell known by the name of the Argonaut, or the Paper Nautilus, has been not unfrequently found occupied by an animal resembling the Sepia, and floating on the surface of the water in the Mediterranean, and other seas of warm climates, but the beautiful fiction of its assumed powers as a navigator, alluded to by the poet, has been almost entirely dispelled by the researches of modern science. The name Argonaut has been applied to the occupant of this shell, from its alleged resemblance, when floating on the surface of the waves, to a vessel in full sail, Argo being the name of the ship, supposed to have been the first fitted out for mercantile adventure.

The fabled history of the Argonaut has been handed down from the earliest times, from one author to another, each repeating what had been formerly written, without possessing the means, or taking the trouble of making farther inquiry, unwilling even if they suspected the truth of the tale, to deprive their favourite science of so elegant an illustration.

The result of the inquiries of modern naturalists appears to be, that a species of Sepia takes possession of the shell we know by the name of the Argonaut, in the same manner, and for the same purpose, as the hermit crab, which occupies the interior of a deserted univalve shell

Lamarck says,—"Although, according to my belief, we

are not at present acquainted with the true animal of the Argonaut, we cannot doubt that it is a molluscous animal. But let the formation of this animal, be what it may, it must be so formed as to serve as a mould for its shell, which is produced and formed by the deposit of a certain matter, which exudes from its surface, therefore it is certain the animal could not have been a Sepia.



THE PAPER NAUTILUS.
(According to the erroneous ideas of ancient authors.)

"In fact the essential form of a Sepia is a short, straight, obtuse, and oval or globular body, and consequently incapable of becoming the mould of the involute spire of the shell of the Argonaut. It is a well demonstrated fact,

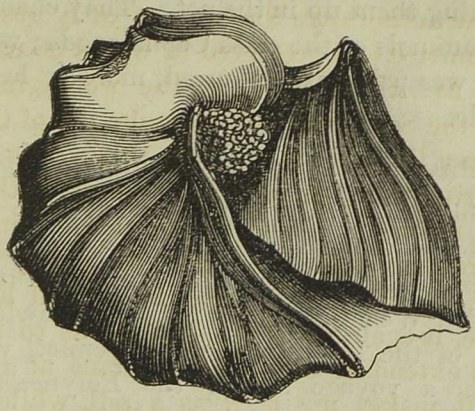
that all those animals which possess a spiral shell, as snails and others, have their body, naturally and exactly formed like the shell which they construct."

The same author says the error of early observers has been transmitted and preserved in works of natural history, and as in ancient tales the wonderful is never neglected, the Sepia was said to make use of the shell it occupied as a little boat. In fact they relate that when the Sepia rises from the bottom of the sea with its shell, it keeps it reversed, so that closing the opening with its body to prevent its being filled with water, it is more easily able to rise. But when the animal has reached the surface, it again turns the shell so as to cause it to float, then extending the thin membrane at the base of its arms, it makes use of it as a sail, while the arms themselves answer the purpose of oars and rudder. All this, he concludes, "is very well imagined, but it is impossible, and consequently improbable."

In addition to this we may observe that there is no known species of Sepia, possessing arms or membranes, expanded like a sail, although it is possible this appearance may have been observed in badly or fraudulently prepared specimens.

The only authentic account we possess of the living inhabitant of a species of Nautilus, as far as regards the use it makes of its shell is to be found in Captain Tuckey's voyage up the river Zaire in Africa. Mr. John Cranch, the zoologist to the expedition, took in the Gulf of Guinea, and afterwards on the voyage, by means of a small net, several specimens of a species of Sepia which were swimming in small argonauta on the surface of the sea. The species he captured has been named *Ocythöe Cranchii*. On the thirteenth of June, he placed two

living specimens in a vessel of sea-water: the animals very soon protruded their arms, and swam on and below the surface, having all the actions of the polypus of our seas;



SHELL OCCUPIED BY THE OCYTHÖE CRANCHII.

OCYTHOE CRANCHII.

by means of their suckers they adhered firmly to any substance with which they came in contact, and when sticking to the sides of the basin, the shell might easily be withdrawn from the animals. They had the power of completely withdrawing within the shell, and of leav-

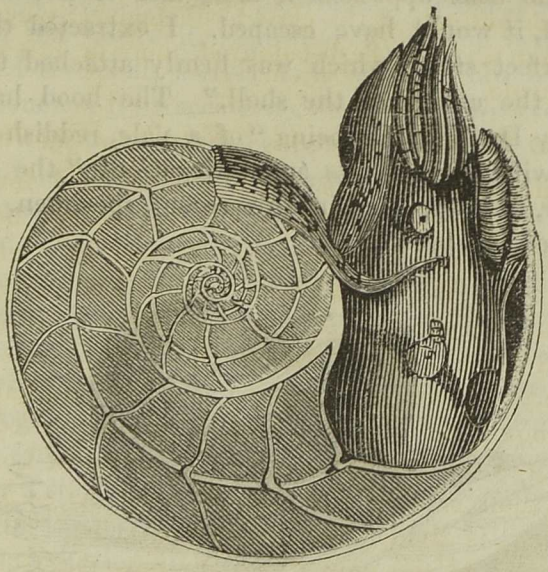
ing it entirely. One individual quitted its shell, and lived several hours, swimming about, and showing no inclination to return into it; and others left the shells as he was taking them up in the net. They changed colour like other animals of the class Cephalopoda; when at rest the colour was pale flesh-coloured, more or less speckled with purple.

The Pearly Nautilus, (*Nautilus Pompilius.*)

The inhabitant of this singular shell had long been sought after with eagerness by naturalists, but it is only within these few years that its true nature has been ascertained. We are indebted for this knowledge to the researches of the late Mr. George Bennet, who, while engaged in a voyage among the Polynesian Islands, captured a specimen containing a living animal, which was brought to England, and is now deposited in the Museum of the Royal College of Surgeons in London.

The shell of the Nautilus, as may be seen by the engraving, is divided into numerous cells. The use of these cells to the animal we are now describing, was formerly not well understood, but they were supposed to be employed, by their inhabitant, for the purpose of rising or sinking in the water at will. The body of this *Cephalopod*, it will be seen, only occupies the outer cell of its habitation, its increased size having rendered it too large to remain in that preceding it. If, as the animal deserted its smaller tenements, one after the other, they had been filled up with solid matter, the shell would have become too cumbersome for its owner; so that we have here another proof of the providing care of the Creator. We shall describe, in Mr. Bennet's own words the capture of this interesting object.

"It was on the twenty-fourth of August, 1829, (calm and fine weather, thermometer at noon 79°,) in the evening, when the ship Sophia was lying at anchor, in

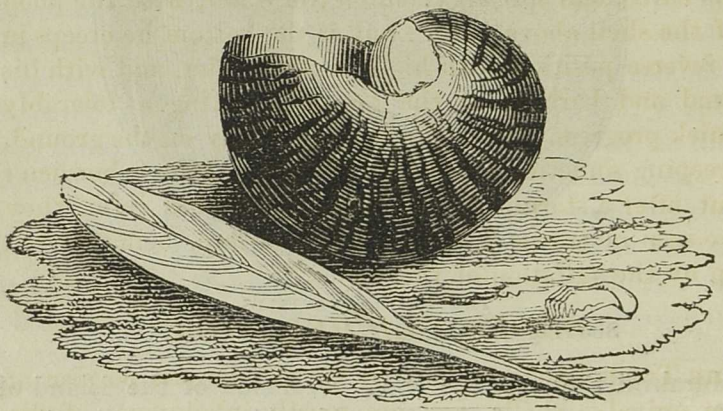


THE PEARLY NAUTILUS.
Showing the Animal, and a Section of its Shell.

Marakini Bay, on the south-west side of the island of Erromanga, one of the New Hebrides group, Southern Pacific Ocean, that something was seen floating on the surface of the water, at some distance from the ship; to many it appeared like a small dead tortoise-shell cat, which would have been such an unusual object in this part of the world, that the boat, which was alongside of the ship at the time, was sent for the purpose of ascertaining the nature of the floating object.

"On approaching near, it was observed to be the shell-fish, commonly known by the name of the Pearly

Nautilus: it was captured and brought on board; but the shell was shattered from having been struck with the boat-hook, in taking it, as the animal was sinking when the boat approached, and, had it not been so damaged, it would have escaped. I extracted the fish in a perfect state, which was firmly attached to each side of the cavity of the shell." The hood has been stated by Dr. Shaw, as being "of a pale, reddish-purple colour, with deeper spots and variegations;" the colour, however, as it appeared in this recent specimen, was of a dark reddish-brown.



SHELL OF THE NAUTILUS; AND THE SEA-PEN, OR INTERNAL SHELL OF THE LOLIGO.

Although this is the only instance of the animal itself having been brought to this country, there is but little doubt of its having been frequently taken, but as the shell was the object of the captors, and not its inhabitant, the latter has been thrown away as useless. An officer in His Majesty's Navy found a Nautilus in a hole in a reef of rocks, near an island on the Eastern coast of

Africa; the mantle of the fish like a thin membrane, covered the shell, which was drawn in as soon as it was touched, and the elegant shell was then displayed. "I and others," says the same informant, "when it was first seen did not notice it, regarding it, as the membrane enveloped the shell, merely as a piece of blubber; but having touched it by acccident, the membranous covering was drawn in, and we soon secured our beautiful prize."

Rumphius, a German naturalist, appears to have been acquainted with its habits; he says, "When he thus floats upon the water he puts out his head, and all his barbs, and spreads them on the water, with the poop of the shell above water: but at the bottom he creeps in a reverse position with his boat above him, and with his head and barbs upon the ground, making a tolerably quick progress. He keeps himself chiefly on the ground, creeping sometimes also into the nets of the fishermen: but after a storm, as the weather becomes calm, they are seen in troops floating on the surface, being driven up by the agitation of the waves."

ORDER TRACHELIPODA.

The Trachelipods contain by far the largest portion of the univalve shells, and are mostly inhabitants of the waters. They form two numerous groups, the feeders on animal food, (*Zoophagi*,) and those that exist on vegetable substances, (*Phytophagi.*) The animal feeders are well distinguished from the other group, by having a mouth without jaws, being furnished with a tube which they can retract or advance at pleasure, for the purpose of sucking their nutriment from the bodies of other inhabitants of the deep. The animal feeders are also known from the other section by the possession of a

projecting tube called a *siphon*, which conveys the water to the gills. The shell also points out to which section its possessor belonged, from the lower part of its opening being formed either into a sort of canal, or a groove for the reception of its siphon. They are all marine animals, and breathe water. The flesh-eating tribes compose five families.

Family Convoluta, (*rolled up like a scroll.*)
Family Columellaria, (*distinguished by a plaited columella.*)
Family Purpurifera, (*yielding a purple colour.*)
Family Alata, (*winged.*)
Family Canalifera, (*having a canal at the base of the opening.*)

Family *CONVOLUTA.*

The convoluted shells contain but few genera; but these are very rich in species, and furnish us with some of the most beautiful specimens of the class.

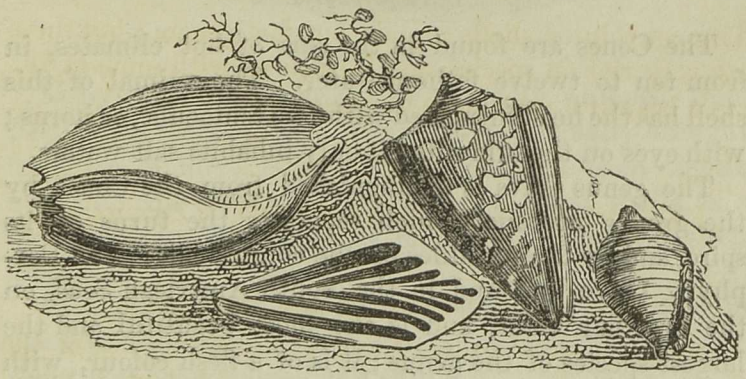
FEEDERS ON ANIMAL FOOD, (Zoophagi.)

The Marble Cone, (*Conus marmoreus.*)

Lamarck notices no less than 181 recent species of the Cone shell. The Marbled Cone figured below, is found in most of the Asiatic seas, and is not uncommon; it is of a dusky colour, and covered with angular white spots. The section of this shell points out in a remarkable manner the economy and providence of the Creator, so visible in all his works.

It will be seen on referring to the engraving, that the shell is much thicker in its outer whorl or revolution than in any other part: and this exceeding thickness is

necessary for the protection of the soft body of its inhabitant. In the course of the growth of the animal the shell is enlarged, and that part that was external becomes internal, the last made portion of the shell forming the outer wall; if, therefore, the inner part of the shell retained its original thickness, its weight would become too great for its possessor. To guard against this inconvenience, and this useless waste of material, the creature possesses the power of absorbing so much of the substance of what now becomes the internal portion of its dwelling, as is unnecessary for its present use, and of re-depositing the same on the outward wall of its mansion, where strength is most required*.

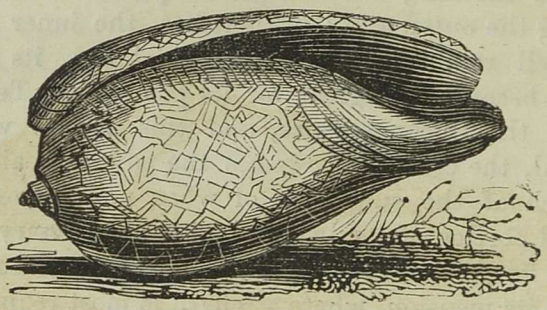


Voluta diadema. *Conus marmoreus.* *Columbella mercatoria.*

The Cones, says Lamarck, are the most beautiful of all the univalve shells; the genus comprises the most valuable and the most remarkable specimens of this family, whether we look at the regularity of their form or the splendour of their colours. The beauty of many,

* This is one of the rare exceptions to the usual plan resorted to by nature in the formation of a shell, as noticed in the introductory chapter.

but above all, the extreme rarity of others, have given them a species of celebrity, and have caused them to be much sought after by collectors.



Oliva porphyria.

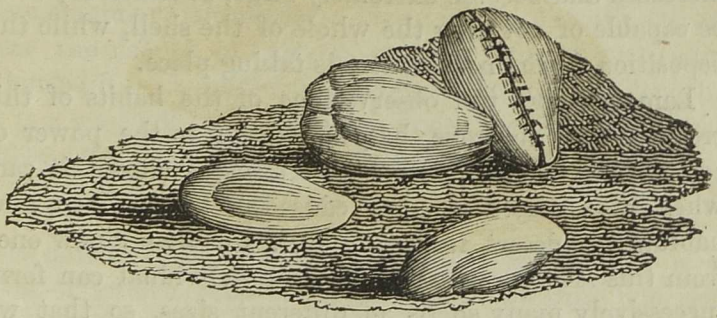
The Cones are found in the seas of hot climates, in from ten to twelve fathom water. The animal of this shell has the head furnished with two tentaculæ, or horns; with eyes on the summits; it only inhabits salt waters.

The genus Oliva is distinguished from the Cones by the groove or canal which separates the turns of its spire, and by the wrinkles on the columnella. The Porphyry Olive is found in the South American Seas, on the Brazilian coast, and is the most beautiful and the largest species of the genus; it is of a flesh colour, with numerous lines of a reddish brown, forming angular figures of various shapes, and covered with irregularly formed spots of a red or maroon colour. Its length is nearly four inches. There are about seventy species of this beautiful shell.

THE MONEY COWRY, (*Cyprœa moneta.*)

THE Money Cowry of Guinea is very common on the Indian and African coasts; and is used by many of

the inhabitants of Africa as a circulating medium; it is also employed for the same purpose in Hindoostan, particularly at Calcutta, where great quantities are obtained from the inhabitants of the Maldive Islands in exchange for rice.



Cypræa moneta.

Many tons of Cowries are annually shipped from England to Guinea; these having been originally brought from the Maldive Islands to Bengal, and from thence sent into this country. The value of these shells as a circulating medium depends naturally enough on their greater or less abundance.

In Bengal, in general, from 2000 to 2400 are equal in value to a shilling. But in Africa they are much dearer, about 250 being valued at a shilling.

The Cowrie shell is found of three different forms, according to its age. First, in its extreme youth, when the shell is extremely imperfect, and like a slender cone, without any appearance of the usual characters of the genus. Secondly, when half-grown; it then begins to assume the form of the perfect shell, but is extremely slight and colourless, and the point of its spire projects. Thirdly, when perfect; it has now received a second

deposit of shelly matter, in which its specific colours appear, and its spire is completely hidden. The second deposit with which the shell is covered is secreted by the two membranous wings of the creature's mantle, which in the adult state of the animal, have rapidly increased and become extremely large, so much so, as to be capable of covering the whole of the shell, while the deposition of the new matter is taking place.

Lamarck says the observations of the habits of this creature tend to prove that, in addition to the power of completing its shell, as we have already noticed, it can, when its increased size has caused it to require a new habitation, desert its former shell and form a new one; from this it happens that the same individual can form successively many shells of different sizes, so that we find the same species both large and small.

When not in search of food, these animals are found buried in the sand, at some distance from the sea-shore, in temperate as well as in hot climates.

Family *COLUMELLARIA.*

This family is distinguished from the next in having the columella plaited, and a notch at its base. It does not include any shells with a plaited columella, in which the opening at the base is entirely smooth, that is, without a notch.

The Diadem Whorl Shell, (*Voluta diadema.*)

The Diadem Whorl Shell is a very beautiful specimen of its genus; it is marbled with white, upon a yellow ground but the markings become nearly obliterated by age: it is as much as seven inches in length, and is found in the Asiatic seas. The head of the animal of this shell has two pointed tentaculæ, with an eye at the outer base of

each. Its mouth is a lengthed cylindrical and retractile tube, furnished with little hooked teeth; it has also a tube to conduct the water to the branchiæ, springing out obliquely behind the head.

THE COMMON COLUMBELLA, (*Columbella mercatoria.*)

THE common Columbella is found in the Atlantic Ocean near the island of Goree, and in the West India Islands; it is about three-quarters of an inch in length. It is a sea-shell, and is found upon the coast; it possesses a very small oval operculum attached to its foot.

FAMILY *PURPURIFERA.*

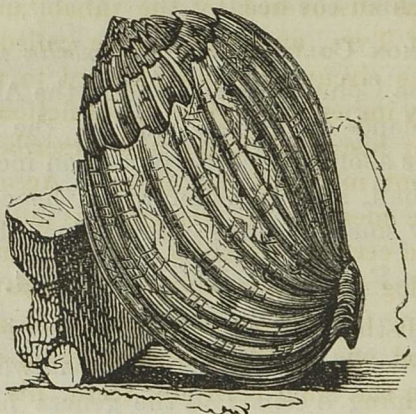
THE notch at the base of the shells of this family is a kind of groove bent backwards and upwards, but not properly forming a canal; all the genera have an operculum. The name Purpurifera has been given to these Trachelipods, because some of the genera contain in a peculiar reservoir, the colouring-matter with which the Romans, and other ancient nations, dyed their beautiful and well-known purple, which was so much in use before the discovery of cochineal.

THE MUSIC HARP SHELL, (*Harpa musica.*)

THE Harp shells are found in the Indian seas, and in great abundance also in the Red Sea. A very curious fact appears in the history of the animal of the Harp which deserves notice. It was observed a long time back by a German naturalist named Bon, but had since then been either forgotten or disbelieved: a recent traveller has confirmed its truth, although he notices it as a new discovery; it is as follows:—

The foot of the animal has the power of dividing itself into two portions; and one, namely, the hinder

portion, can be separated from its body by the creature itself, when it finds itself suddenly in danger, and wishes



Harpa musica.

to retire into the deepest recess of its shell; on this account it is without an operculum, which would evidently be useless, as it would be lost at the same time as the foot.

The Harps, says Lamarck, are very beautiful shells, and if they were less common, would, on account of their elegant forms and colours, become valuable in a collection. Some species, however, are still considered rare.

The Harps take their name from the fancied resemblance between the regularity and direction of the ribs on the shell, and the strings of a harp. The species are not numerous, not exceeding eight in number.

The Wide-Mouthed Purpura, *(Purpura patula.)* This species of Purpura is said to be that which was employed by the Romans in dyeing, but many others of the same family yield a purple colouring-matter. It

is nearly three inches in length, and is found in the Atlantic Ocean and the Mediterranean.

The purple colour which this little Molluscous animal produces, was discovered by the inhabitants of the ancient city of Tyre, and was thence called the Tyrian purple. The circumstances which led to the discovery of it are very imperfectly known, but fiction has supplied the want of historical facts, and described its origin with sufficient minuteness of detail. According to one account, the merit of its discovery is due to a dog belonging to a certain Hercules. We are informed that when this dog was accompanying his master, who was then following the nymph Tyros along the sea-shore, the animal seized one of the Purpuræ lying on the sand, and breaking the shell with his teeth, his mouth soon became coloured with the purple juice. The nymph having observed the effect, immediately expressed a strong desire to have a dress dyed of the same beautiful colour; and her lover no less anxious to gratify her wishes, at last succeeded in discovering a method of applying it to cloth.

This colour was so highly valued by the ancients, that it was either consecrated to the worship of the Deity, or conceived to be fit only for the garments of royalty.

Under the Mosaic dispensation the stuffs for the service of the altar and the habits of the high-priest were enjoined to be of purple. The Babylonians devoted this colour to the dress of their idols, and most of the other nations of antiquity appear to have done the same. Pliny informs us that it was used by Romulus and the succeeding kings of Rome, as well as by the consuls and first magistrates under the republic. The Roman emperors at last appropriated it entirely to their own use, and

denounced the punishment of death against those who should dare to wear it, although covered with another colour. This absurd and tyrannical restriction confined the dyeing of the Tyrian purple to a few individuals, and, in a short time, the knowledge of the process was entirely lost.

In the twelfth century, neither the creature that furnished the dye, nor the method employed by the ancients to communicate to cloths the rich and beautiful purple it afforded, were at all known ; and on the revival of learning, it was even suspected by many, that the accounts which had come down to us respecting this celebrated colour were entirely fabulous.

According to Pliny, the Tyrians removed the finest colouring-matter out of the largest shells, in order to possess it in a more pure state, and to extract it more effectually, but obtained the colour from the smaller by grinding them in mills. He adds, that when the Purpuræ were caught, the receptacle which contained the dyeing-liquor was taken out and laid in salt for three days; and that after a sufficiency of the matter had been collected, it was boiled slowly in leaden vessels over a gentle fire, the workman scumming off from time to time the fleshy impurities. This process lasted ten days, after which the liquor was tried by dipping wool into it, and if the colour produced by it was defective, the boiling was renewed.

Other colouring-matters were employed sometimes to economize, and at other times to vary the effect of the liquors of the Purpuræ. Among these Pliny enumerates *Fucus marinus*, or Archil, and the *Anchusa tinctoria*, or Alkanet, both of which are still used as dyes. By these and other means, the purple colour was made to assume

a variety of shades, some inclining more to the blue, and others to the crimson.

In modern times several attempts have been made to obtain this dye; but the discovery of cochineal has rendered it a matter of little import.

In the year 1683, Mr. William Cole, of Bristol, being at Minehead, was told of a person living at a sea-port in Ireland, who had made considerable gain by marking with a delicate and durable crimson colour, fine linen that was sent to him for that purpose, and that this colour was made from some liquid substance taken from a shell-fish. Mr. Cole being a lover of natural history, and having his curiosity thus excited, went in search of these shell-fish, and, after trying various kinds without success, he, at length found considerable quantities of a species of buccinum on the sea-coasts of Somersetshire, and the opposite coasts of South Wales. After many ineffectual endeavours, he discovered the colouring matter, placed in a white vein, lying transversely in a little furrow, or cleft, next to the head of the fish, "which," says he, "must be digged out with the stiff point of a horse-hair pencil, made short and tapering, by reason of the viscous clamminess of the white liquor in the vein, that so by its stiffness it may drive in the matter into the fine linen or white silk intended to be marked." Letters or marks, made in this way, with the white liquor in question, "will presently appear of a pleasant green colour, and, if placed in the sun, will change into the following colours,—that is, if in Winter, about noon, if in the Summer, an hour or two after sunrise, or so much before setting, (for in the heat of the day, in Summer, the colours will come so fast that the succession of each will scarce be distinguishable,) next to

the first light green will appear a deep green, and in a few minutes this will change into a full sea-green, after which, in a few minutes more, it will alter into a watchet blue, and from that, in a little time more, it will be of a purplish red, after which, lying an hour or two, (supposing the sun still shining,) it will be of a very deep purple red, beyond which the sun can do no more."

"But the last and most beautiful colour, after washing in scalding water and soap, will (the matter being again exposed to the sun or the wind to dry,) be a much different colour from all those mentioned, that is, a fair bright crimson, or near to the prince's colour, which afterwards, notwithstanding there is no styptic to bind the colour, will continue the same, if well ordered, as I have found in handkerchiefs that have been washed more than forty times, only it will be somewhat alloyed from what it was after the first washing."

Some years after this, Réaumur discovered great numbers of a species of buccinum, on the coast of Poitou, and the stones round which they had collected, were covered with small oval masses, some of which were white, and others of a yellowish colour; and, having squeezed some of them on the sleeves of his shirt, in about half an hour he found it stained of a fine purple colour, which he was unable to discharge by washing. In repeating his experiment on his return home, he found it was necessary that the cloth should be exposed to the direct rays of the sun.

The difficulty of procuring and preserving a sufficient number of these shell-fish, must always render the use of this dye very limited; but Dr. Bancroft is of opinion, that it might still be rendered beneficial in staining or printing fine muslins, for which purpose but little colour-

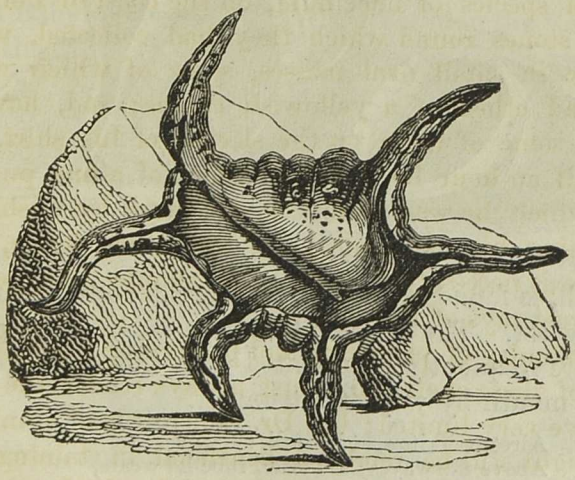
ing-matter is required. No substance, he remarks, will afford a substantive purple of equal beauty and durability, and capable of being applied to linen or cotton with so much simplicity and expedition.

Family *ALATA.*

This family is distinguished by having a canal of variable length at the base of its opening, and by the fact of the right margin of the shell changing its form during the growth of the animal.

The Spotted Scorpion Shell, (*Pterocera scorpio.*)

This curious shell is found in the East Indian seas, and attains a considerable size, as much as six inches. In an early age the projecting claws of this shell are very small, so that its appearance is materially different from that which it assumes at a more advanced period of its growth. It is known as the Spotted Scorpion-Shell, and is distinguished from other species of the same



Pterocera scorpio.

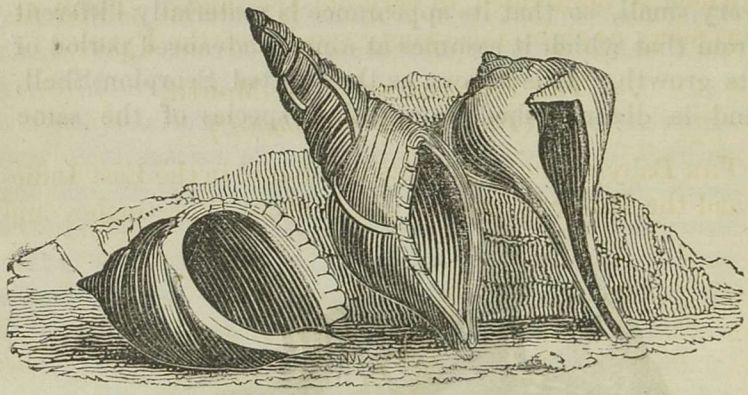
genus, by the knotted and granulated appearance of its surface; the opening of the shell is long and narrow, and of a dull violet red, sometimes brownish, on which numerous transverse wrinkles are seen, either of a pure white, or slightly tinged with yellow.

Family *CANALIFERA.*

The shells belonging to this family agree with those of the last in having a canal at their base: but the lip to the right of the opening does not change its form through age.

The Variegated Sea-Trumpet, (*Triton variegatum.*)

The *Triton variegatum*, or Variegated Sea-Trumpet, a large and beautiful shell, sometimes as much as two feet



Dolium perdix. *Triton variegatum.* *Pyrula caniculata.*

in length, is found chiefly in the torrid zones, near the Asiatic coast. The attendants on the sea-gods of pagan Rome are frequently represented with this shell applied to their mouth by way of a trumpet.

> Already Triton, at his call, appears
> Above the waves; a Tyrian robe he wears,
> And in his hand a crooked trumpet bears.

The sovereign bids him peaceful sounds inspire,
And give the waves the signal to retire.
His writhen shell he takes, whose narrow vent
Grows by degrees into a large extent,
Then gives it breath; the blast, with doubling sound,
Runs the wide circuit of the world around.
The sun first heard it, in his early east,
And met the rattling echoes in the west;
The waters, listening to the trumpet's roar,
Obey the summons, and forsake the shore.

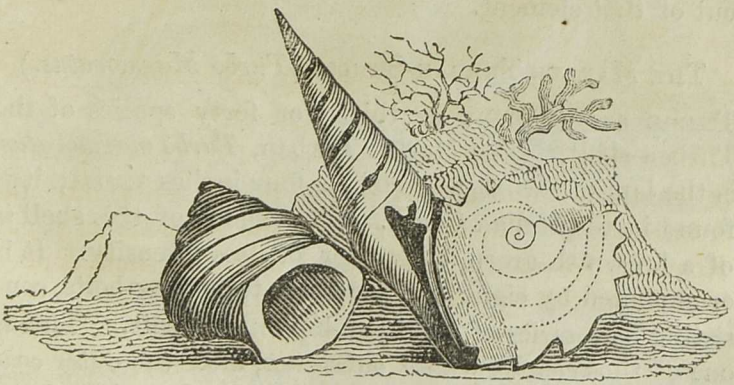
DRYDEN.

THE CANICULATED PEAR-SHELL, (*Pyrula caniculata.*)

THIS shell is found in the Icy Sea, and on the coast of Canada, and attains the length of seven inches. The animal of the Pyrula is at present unknown. There is a kind of keel or ridge along the edge of the whorls, which is obliterated in very old specimens. There are as many as eight-and-twenty species of the Pyrula.

THE BABYLONIAN SPLIT-MOUTH,
(*Pleurotoma Babylonia.*)

THE Babylonian Split-Mouth is found in the East Indies and the Molucca Islands, and is about three inches and



Turbo marmoratus. *Pleurotoma Babylonia.* *Trochus imperialis.*

a quarter in length. It is said that the animal of this shell, when in motion, has its foot separated as it were from its body by a long thick footstalk, arising from the centre of the mantle, which is at this time turned back over the shell. This separation of the foot has the effect of causing the creature to tumble over frequently, from the great weight it has to support.

VEGETABLE FEEDERS, (Phytophagi.)

Those genera of the Trachelipodes which live on vegetable substances have no projecting siphon, but possess a mouth furnished with jaws; they are in general land-shells, and, consequently, the air which they breathe is conveyed directly to their branchiæ. Some of their tribes, however, live in fresh water, either in running streams or in stagnant pools: among these, some breathe water and others air. These last are obliged frequently to come to the surface for the purpose of breathing,—others again inhabit salt water, and are unable to exist out of that element.

The Marble Turban-Shell, (*Turbo Marmoratus.*)

There are as many as thirty or forty species of the Turban-shell. The Marble Turban, *Turbo marmoratus*, is the largest, being as much as four inches across; it is found in the Indian Ocean. The colour of this shell is of a brownish-green, of greater or less intensity. It is ornamented by eight or ten narrow transverse belts, consisting of a series of white or brownish spots. This is one of those shells whose substance, after the outer coat is removed, is of the nature of mother-of-pearl.

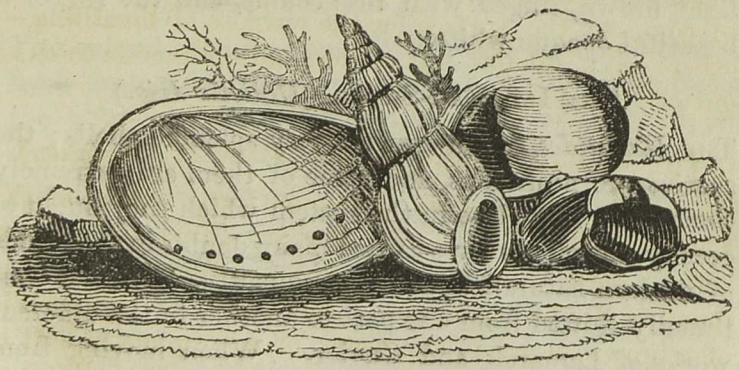
The *Turbo littoreus* (the Shore Turban) is the well-known periwinkle, with which our rocky coasts abound.

THE IMPERIAL TOP-SHELL, (*Trochus imperialis.*)

THESE shells have received their name from their resemblance in form to a boy's top. They are all marine shells, and the apex of their spire is always very sharp-pointed. In some places they are called *flat-mouthed snails.* The greater number of these shells, (and the species are very numerous,) are of a beautiful pearly substance, and many of them are also elegantly marked with longitudinal ribs; there are as many as seventy species,—the larger and more elegant are only found in the seas of hot climates.

THE PRECIOUS SCALARIA, (*Scalaria pretiosa.*)

THIS shell is noted for its rarity, and for the singular arrangement of its whorls, which do not touch each other,



Haliotis iris. *Scalaria pretiosa.* *Neritina pulligera.*

and appear as if they were only connected by the ribs with which the shell is adorned. Like the turbans, the

inhabitants of the Scalariæ are found on the sea-coast, on rocks and large stones, between high and low water mark. The native place of the Scalaria pretiosa seems to be uncertain; Lamarck, and several others, believe it comes from the East Indies, while others consider it an inhabitant of the Mediterranean. So great was the rage some years back, to possess a perfect specimen of this shell, that as much as twenty or thirty pounds, and even more, has been given for a well-preserved specimen. Travellers relate that the Scalariæ are much sought after and highly prized by the women on the coast of Amboyna, and at Batavia, where they are used as ear-rings, and in forming necklaces. They are, although rarely, as much as four inches in length. It is said, that there was a specimen in the cabinet of the empress Catherine of Russia still larger; but the most usual size is from one to two inches in length. A fine specimen of this shell ought to be semi-transparent like porcelain, of a light brown, tinged with rose-colour, and the ribs of a beautiful opaque white.

The Iris Ear-Shell, (*Haliotis Iris.*)

The *Haliotides*, or sea-ears, are very splendid shells; the species are numerous, and some of them are extremely common. The place in the system which they ought to occupy appears to have caused many doubts in the minds of modern naturalists, and, consequently, we find it continually shifted from one part to another in the different works of Lamarck and Cuvier. When moving from place to place in search of food, the animal and its shell present a very pleasing sight, the slender tentacula, which appear through the different holes that ornament the margin of the shell, gracefully waving in all directions;

these tentacula are supposed to be breathing-tubes. In the young shell, the number of perforations is not so great as in an adult, one being formed at each progressive stage of the creature's growth. Sometimes the holes which were first formed, become, by age, filled up. The proportions of the shell, also, vary materially, so as to render the separation of species very difficult and uncertain.

The Dusty Neritina, (*Neritina pulligera.*)

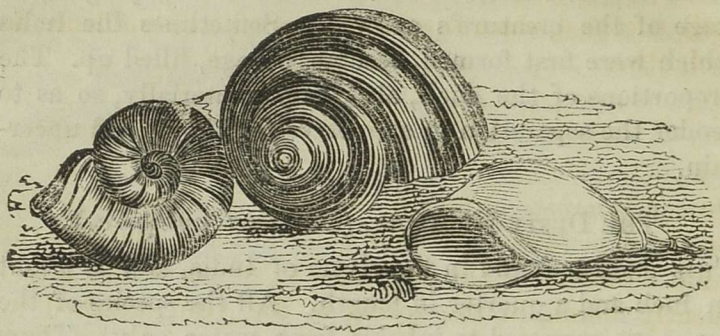
This shell is found in the rivers of India, and is about an inch and a quarter in length. All the species of the genus are supposed to inhabit fresh water only. There is a curious fact attached to the history of the Neritina, and of a neighbouring genus, Nerita,—namely, that when found in a fossil state, their colours are always in good preservation. The species, which are tolerably numerous, are, in general, natives of hot climates.

The Viviparous Paludina, (*Paludina vivipara.*)

The animal of the genus Paludina is an inhabitant of fresh waters: it takes its specific name from the fact of the young being hatched within the parent shell, and deposited in the waters perfectly formed. In nearly the whole of this class, however, the eggs are laid either in water or in the earth, and afterwards hatched after a longer or shorter period.

These shells are found generally in running streams of fresh water; sometimes, however, they are met with in brackish water, at the mouths of rivers. The operculum of the Paludina is of a strong horny substance. The young, immediately they are hatched, attach themselves to the outside of the shell of the mother, where they

remain until they are sufficiently strong to trust themselves in the water.



Planorbis corneus. Paludina vivipara. Lymnæa stagnalis.

Lymnæa Stagnalis.

The *Lymnæa stagnalis* is found in stagnant waters, particularly narrow ditches, in great abundance. As it breathes air, it is necessary for its existence that it should frequently resort to the surface of the water; and, consequently, we find these shells floating about in great numbers, with the body partly out of the shell. The least appearance of danger causes a Lymnæa to withdraw the whole of its body into its shelly covering; and as this increases its specific gravity, it instantly sinks to the bottom, where it remains in safety. In order to reach the surface again, it is obliged to crawl to the side of the ditch, and when it has reached the level of the water, it again trusts its little bark to the mercy of the winds and stream, for it has very little power to direct its own course.

During the winter, these creatures remain at the bottom, buried in the mud, and in a state of torpor.

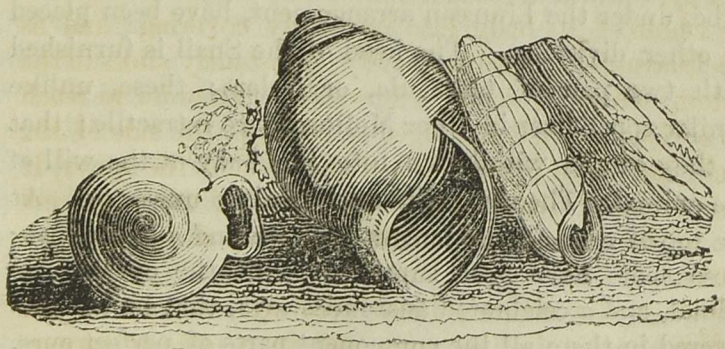
Although apparently useless to mankind, they form part of the subsistence of many water-birds, and of fishes, which are extremely fond of them. The species are not easily decided, since they bear so great a resemblance to each other.

The Horn-shaped Planorbis, (*Planorbis corneus.*)

The *Planorbis*, although differing in form from the Lymnæa, possesses the same habits, and is found in the same localities. The jelly-like substance which is frequently found, in the spring of the year, attached to water-cresses and other aquatic plants, and which is considered by many to be of a poisonous nature, and looked upon as the spawn of toads, is merely the covering of the ova of this and other inhabitants of fresh-water shells; and, although very disagreeable, certainly not poisonous.

The Red-mouthed Bulimus, (*Bulimus hæmastomus.*)

The *Bulimus hæmastomus* is a most beautiful shell; it is



Bulimus hæmastomus. *Pupa mummia.*

a native of Guiana, and is frequently as much as four inches in length. The most singular part of its natural history is the large size of the egg of the animal in comparison with its magnitude; it is said to equal that of a moderate-sized pigeon.

The Mummy Puppet Shell, (*Pupa mummia.*)

The *Pupa mummia* is found in the Antilles; it takes its name from the singularity of its form, which very much resembles that of a mummy.

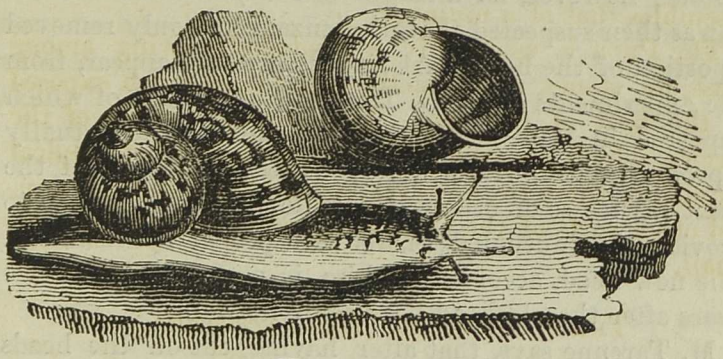
The Pupa is essentially a land-shell, living among grass, on stones, and sometimes in places much exposed to the heat of the sun. The greater number of the species, which are very numerous, are natives of tropical countries; there are, however, several found in Germany, and other parts of the Continent, but they are extremely small.

The Wood Snail, (*Helix nemoralis.*)

The Snail *(Helix)* is an animal well known in every part of the globe, and its species are still extremely numerous, although many shells which belonged to this tribe, under the Linnæan arrangement, have been placed in other divisions. The head of the Snail is furnished with two pair of tentacula, or feelers; these, unlike similar appendices in other Mollusca, are retractile; that is, they can be withdrawn into the body at the will of the animal. The use of these tentacula is uncertain. At the top of each of the longest pair we find a black spot; these spots have been supposed to be the eyes of the animal, and a celebrated anatomist says, that he has discovered in them all the component parts of perfect eyes.

However this may be, the animal appears to use them rather as organs of touch than of sight. Some writers suspect that the sense of smell resides in one or both pairs of these appendages.

The uses to which Snails are applied are not many; some of the larger kinds, however, are, in some countries, employed as food. The Romans, according to Pliny, consumed large quantities, and considered them



Helix nemoralis.

in the light of delicacies, and considerable pains were taken in fattening them for the table. Those from Sicily and the Balearic Islands were in great request, and attained a very large size. Some authors say they are still used as food in several parts of the Continent.

In Paris, London, and many large towns, great numbers of Snails are frequently brought to market; but these are not employed as food, but used medicinally by persons suffering under consumption, and other diseases of the chest.

It was already known that polypi, and some species of worms, could have portions of their body cut off, and

that the parts removed would be afterwards reproduced; and as these animals had no well-distinguished extremities, such as heads or limbs, the fact, although singular, was not disputed; but, when it was asserted by Spallanzani, that Snails, which have a very well-defined series of parts, could, after the head was removed, reproduce that portion of the body, the scientific world became naturally incredulous, and numerous experiments were made, and thousands of Snails slaughtered, to ascertain the fact. No one, however, for a length of time, could succeed;—it was then suspected that Spallanzani had only removed a portion of the head. At length, it would appear, from the experiments of M. G. Tarenne (an account of which appeared in 1808), that these creatures could actually reproduce a complete head. He gives as a reason of the want of success of others, the little precaution taken to provide the mutilated Snails with proper nourishment. The new head, according to him, is perfect in about two years after the old head has been removed.

M. Tarenne says, that after having cut off the heads of two hundred Snails, he threw them all into a moist spot at the end of his garden, that they might obtain the nourishment most fitted for them (how they could eat without their heads he does not say); at the end of the summer he examined all the mutilated Snails he could find, and he discovered that they all had a new head, about the size of a grain of coffee; they had four small tentacula, a mouth, and lips; at the end of the following summer, the heads were perfectly reproduced, and like the original head, with the exception of the skin, which was more delicate. "After this experiment," says a French author, "we cannot doubt that the entire head of a Snail can be regenerated after it has

been removed; however, I cannot disguise the fact, that I have a kind of repugnance at admitting the matter to be entirely beyond dispute."

If the advantages bestowed on man by Snails are not numerous, the disadvantages, or rather inconveniences, produced by them are very considerable; they are particularly destructive in orchards and kitchen-gardens. On this account, many methods have been recommended for the purpose of destroying them. Although many of these are tolerably successful, there is no plan more likely to keep the breed of Snails under, particularly in enclosed gardens, than that of early rising, and gathering them, if we may so express ourselves, while the dew is yet on the grass: if the shells are then broken, they become excellent food for poultry. Ducks may sometimes be allowed to wander in the garden, as they do but little damage to the vegetation, and are great destroyers both of Snails and slugs.

A singular account of the instinct of Snails is, perhaps, worth recording.

The garden of a small house, by the side of one of the roads leading into London, was much infested by a colony of Snails; the proprietor of this house, desirous of getting rid of the pest, and yet unwilling to kill the Snails, collected them, and threw them unharmed into the road; but still, he every morning discovered as many Snails among his pinks and tulips as he had removed the previous day: this somewhat puzzled him, until once, on leaving his house early, he perceived the Snails which he had but an hour before thrown into the dusty road, moving, not in a body, but each from the spot on which it was thrown, in a direct line from that spot to the low wall which encompassed the garden, as if they

comprehended the mathematical fact, that "a straight line is the nearest way from one given point to another." How were these Snails aware that by moving in that direction they should arrive at a green spot? From the road nothing could be visible to them but dust,—from the path, nothing but the wall in front,—but still, although the whole of their path was covered with dust, they proceeded steadily on, until they had surmounted the wall, and reached their old quarters. By what other faculty were they guided but that instinct which supplies the place of the higher powers of the mind, and which is imparted with so liberal a hand to the meanest creature i nature?

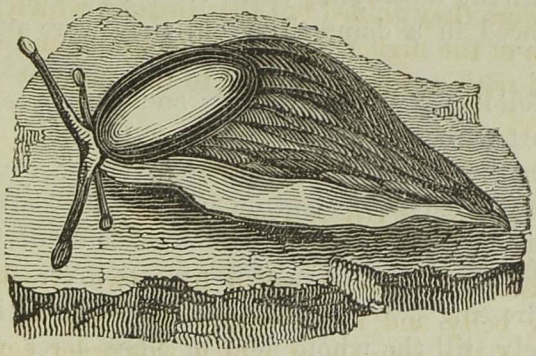
ORDER GASTEROPODA.

The Gasteropods are so called from two Greek words, meaning belly and foot, because the foot, or organ of motion, of the animals of which this order consists, is attached to the whole of the under part of the creature, or, rather, the belly or under part is itself the foot, and is for that purpose broad and flat. The Gasteropods are also distinguished from the last order by having a straight body, in no case spiral, and never possessing a shell capable of enclosing the whole body; in some cases, the body is completely naked, and without the protecting covering of any shell whatever.

The Red Slug, (*Limax rufus.*)

The Common Slug is a good example of an individual of this order entirely wanting a shell. The Slugs, like the snails, are found in all countries; they are equally

destructive to vegetation, but as yet have never been used by man for any useful purpose, if we except the fact of their sometimes becoming the food of ducks and poultry. The *Limax rufus*, Red, or more properly brown, Slug, for the colour is of a reddish-brown, varying in intensity to such an extent as to render it impossible to find two specimens of the same colour, is more commonly found in fields than in gardens.



Limax rufus.

There are many species of the Slug; but they are not well defined, on account of the variable nature of their colour; the black and the brown kinds are, however pretty well known: the black, in particular, is very destructive in kitchen-gardens, and commits great havoc in fields of cabbages and turnips.

In one or two species, the buckler, or smooth space near the head, contains a very small oval shell.

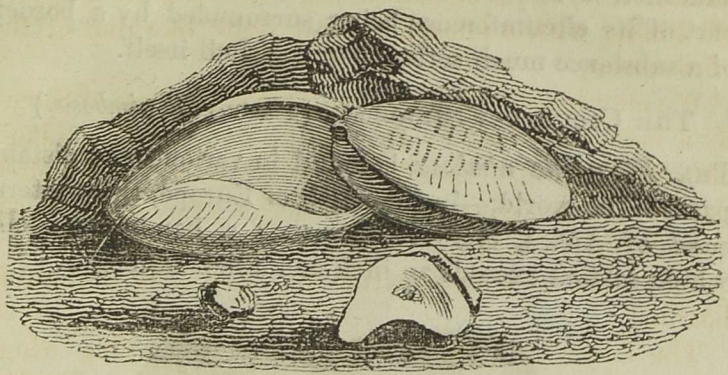
There is a very singular species of Slug found in Teneriffe, under stones in moist places; it is not more than an inch and a quarter in length; it is called *Limax noctiluca*, the night shining Slug. The buckler, in this

species, is very narrow, and covered with pores, which exude a kind of viscous substance, which has the property of shining with a phosphorescent light, like that of the glow-worm.

We may have some idea of the rapid increase of Slugs, by a fact mentioned by Dr. Leech, that two individuals of a small species have laid as many as seven hundred and sixty-six eggs; and these eggs were dried in an oven without destroying their vital powers, since, on being placed in a damp situation, they were afterwards hatched.

The following plan of taking and destroying Slugs was resorted to by a gentleman near Ipswich. Having heard that turnips were employed to entice Slugs from wheat, he caused a sufficient quantity to dress eight acres to be got together, and then, the tops being divided and the apples sliced, he directed the pieces to be laid separately, dressing two rows with them, and omitting two, alternately, till the whole field of eight acres was gone over. On the following morning, he employed two women to examine the tops and slices, and free them from the Slugs, which they threw into a measure; and when cleared, they were laid on those rows that had been omitted the day before. It was observed invariably, that in the rows dressed with the turnips no Slugs were to be found upon the wheat, or crawling upon the land, though they abounded upon the turnips; while, on the undressed rows, they were to be seen in great numbers, both on the wheat and on the ground. The quantity of Slugs thus collected was nearly a bushel.

THE WOODLIKE BULLA, (*Bulla lignaria.*)



Bulla Lignaria.

THE animal of the *Bulla* is singular, from possessing within its stomach three pieces of a substance resembling bone; these give that organ the power of crushing or grinding the food, forming a kind of gizzard. The bony portion of this stomach is represented in the foreground in the engraving. The Bulla lignaria is about two inches and a half in length, and is found in the European seas; Lamarck mentions as many as eleven species.

THE NAIL SHAPED CREPIDULA,
(*Crepidula unguiformis.*)

THE genus *Crepidula* takes its name from its bearing some resemblance to a little shoe; none of the species are found in Europe. Of these there are about six, but they are all confined to the seas of warm climates.

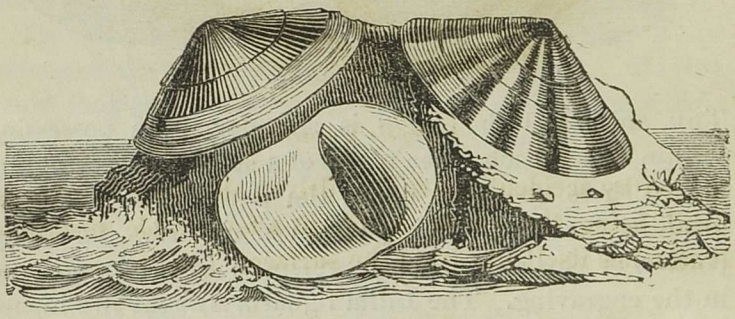
THE MEDITERRANEAN UMBRELLA,
(*Umbrella Mediterranea.*)

THE *Umbrella Mediterranea*, as its name implies, is

found in the Mediterranean, and in the Gulf of Tarento. The shell of the Umbrella is singular, from the lower part of its circumference being surrounded by a border of a substance much softer than the shell itself.

The Clouded Fissurella, (*Fissurella nimbosa.*)

The *Fissurella nimbosa* is found in various and distant parts of the world,—in the north of Europe, the western coast of Africa, &c. It is rather a handsome shell, which seldom exceeds an inch and a half in length.



Umbrella Mediterranea. *Crepidula unguiformia.* *Fissurella nimbosa.*

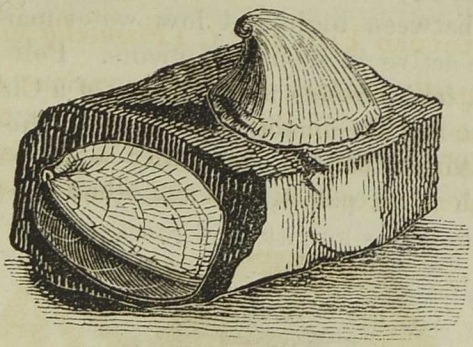
The Fissurella very much resembles our limpet, but differs from it by having a small, rather oval-formed hole in the summit of the shell, affording a passage to a small canal through which the water is discharged, after having passed over the branchiæ.

The Hungarian Bonnet Shell.

(*Pileopsis Ungarica.*)

The *Pileopsis Ungarica* is extremely elegant both in its form and markings; it is of a delicate white, slightly

tinged, internally, with rose-colour. The animal attaches itself to rocks, between high and low-water mark, and very rarely, if ever, changes its situation, unless re-



Pileopsis Ungarica.

moved by accident, when it is driven about by the waves, until, being thrown on a rock in a favourable situation, it attaches itself firmly to the surface.

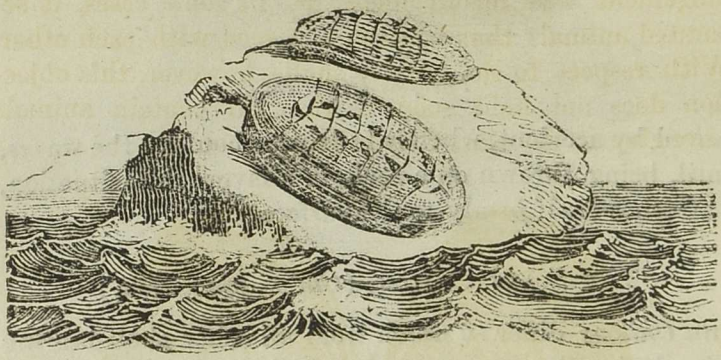
The Scaly Chiton, (*Chiton squamosus.*)

The *Chitons* differ so much from all other shell-bearing animals in the arrangement of their shelly covering, that they have been placed by different naturalists in various parts of their system. Lamarck, in referring to these animals, has placed them near the end of the Mollusca.

"Although," says Lamarck, "when we examine this creature, and observe the several pieces of which its shell is composed, attached to the marginal membrane of the mantle which surrounds them, it appears not a univalve, but a multivalve shell; yet these shelly pieces ought not to be regarded in any other light than as a lengthened

shell of one piece, which Nature had originally broken transversely into several distinct moveable pieces, to give greater freedom to the animal in its movements."

The Chitons, like the neighbouring genera, frequent the rocks between high and low water mark, but are much more active in their movements. Poli a learned Neapolitan, in describing the anatomy of a Chiton, says, that the interior of the mouth or throat of this animal is covered with a multitude of teeth,—some simple, and others with three points, and that these teeth are disposed in numerous longitudinal rows.



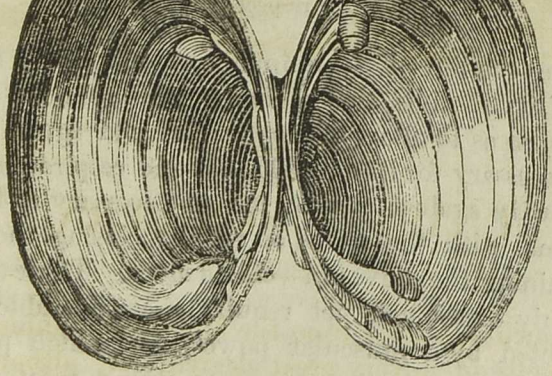
Chiton squamosus.

CLASS CONCHIFERA

The Conchifera differ from the Molluscous animals that bear shells in a very great degree; for, although the substance of the body is soft, unlike the Mollusca, it is inarticulate, and always enclosed in a shell of two valves,

without head or eyes,—a mouth, if it may be so called, concealed from view, and without any hard parts, and the whole body enveloped in a large mantle, or hood, formed of two thin lobes, generally perfectly free, but at times united in front: these are the principal distinguishing characters of this class.

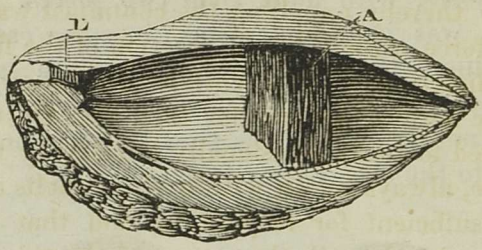
In earlier systems, when shells were classed without much reference to the animals that inhabited them, the only distinction made was the number of pieces of which the shell was formed, and they were arranged under the heads of *univalves*, of one piece, *bivalves*, with two pieces, and *multivalves*, with more than two pieces. This arrangement was inconvenient, as, in some cases, it separated animals that otherwise agreed with each other. With respect to the bivalve shells, however, this objection does not hold good, as they all contain animals belonging to the class Conchifera.



Valves of the *Unio Batava*, with the Connecting Ligament.

The individuals of this class appear to be deprived of all the senses except that of feeling. Their powers of motion have been so well described by Dr. Roget, in his *Bridgewater Treatise*, that we cannot do better than extract a portion from that interesting work.

The two valves of the shell of the Conchifera are united at the back by a hinge-joint, often very artificially constructed, having teeth that lock into each other ; and the mechanism of this articulation varies much in different species. The hinge is secured by a substance of great strength.



Section of an Oyster, showing the situation of the Hinge, L., the Adductor Muscle, A, and the transverse direction of its Fibres, with respect to the Valves.

During the life of the animal, the usual and natural state of its shell is, that of being kept open for a little distance, so as to allow of the ingress and egress of the water necessary for its nourishment and respiration; but, as a security against danger, it was necessary to furnish the animal with the means of rapidly closing the shell, and retaining the valves in a closed state. These actions, being only occasional, yet requiring considerable force, are effected by a muscular power, for which purpose sometimes one, sometimes two, or even a greater number of strong muscles are placed between the valves,

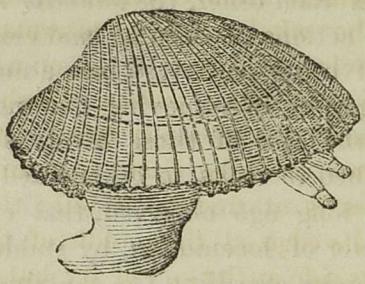
their fibres passing directly across from the inner surface of the one to that of the other, and firmly attached to both. They are named, from their office of bringing the valves towards each other, the *adductor muscles*.

The simple actions of opening and closing the valves are capable of being converted into a means of retreating from danger, or of removing to a more commodious situation, in the case of those bivalves which are not actually attached to rocks, or other fixed bodies.

Diquemarc long ago observed, that even the Oyster has some power of locomotion, by suddenly closing its shell, and thereby expelling the contained water with a degree of force, which, by the reaction of the fluid in the opposite direction, gives a sensible impulse to the heavy mass. He notices the singular fact, that Oysters which are attached to rocks occasionally left dry by the retreat of the tide, always retain within their shells a quantity of water sufficient for respiration, and that they keep the valves closed until the return of the tide; whereas those Oysters which are taken from greater depths, where the water never leaves them, and are afterwards removed to situations where they are exposed to these vicissitudes, of which they have had no previous experience, improvidently open their shells after the sea has left them; and, by allowing the water to escape, soon perish.

Many bivalve Mollusca are provided with an instrument shaped like a leg and foot, which they employ extensively for progressive motion. In the *Cardium*, or cockle, this organ is composed of a mass of muscular fibres, interwoven together in a very complex manner and which may be compared to the muscular structure of the human tongue: the effect in both is the same,

namely, the conferring a power of motion in all possible ways: thus it may be readily protruded, retracted, or inflected at every point.



The Cardium, or Cockle.

The *Solen*, or razor-shell fish, has a foot of a cylindrical shape, tapering at the end, and much more resembling in its form a tongue than a foot. In some bivalves the dilatation of the foot is effected by a curious hydraulic mechanism: the interior of the organ is formed of a spongy texture, capable of receiving a considerable quantity of water, which the animal has the power of injecting into it, and of thus increasing its dimensions.

The foot of the *Mytilus edulis*, or common mussel, can be advanced to the distance of two inches from the shell, and applied to any fixed body within that range. By attaching the point to such body, and retracting the foot, this animal drags its shell towards it, and by repeating the operation successively on other points of the fixed object, continues slowly to advance.

This instrument is of great use to such shell-fish as conceal themselves in the mud or sand, which its structure is then peculiarly adapted for scooping out. The cockle continually employs its foot for this purpose; first elongating it, directing its point downwards, and

insinuating it deep into the sand, and next turning up the end, and forming it into a hook, by which, from the resistance of the sand, it is fixed in its position, and then the muscles, which usually retract it, are thrown into action, and the whole shell is alternately raised and depressed, moving on the foot, as on a fulcrum. The effect of these exertions is to drag the shell downwards. When the animal is moderately active, these movements are repeated two or three times in a minute. The apparent progress is at first but small; the shell, which was raised on its edge at the middle of the stroke, falling back on its side at the end of it; but when the shell is buried so far as to be supported on its edge, it advances more rapidly, sinking visibly at every stroke, till nothing but the extremity of the tube can be perceived above the sand.

By a process exactly the inverse of this, that is, by doubling up the foot, and pushing with it downwards against the sand below, the shell may be again made to rise by the same kind of efforts which before protruded the foot. By this process of burrowing, the animal is enabled quickly to retreat when danger presses, and when this is past, it can, with equal facility, emerge from its hiding-place.

The *Cardium* can also advance at the bottom of the sea, along the surface of the soft earth, pressing backwards with its foot, as a boatman impels his boat onwards by pushing with his pole against the ground in a contrary direction. It is, likewise, by a similar expedient that the Solen forces its way through the sand, expanding the end of its foot into the form of a club.

The *Tellina* is remarkable for the quickness and agility with which it can spring to considerable distances,

by first folding the foot into a small compass, and then suddenly extending it, while the shell is, at the same time, closed with a loud snap.

The *Pinna*, or marine mussel, when inhabiting the shores of tempestuous seas, is furnished, in addition, with a singular apparatus for withstanding the fury of the surge, and securing itself from dangerous collisions, which might easily destroy the brittle texture of its shell. The object of this apparatus is, to prepare a great number of threads, which are fastened at various points to the adjacent rocks, and then tightly drawn by the animal, just as a ship is moored in a convenient station, to avoid the buffeting of the storm. The foot of this bivalve is cylindrical, and has, connected with its base, a round tendon, of nearly the same length as itself, the office of which is to retain all the threads in firm adhesion with it, and concentrate their power on one point. The threads themselves are composed of a glutinous matter, prepared by a particular organ. They are not spun by being drawn out of the body, like the threads of the silk-worm, or of the spider, but they are cast in a mould, where they harden, and acquire a certain consistence before they are employed. This mould is curiously constructed: there is a deep groove which passes along the foot, from the root of the tendon to its other extremity, and the sides of this groove are formed so as to fold and close over it, thereby converting it into a canal. The glutinous secretion, which is poured into this canal, dries into a solid thread; and, when it has acquired sufficient tenacity, the foot is protruded, and the thread it contains is applied to the object to which it is to be fixed, its extremity being carefully attached to the solid surface of that object. The canal of the foot is then

opened along its whole length, and the thread, which adheres by its other extremity to the large tendon at the base of the foot, is disengaged from the canal. Lastly, the foot is retracted, and the same operation is repeated.

Thread after thread is thus formed, and applied in different directions around the shell. Sometimes the attempt fails, in consequence of some imperfection in the thread; but the animal, as if aware of the importance of ascertaining the strength of each thread, on which its safety depends, tries every one of them as soon as it has been fixed, by swinging itself round, so as to put it fully on the stretch; an action which probably also assists in elongating the thread. When once the threads have been fixed, the animal does not appear to have the power of cutting or breaking them off. The liquid matter, out of which they are formed, is so exceedingly glutinous as to attach itself firmly to the smoothest bodies. It is but slowly produced, for it appears that no Pinna is capable of forming more than four, or at most five threads, in the course of a day and night. The threads which are formed in haste, when the animal is disturbed in its operations, are more slender than those which are constructed at its leisure. In Sicily, and other parts of the Mediterranean, these threads have been manufactured into gloves, and other articles, which resemble silk.

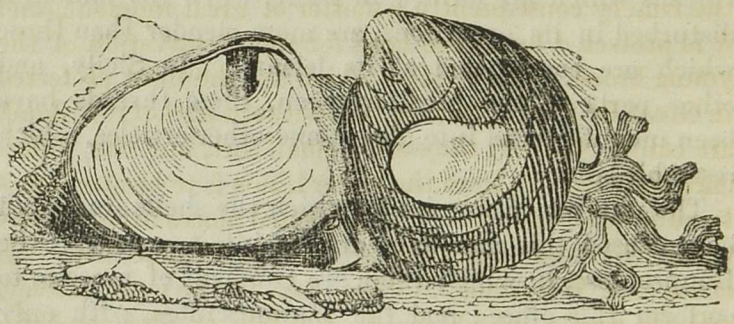
The number of muscles by which the shells are moved have caused this class to be divided into two orders: the Bimusculosa, in which there are two pair of muscles to perform this office; and the Unimusculosa, with only one pair.

ORDER UNIMUSCULOSA.

The Conchiferous animals which possess but one pair of muscles, are much more limited in number than those with two or more; but they contain in their ranks several well-known and useful species, as, for instances the oyster, the mussel, and the animal which produces the oriental pearl.

The Horse-Foot Bowl-Shell,
(*Anomia ephippium.*)

The shells of the Anomiæ are exceedingly irregular in their form: like the oysters, they remain during the whole of their existence attached to one spot, either on a rock, or on the shell of some larger inhabitant of the deep. These shells are more frequently found in the same places as the oyster, and very commonly attached to the shell of the latter; as an article of food, the Anomia is of little or no value. Its organization and manner



Anomia ephippium, [*Anomia,* a little bowl; *ephippium,* a horse's foot.]

of living are much the same as those of the oyster. The most singular part of its construction consists in

the use made of one of the muscles with which it is furnished, which, instead of being attached to the shell, is fixed to a solid piece of shelly substance, in the form of a cone with the top cut off; this *operculum*, or lid, closes a singular opening in one of the valves of the shell itself. The animal adheres to the rock, or other substance, by means of this lid, and is detached with great difficulty.

The Oyster, (*Ostrea edulis.*)

The common Oyster (*Ostrea edulis*) is well known to all, and is found, as far as our knowledge extends, on the sea coasts in every part of the globe; it was known to the Romans, who prized it so highly, that vessels were fitted out to procure it from distant countries; they even sent as far as Britain for this delicacy, considering the British Oyster better than those of the Mediterranean, and accordingly these luxurious people paid enormous prices for the produce of our coasts. At present the consumption of Oysters is very extensive, and the fishery consequently a matter of great moment, and it is protected by severe laws for the preservation of the young brood. The Oysters which are the most preferred in Great Britain, at least in the southern part of the island, are called Natives; they are a small sort, but the difference they exhibit from the larger kinds is to be attributed to cultivation and age. The principal places from whence these Oysters are procured, are the river Colne, near Colchester, at Wivenhoe, Malden, &c., in the river Mersey, and the Swale, which divides the Isle of Sheppey from the rest of Kent, at Milton, Faversham, Queenborough, &c. Although these Oysters are called Natives, they are chiefly the produce of the French banks on the coast

of Normandy, from which the spawn, or spat, is fetched, and laid down on the oyster-beds at the different fishing banks; the few that absolutely spawn in these rivers belong to the Colchester river.

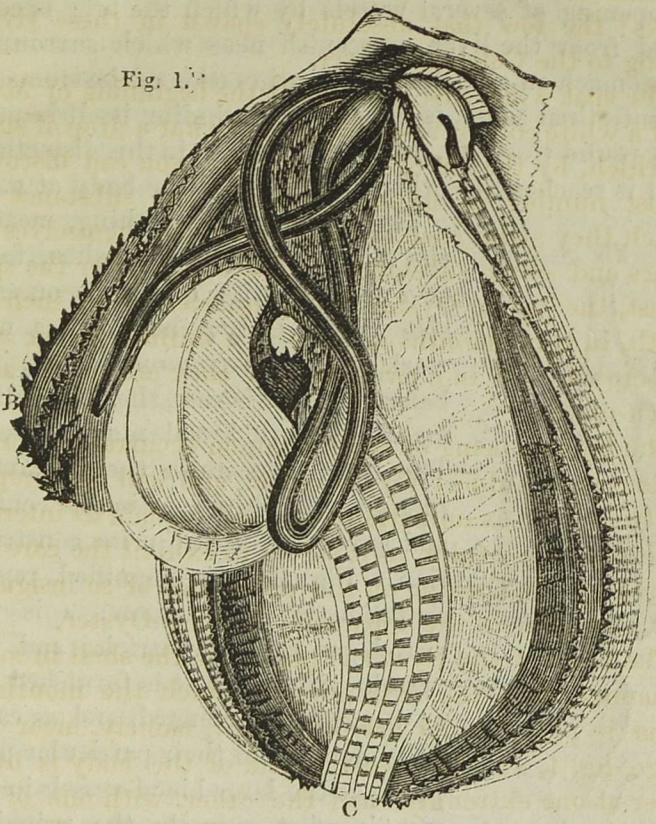
The spat when first cast, about the beginning of May, is of a white colour, resembling somewhat a drop of suet, in which, by the aid of a microscope, you can discover a vast number of minute Oysters: the substance in which they swim enables them to attach themselves to stones and other substances. Three days after the spat is cast, the young Oysters are a quarter of an inch in width, in three months as large as a shilling, in six as a half-crown, and in a twelvemonth they are as big as a crown-piece.

The Oyster, being of such common occurrence, forms an excellent subject for dissection, and will well repay the trouble of examination; we shall explain its internal structure rather fully, as it serves to exhibit the care bestowed by the Creator on the necessities of so insignificant a creature as the apparently helpless Oyster.

The body of the Oyster is placed in the shell in such a manner, that the extremity at which the mouth is found is placed in its narrowest part, namely, near the hinge, fig. 1, A. The general form of the body is oval, wider at one extremity than the other, with one of its sides considerably flattened. In referring to fig. 1, it is to be noticed, that part of the body has been cut away to show the internal structure; the double mantle, by which the principal parts are invested, is free in the whole of its circumference, with the exception of a part of its margin near to the mouth on the straight side, where its two lobes are united for a short distance, forming a kind of hood to the head; the mantle, of which we

have been speaking, has a double row of fringes on each of its lobes, those on the outer lobe being the shortest.

Fig. 1.

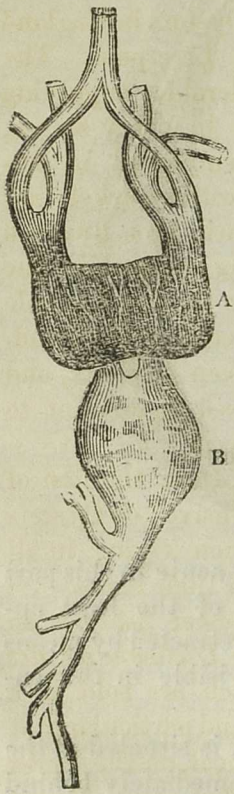


The sense of feeling appears to be very acute in this part of its structure, warning the creature of the least approach of danger; these fringes can be retracted by means of a series of extremely fine muscles, visible in the engraving.

The mouth, as we have already seen, is situated at the narrow extremity of the shell, and immediately behind

its opening it is dilated into a kind of bag: this answers the purpose of a stomach, and if cut open will exhibit the opening of several vessels by which the bile is conveyed from the liver, a greenish mass which surrounds the stomach on all sides; the continuation of the stomach, the intestinal canal, is clearly seen winding itself beautifully round the liver, which is removed in this dissection, until it reaches the other extremity of the body at B.

Fig. 2.



The organs of breathing, nearly the same as the gills in fishes, form two double series of vessels on each side of the body; they form a network of vessels C, among which, just before the spat is cast, the preparation for the future brood may be seen. The heart appears in the engraving like a small white spot in the centre, and is very beautiful in its construction. Fig. 2 is a magnified representation of this organ: A is the auricle, and B the ventricle, and the vessels with which it is furnished are as beautifully arranged, and as carefully devoted to their particular purposes, as the large blood-vessels in the most perfect animal; the principal branches are three, one leading to the mouth and the feelers, the second to the liver and stomach, and the third to the hinder part of the body.

The Oyster, as we have already said, is found in the seas of most countries; but it appears to be never

met with at any great depth, or at a distance from the mouth of some large river. It is never found so high up the river as to live constantly in fresh water, though often so far distant from the sea as to be uncovered at low water. No solid substances have been found in the stomach of the Oysters, and they are supposed to exist on very minute soft-bodied animals, or on animal substances dissolved in the surrounding water.

Most of the Oysters fattened at Colchester are brought from the little creeks between Southampton and Chichester; according to Macculloch, the best Oysters in England are found at Purfleet, and the worst at Liverpool. The Oyster fishery at Poole is very considerable, supplying the London Market for two months in every season, about forty sloops and boats being employed in this traffic. The Bristol, Bath, and Gloucester markets are supplied chiefly from the Welsh coast, two hundred fishermen and five or six sloops being engaged in the fishery. It is calculated that about ten thousand people are employed in this fishery along the coast of England.

The quantity of Oysters bred and taken in Essex, and consumed chiefly in London, is supposed to amount to fourteen or fifteen thousand bushels a year.

The fishing for Oysters is permitted from the first of September to the last day of April inclusive; or Oysters are in season, according to the common saying, in all those months which have the letter *r* in their name.

The following description of the Oyster fisheries in France is abridged from a paper in the *Dictionnaire des Sciences Naturelles*. The Oysters which are sold in a great portion of the North of Europe, and particularly at Paris, are brought from the Bay of Cançal, on the shores of the Channel, between the town of that name, Mount

St. Michael and St. Malo. The bottom of this bay is level, firm, and unbroken, and there is no current or water within it. The fishery begins usually at the end of September, and finishes in April; during all the rest of the year it is prohibited, partly for fear of destroying the young fish, and partly because the Oyster is supposed to be unfit for food during that time. The Oysters are taken, as with us, by means of a drag-net. The Oysters thus taken are disembarked at the ports of Granville and Cançal, from whence they are carried to different places where fattening grounds are established. These preserves are not only of service in keeping the Oysters, but they also improve the flavour and appearance of the fish. The places for feeding the Oysters are generally placed between high and low water mark, though not always; they are excavations, generally of an oblong form, sometimes made in the solid stone, at others dug out of the sand, and covered at the bottom with large stones and coarse sand, and not above a couple of feet in depth ; they are all provided with a kind of trap door, which is opened when the tide is out, and allows the water to escape, and the reservoirs are again filled at the return of the tide: great care is taken to prevent any mud being introduced among the Oysters, and they are frequently looked over for the purpose of removing such as have died. At Courseul, Havre, Dieppe, and some other places, the tanks are so constructed that the admission of the tide can be prevented, and the Oysters are supposed to be more tender and delicate than those which have felt the daily effects of the sea-water.

They have a method in France of causing the Oysters to assume a green colour, and Oysters of this kind appear to be favourites with the epicure. To effect this change

in colour, they choose a small receptacle into which they admit the sea-water, and let it remain a sufficient time to allow the stones with which it is paved to become green. When this takes place the Oysters are placed within it. This is done with greater care than usual, and much fewer Oysters can find room, as they must not be laid on each other. Sometimes, in about three days, the Oysters begin to turn green, but it takes a month to bring them to a deep colour; rainy weather is unfavourable to this change. These Oysters fetch a much higher price in the market than the others, and the inhabitants suppose they are fed on very scarce and high-priced herbs.

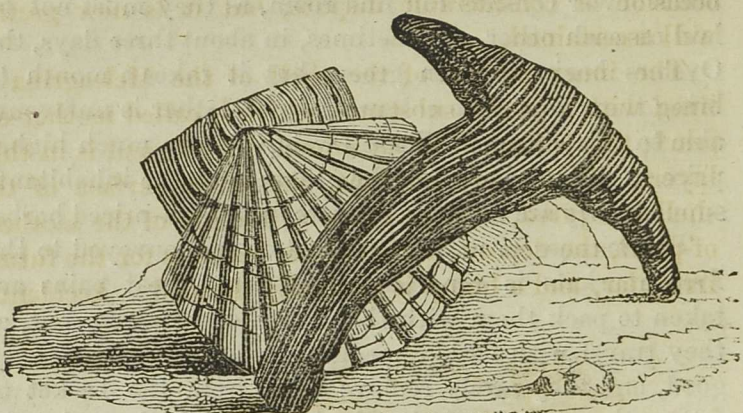
The manner in which the Oysters are conveyed to the Paris markets is generally in baskets; great pains are taken to pack them with the mouth downwards, but, as they travel with little expedition, they are seldom very good, and they rarely remove them from the basket to fatten them as we do in England. Sometimes in the Winter season they are brought to Paris in boat-loads, and they are then much more reasonable in price; these are brought from St. Just by the river Somme.

The Great Comb Shell, (*Pecten maximus.*)

This shell, although it has the name of the Great Pecten, is not the largest of the numerous tribes to which it belongs; it is found in all the European seas. The regular nature of the fluting with which it is covered, and the elegance of its markings, have brought it much into use among ladies, who employ it in making pincushions and other articles of fancy-work; there are about sixteen recent and thirty fossil species.

The power of locomotion appears to be very considerable in some species of the Pectens; it is said the

animal can raise itself up in the water, and even reach the surface, by moving the two valves of its shell; but this is a fact not quite established, as but little is known of its habits. It is sometimes used as an article of food; but to render it tolerably palatable it requires cooking.



Pecten maximus. *Malleus albus.*

In some countries, the shells of the larger species are used by the poorer classes instead of plates. In Paris, the *restaurateurs* employ them for the same purpose when serving up a certain preparation of mushrooms; in England, they are employed in cooking scalloped oysters, and the shell is consequently known as the Scallop Shell.

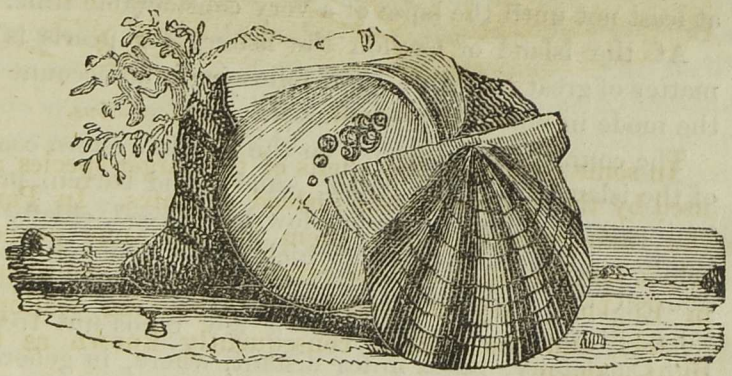
THE PEARL OYSTER, (*Meleagrina margaritifera.*)

THE animal of this shell, although popularly called an oyster, is very different in structure, bearing greater resemblance, in some parts of its formation, to the mussel, particularly in possessing a *byssus*, or beard; it is the shell in which the famous oriental pearls are found.

There are but two known species of the Meleagrina, which are chiefly found in the Persian Gulf, and at Ceylon, or in some of the seas of Australasia.

The cause of the formation of pearl, in the shells of this and other inhabitants of the water, has been the occasion of considerable dispute, but it is now pretty well ascertained.

The inner portion of the shell of the Meleagrina is lined with a pearly substance, which is called mother-of-pearl; this is formed by an animal deposit, and is in thin layers. If, by any accident, the inner surface of the shell is injured, so as to cause a fracture of the mother-of-pearl, the deposit, in that place, becomes for the future irregular, and a bump is gradually formed. Accidental



Meleagrina margaritifera.

circumstances cause this bump to assume various shapes: sometimes it is oval, sometimes globular, and at others pear-shaped. This kind of pearl is always originally found attached to the shell by means of a small neck, or foot-stalk, and the spot at which this neck was placed can always be traced on the pearl itself.

But pearls are at times found loose in the shell;—in this case, the pearly matter is deposited on some extraneous substance, such, for instance, as a grain of sand, and, by dissolving the pearl in an acid, this nucleus can be traced.

Some of these round pearls are supposed to be formed on a centre, consisting of the remains of a diseased *ovum*, or egg, of the animal.

Every schoolboy knows the story of Cleopatra having dissolved a valuable pearl in vinegar, and afterwards drunk it off, to show her ridiculous disregard of expense. But the account may reasonably be doubted; for had the acid been strong enough to dissolve the pearl, it would have been impossible to drink it, and if it was weak enough to drink, it would not have dissolved the pearl, at least not until the lapse of a very considerable time.

At the island of Ceylon the fishery for pearls is a matter of great moment. The following is an account of the mode in which it is conducted.

The country round Aripo, on the north-western coast of the island of Ceylon, is flat, sandy, and barren, presenting nothing to the eye but low brushwood, chiefly of thorns and prickly pears (which are the plants that nourish the cochineal insect*), and here and there some straggling villages with a few cocoa-nut trees. But Condatchy, three miles distant, where, in general, nothing is to be seen but a few miserable huts, and a sandy desert, becomes, during the period of the pearl-fishery, a populous town, several streets of which extend upwards of a mile in length, (though, as the houses are only intended as a shelter from the sun and rain, they

* The insect from which our most beautiful scarlet dyes are prepared.

are very rudely constructed,) and the scene, altogether, resembles a crowded fair on the grandest scale. The people most active in erecting huts, and speculating in the various branches of merchandise, are Mohammedans, Cingalese (natives of Ceylon), and Hindoos from the opposite coast of the continent of India. Apparently, however, from their natural timidity, none of the Cingalese are divers, and scarcely any of them engage in the other active parts of the fishery: they merely resort hither for the purpose of supplying the markets.

About the end of October, in the year preceding a pearl-fishery, when a short interval of fine weather prevails, an examination of the banks takes place. A certain number of boats, under an English superintendent, repair in a body to each bank, and having, by frequent diving, ascertained its situation, they take from one to two thousand oysters as a specimen. The shell are opened, and, if the pearls collected from a thousand oysters be worth three pounds sterling, a good fishery may be expected. The "banks," or beds of oysters, are scattered over a space in the Gulf of Manaar, extending thirty miles from north to south, and twenty-four from east to west. There are fourteen beds (not all, however productive), of which the largest is ten miles long, and two broad. The depth of water is from three to fifteen fathoms.

The pearl-oysters in these banks are all of one species, and of the same form: in shape not very unlike our common English oyster, but considerably larger, being from eight to ten inches in circumference. The body of the animal is white, fleshy, and glutinous; the inside of the shell (the real "mother-of-pearl,") is even brighter and more beautiful than the pearl itself: the outside

smooth and dark-coloured. The pearls are most commonly contained in the thickest and most fleshy part of the oyster. A single oyster will frequently contain several pearls, and one is on record as having produced one hundred and fifty.

Sometimes the English government of Ceylon fishes the banks entirely at its own risk; sometimes, the boats are let to many speculators; but, most frequently, the right of fishing is sold to one individual, who sub-lets boats to others. The fishery for the season of the year 1804 was let by government to an individual for no less a sum than 120,000*l.*

At the beginning of March, the business commenced, and upwards of two hundred and fifty boats were employed in the fishery alone. These, with their crews and divers, and completely equipped with everything necessary to conduct the business of the fishing, come from different parts of the coast of Coromandel. After going through various ablutions and incantations, and other superstitious ceremonies, the occupants of these boats embark at midnight, guided by pilots, and as soon as they reach the banks, they cast anchor, and wait the dawn of day.

At about seven in the morning, when the rays of the sun begin to emit some degree of warmth, the diving commences. A kind of open scaffolding, formed of oars, and other pieces of wood, is projected from each side of the boat, and from it the diving-tackle is suspended, with three stones on one side, and two on the other. The diving-stone hangs from an oar by a light rope and slip-knot, and descends about five feet into the water. It is a stone of fifty-six pound's weight, of a sugar-loaf shape. The rope passes through a hole in the

top of the stone, above which a strong loop is formed, resembling a stirrup-iron, to receive the foot of the diver. The diver wears no clothes, except a slip of calico round his loins,—swimming in the water, he takes hold of the rope, and puts one foot into the loop or stirrup, on the top of the stone.

He remains in this upright position for a little while, supporting himself by the motion of one arm. Then a basket, formed of a wooden hoop and net-work, suspended by a rope is thrown into the water to him, and in it he places his other foot. Both the ropes of the stone and the basket he holds for a little while in one hand. When he feels himself properly prepared, and ready to go down, he grasps his nostrils with one hand, to prevent the water from rushing in, with the other gives a sudden pull to the running-knot suspending the stone, and instantly descends; the remainder of the rope fixed to the basket is thrown into the water after him, at the same moment; the rope attached to the stone is in such a position as to follow him of itself. As soon as he touches the bottom, he disentangles his foot from the stone, which is immediately drawn up, and suspended again to the projecting oar in the same manner as before, to be in readiness for the next diver. The diver, arrived at the bottom of the sea, throws himself as much as possible upon his face, and collects everything he can get hold of into the basket. When he is ready to ascend, he gives a jerk to the rope, and the persons in the boat, who hold the other end of it, haul it up as speedily as possible. The diver, at the same time, free of every incumbrance, warps up by the rope, and always gets above water a considerable time before the basket. He generally comes up at a distance from the boat, and swims about,

or takes hold of an oar or a rope, until his turn comes to descend again; but he seldom comes into the boat until the labour of the day is over. When a young diver is training to the business, he descends in the arms of a man completely experienced in the art, who takes great care of him, and shows him the manner of proceeding, and the pupil at first brings up in his hand a single oyster, a stone, or a little sand, merely to show that he has reached the bottom. The length of time during which the divers remain under water is rarely much more than a minute and a half; yet, in this short period, in a ground richly clothed with oysters, an expert man will often put as many as one hundred and fifty into his basket. There are two divers attached to each stone, so that they go down alternately. The men, after diving, generally find a small quantity of blood issue from their nose and ears, which they consider as a favourable symptom, and perform the operation with greater comfort after the bleeding has commenced. They seem to enjoy the labour as a pleasant pastime, and never murmur or complain, unless when the banks contain a scarcity of oysters, though their labours are continued for six hours.

When the day is sufficiently advanced, the head pilot makes a signal, and the fleet set sail for the shore. All descriptions of people hasten to the water's edge to welcome their return, and the crowd, stir, and noise, are then immense. Every boat comes to its own station, and the oysters are carried into certain paved enclosures on the sea-shore, where they are allowed to remain in heaps (of course, well-guarded) for ten days, that time being necessary to render them putrid. When the oysters are sufficiently decayed, they are thrown into a

large vessel, filled with salt water, and left there for twelve hours, to soften their putrid substance. The oysters are then taken up, one by one, the shells broken from one another, and washed in the water. Those shells, which have pearls adhering to them, are thrown on one side, and afterwards handed to clippers, whose business it is to disengage the pearls from the shells with pincers.

When all the shells are thrown out, the slimy substance of the oysters remains, mixed with sand and broken fragments of shells, at the bottom of the vessel. The dirty water is lifted out in buckets, and poured into a sack, made like a jelly-bag, so that no pearls can be lost. Fresh water being then added from time to time, and the whole substance in the vessel continually agitated, the sand and pearls together are, by degrees, allowed to sink to the bottom.

As soon as the sand is dry it is sifted; the large pearls, being conspicuous, are easily gathered; but the separating the small and diminutive ("seed pearls," as they are called,) is a work of considerable labour. When once separated from the sand, washed with salt water, dried, and rendered perfectly clean, they are sorted into classes, according to their sizes, by being passed through sieves. After this, a hole is drilled through each pearl; they are then arranged on strings and are fit for the market.

Pearls have been considered as valuable ornaments from the earliest times: they are mentioned in the book of Job (xxviii. 18), and are often alluded to by the classical writers.

There have been various attempts to imitate them successfully; one of the most singular of which,—known to have been practised early in the Christian era, on the

banks of the Red Sea,—is still carried on in China. A hole is bored in the shell of the pearl-oyster, a piece of iron-wire inserted, and the oyster restored to its place; the animal, wounded by the point of the wire, deposits a coat of pearly matter round it: this gradually hardens, successive layers are added, till a pearl of the requisite size is formed, and the shell is once more brought to land.

A plan, somewhat similar to this, was employed by Linnæus, who pierced the shells of the fresh-water mussel, causing thereby a pearl to be formed at the punctured spot; and the Swedish government actually established artificial pearleries,—but these were abandoned after a few years; for, although pearls were formed, they were seldom of sufficient size to be of much value.

False pearls are made of hollow glass globules, the inside of which is covered with a liquid, called pearl-essence, and then filled with white-wax. This liquid is composed of the silver coloured particles which adhere to the scales of the bleak, (*ablette,*) and was first applied to this purpose, early in the last century, by a Frenchman of the name of Jacquin*.

The Hammer Oyster, (*Malleus albus.*)

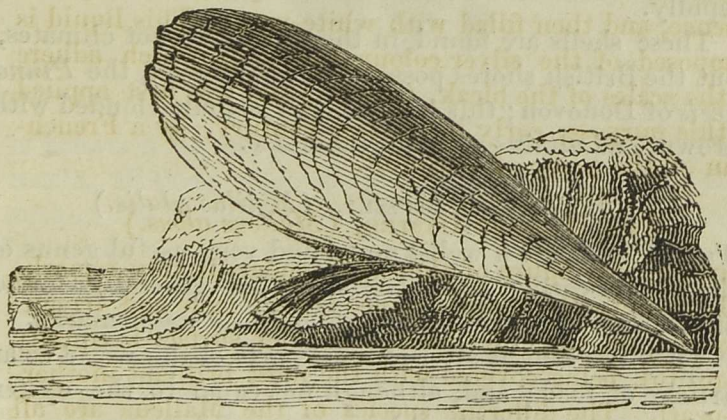
The singular figure of this shell renders it very remarkable; externally its appearance is very rude and irregular, but, on the other hand, the inner surface is equally beautiful, being covered with the most brilliant mother-of-pearl. The different species of the Malleus are all marine, and found in the seas of hot climates, and the rarity of some causes them to be very valuable, and much sought after. Like the neighbouring genera, the

* See Book of Fishes, p. 51.

animal is furnished with a byssus, or beard, by which it adheres to the rocks.

The Rough Pinna, (*Pinna rudis.*)

The Pinna is a marine shell; most of the species are large, and the shells very thin in proportion to their size. That represented in the engraving is found in the American seas, and is sometimes as much as a foot and a half in length; it is by no means rare. There is a species found in the Mediterranean, in about five or six fathoms' water, which is much sought after by the inhabitants of Sicily and Calabria, not only as an article of food, but also for the sake of its beard, or byssus, of which, in many places, a kind of cloth is made, very remarkable for its softness and warmth. The fishermen, to obtain the Pinna, make use of a kind of iron rake,



Pinna rudis.

called a *crampe*, with teeth a foot in length; when the shells are drawn up, the beards are found to be torn in some part of their substance. If a sufficient length

remains attached to the animal, to render the fibres available for the purpose of spinning, they are cut off close to the shell; they are then dried and spun, and afterwards woven into gloves, stockings, caps, and even garments of much larger size.

The threads of which the byssus is formed are extremely fine, and of equal thickness throughout their whole length, very strong, and of a dark morone colour, which is exceedingly permanent.

This curious kind of cloth was long since known to the ancients; but at present its manufacture is very limited, from the great scarcity of the Pinna, and the number of beards necessary to make even so small an article as a pair of gloves. But it is supposed that, if the shells were placed in more favourable circumstances, in preserves, &c., they would increase much more rapidly.

These shells are found in the seas of all hot climates, but the British shores possess but one species, the *Pinna lævis* of Donovon; this is of a horny colour, clouded with brown, and attains a considerable size.

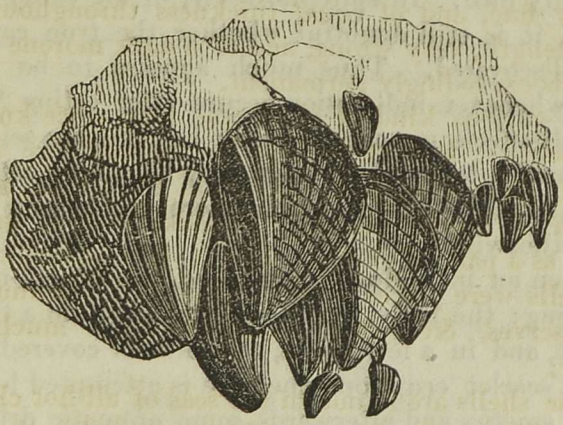
The Common Mussel, (*Mytilus edulis.*)

The Mussels are a well-known and very useful genus of the shell-bearing animals; they are generally found attached to rocks between high and low water marks.

They are sought after in most parts of the world as an article of food; and, although not equal to the oyster, make a very palatable dish.

The Mussel, although usually wholesome, is at times the cause of severe, though temporary, illness. Different reasons have been assigned for this poisonous property, and many signs have been noted, by which it is said the

unwholesome state of this shell-fish can be detected,—a yellowness of colour, an extremely meagre appearance, partial corruption, a diseased state of the animal, a small crab or insect found between the valves of its shell. Other observers have ridiculously attributed the effects to the change in the phases of the moon; but, if we are



Mytilus edulis.

to believe a French physician, who made many experiments, all these guesses are wrong. According to this author, the ill-effects are caused only after the Mussels have been feeding on the spawn of the star-fish; this spawn appears to the eye merely a shapeless lump of jelly, but after a few days it is a living mass of infant star-fish. The time of the year during which this spawn is cast, is from the end of April, or beginning of May, to the end of July, or beginning of August; from this, he says, arises the common observation, that Mussels are only poisonous during those months in which the letter *r* is not found. This spawn, according to our

author, is so venomous and caustic, that it causes great pain, swelling, and inflammation, even to the hand, if handled at this season; the rubbing the part with vinegar is recommended as a cure. Small star-fish were rolled up in other food, and given to dogs and cats, when the animals suffered severely, and, in the end, generally died. In spite, however, of all these experiments, it is still doubtful whether the true cause has been discovered. Thus much appears to be certain, that, whenever indigestion occurs after eating Mussels, some ill effects are experienced; but this has seldom, or very rarely, taken place when they have been eaten with vinegar; and they are much more wholesome cooked than otherwise.

When an individual is *musselled*, the effects are very alarming: the body, head, and face swell to a frightful extent, and in a few hours, the skin is covered with a bright scarlet eruption: the cure is attempted by means of an emetic, and afterwards some aromatic drink, and vinegar and water: this brings on a profuse perspiration, which soon relieves the patient.

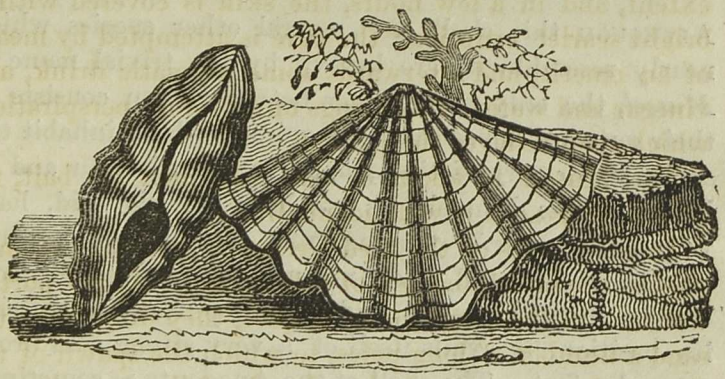
The Mussel is taken by our fishermen for bait, for which purpose it is well adapted.

In some parts of the Mediterranean great attention is paid to the multiplication of this animal. At the port of Tarento, in the kingdom of Naples, they drive into the sand a number of long poles, to which the spawn of the Mussel becomes attached. In the following August, when they have attained the size of almonds, they are taken to the mouths of the brooks and small streams which fall into the gulf: here they are left until October, when they are taken back to the sea, and in the following spring they are considered fit to eat. This change

from the salt to the fresh water, and back again, is said to improve their flavour and colour. Near Rochelle they are preserved in tanks, preserves in which the salt water remains at rest.

The Giant Tridacna, (*Tridacna gigas.*)

The *Tridacna gigas* is the largest of the bivalve shells: it is very thick and close in texture, and is said to have been found as much as five hundred pounds in weight. In Catholic countries the shells have been sometimes used as the receptacles for the holy water in the churches, and formerly they were considered sufficiently valuable to form a present to a king: those in St. Sulpice, at Paris, were given to Francis the First by the Republic of Venice. They have been found in India, as it is related, of so extreme a size, that more than one hundred persons have made a meal on the flesh of a single Tridacna



Tridacna gigas.

gigas, but this no doubt is an exaggeration. These shells adhere to the rocks by their short and strong byssus with so much tenacity as to require the assistance of a mallet and chisels, in the task of separating them from the rock.

ORDER BIMUSCULOSA, (*Shells with Two Pairs of Muscles.*)

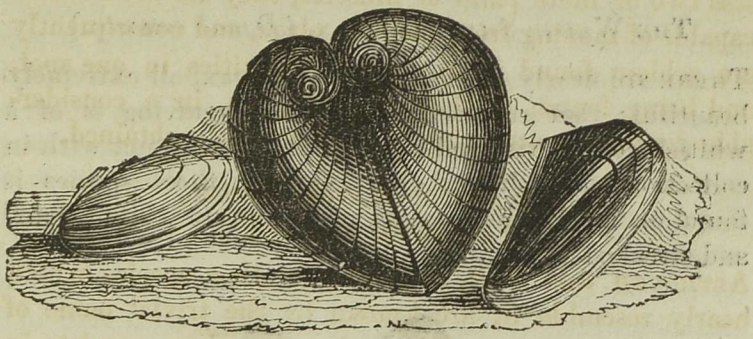
This Order contains by far the greatest portion of the bivalve shells, all interesting to the naturalist, from the variety and beauty of their structure, but few possessing a claim to notice on account of their use as food for mankind: not but that many are equally wholesome with those belonging to the last order; but, as they possess two or more pairs of muscles, they are much more capable of moving from place to place, and consequently are seldom found in any great quantities in one spot, and being found, as they generally are, in a considerable depth of water, they are not so easily obtained.

The Fresh-Water Mussel, (*Anodonta cygnæa.*)

Although this shell, and several other species which nearly resemble it, are known by the trivial name of *Mussel*, the only resemblance between them consists in their outward appearance, the animals which inhabit the shells being very distinct, both in organization and in habits. The Mussels, as we have already said, have very little power of moving from place to place, while on the other hand, the Anodonta is at times far from being a sluggish animal, and, for the purpose of shifting its position, it avails itself of a very strong and broad muscular foot. The shell of the Anodonta is sometimes found to contain pearls, a circumstance which frequently occurs in all shells that are lined with mother-of-pearl.

Some of the Scotch rivers have produced numerous specimens of pearl, very large and beautiful, and which used to bear an extremely high price.

A paper in the Philosophical Transactions for 1693 mentions the collection of pearls from this shell, in the river Omagh, County Tyrone, in Ireland. "The poor people," he says, "in the summer months, go into the water, and some with their toes, some with wooden tongs, and some by putting a sharpened stick into the opening of the shell, take them up; and although, by a common estimate, not above one shell in a hundred may have



Isocardia cor. *Anodonta cygnæa.*

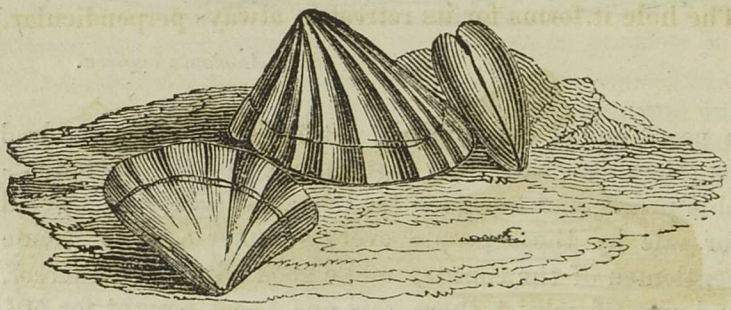
a pearl, and of these pearls not above one in a hundred be tolerably clear, yet a vast number of fair merchantable pearls, and too good for the apothecary, are offered for sale by those people every summer assizes. Some gentlemen of the country make good advantage thereof, and myself, whilst there, saw one pearl bought for 50*l.* that weighed thirty-six carats, and was valued at 40*l.* A miller took out a pearl, which he sold for 4*l.* 10*s.* to a man that sold it for 10*l.*, who sold it to the late Lady Glenanly for 30*l.*, with whom I saw it in a necklace: she refused 80*l.* for it from the late Duchess of Ormond."

The Heart-Shaped Isocardia, (*Isocardia cor.*)

This shell, which is very common in the Mediterranean, where it goes by the name of the *foolscap shell*, and the *bullock's heart shell*, is rare in the British seas, but it is sometimes found on the Irish coast: it is the largest British bivalve shell.

The Wedge-Shaped Donax, (*Donax cuneata.*)

There are nearly thirty species of Donax, all extremely beautiful: that represented in the engraving is of a whitish colour with red streaks: it is often met with in collections of Indian shells. One of these species is found on the English coasts, of a delicate white colour, and streaked with pink.

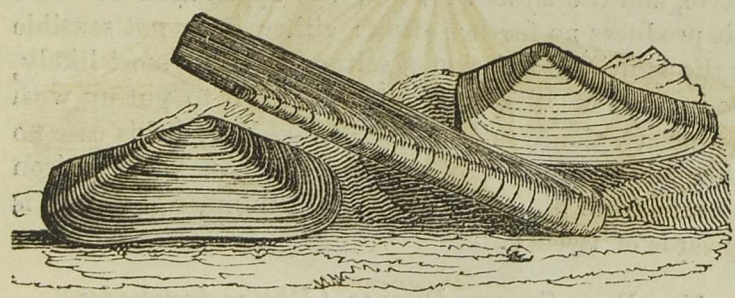


Donax cuneata.

In following the system of Lamarck, we are gradually led through various genera to two species figured on the next page, namely, the Tellina, or *earth-shell*, and the Pandora, and, ultimately, to the Solen, or *razor-shell*.

The Sheath Solen, (*Solen vagina.*)

The Solens are singular from the power they possess of burying themselves in the sands on the coast, sometimes even to the depth of a couple of feet. The foot of the Solen, by means of which it is able to penetrate the sand, is equal to one half of the length of the shell. Their movements are confined to rising to the surface of the sand, in which they have formed their hole, and in again sinking to the bottom. This movement is, no doubt, produced by the action of the foot, which forms itself into a sharp point in its descent, and when it remounts is enlarged as much as possible, to form a resting-point, for the purpose of raising the shell to the surface. It is not supposed that the animal ever entirely leaves its hole of its own accord, although it may possess the power; but it is certain, according to the observations of Réaumur, that if forcibly removed it can re-enter it. The hole it forms for its retreat is always perpendicular.



Tellina. *Solen vagina.* *Pandora rostrata.*

One of these creatures, being taken out of its retreat, was laid on the sand: it first extended its foot in the form of a wedge, or rather cone, and, applying it to the

surface, slightly raised the farthest end of its shell: at the next effort the projecting part of the foot was buried in the sand, and the shell became more elevated: after two or three more attempts the hole had attained a perpendicular direction, and the shell was partly buried in it: the shell then began to descend, and that with considerable quickness.

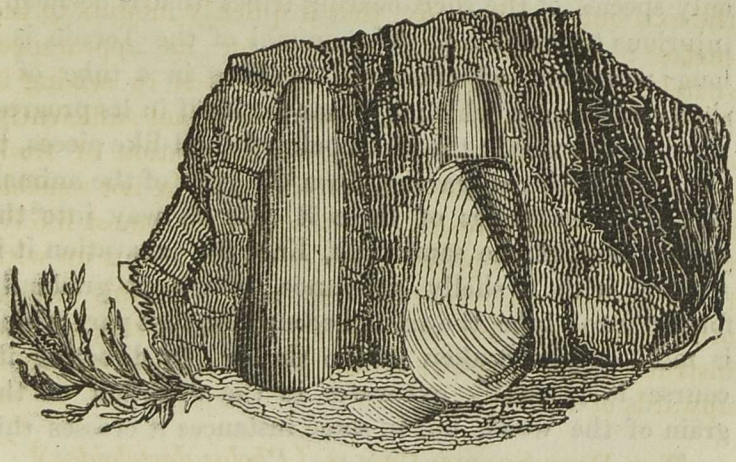
The Solens are used sometimes, but rarely, for food; but in places where they abound they are sought after as bait for fishes: the method of taking them is very singular. Having discovered the place of retreat of the creature, by observing the hole in the sand which leads to its chamber, the fisherman throws into its entrance a small quantity of salt. Although an inhabitant of salt water, the pure salt produces so irritating an effect on the extremity of its body, that it quickly mounts to the surface: the fisherman, waiting for its appearance, snatches hastily at it, and, if he succeeds in seizing it firmly, makes good his capture; but if not sufficiently active, and the animal escapes, the application of fresh salt produces no further effect: either it is not sensible to the additional infusion of salt, or, which is most likely, the instinct of self-preservation causes it to put up with the inconvenience rather than be taken. In this case no other means are left of securing it than using an iron instrument to dig it out with. The number of species is upwards of twenty.

The Date-Shaped Pholas, (*Pholas dactyloides.*)

The Pholas possesses much more powerful means of boring than the solen, for not only does it imbed itself in hard clay, but even in stone and lava. In what manner this is effected has been the subject of much

dispute: it is almost certain that the process is not mechanical, for their soft body, and the fragile nature of their shells, seem an insuperable bar to such a proceeding. Some authors have asserted that the hole is formed by means of an acid, secreted by the animal, which acts chemically on the stone; but there are two reasons against this solution of the difficulty; first, no acid liquid has been discovered in the living animal, and, secondly, although acid would act upon stone, it would have no effect whatever on lava.

Another curious part of the history of these shell-fish is their phosphorescence, which is so bright that it has been asserted, if eaten in the dark, without their being cooked, it appears as if the person devouring them was swallowing phosphorus.



Pholas dactyloides.

Although not used as food in this country, they are not uncommonly eaten on the shores of the Mediterranean, where some large species are found.

The species represented in the engraving is found on

the British coasts, imbedded in clay: its shell is of a delicate white, beautifully carved. The projecting piece at the lower part of the shell in the engraving is the long foot of the animal: on the right hand, the hole from which a shell has been removed is shown.

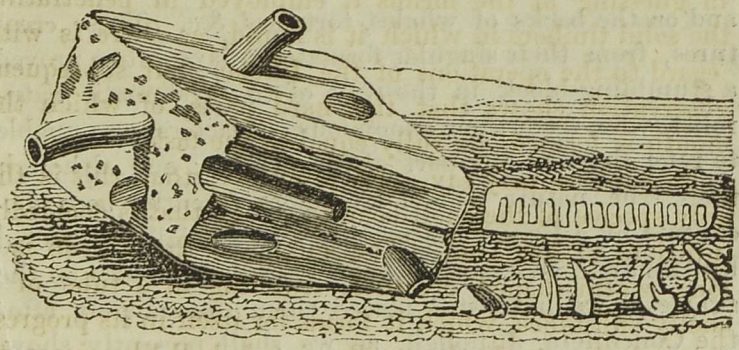
The Ship-Worm, (*Teredo navalis.*)

Before the anatomy of this destructive creature had been carefully examined, there was as much difficulty in guessing at the means it employed in penetrating the solid timbers in which it is found, as there is with egard to the operations of the Pholas; but subsequent observation shows that the hard parts, of which the mouth is formed, are fully equal to the task.

Perhaps we may say, with propriety, that this is the only species of the shell-bearing tribes that is decidedly injurious to mankind. The animal of the Teredo is a long worm-shaped creature, dwelling in a tube of a shelly substance, which it forms for itself in its progress through the wood; the small pointed shell-like pieces, to the right in the engraving, form the jaws of the animal. With the assistance of these it cuts its way into the timber, and, at the same time, lines the excavation it is making with a shelly substance, which is gradually formed into a tube, the animal occupying that part which is most deeply sunken in the timber; in directing its course it generally excavates in the direction of the grain of the wood, but in some instances it crosses this grain.

In Holland a great part of the country is below the level of high water, and, to prevent the irruption of the sea, immense dykes have been formed along the coast; these are framed, on the sea-side, of large masses of sand,

while to the landward they are strengthened by means of strong piles driven into the ground and wattled together. These piles were once discovered pierced in all directions by this destructive worm, to such an extent as to endanger their safety, and, had it not been for a timely discovery of the mischief, immense tracts of country would have been laid under water, and irretrievably lost.



Teredo navalis.

CLASS CIRRHIPEDA.

The Cirrhipeds are well known under the names of *Barnacles* and *Acorn-shells*, being found attached to rocks, ships' bottoms, and pieces of timber which have been under the water for a length of time. They also at times fix themselves on the shells of the larger Mollusca, and on the backs of whales, tortoises, &c. These creatures, from their singular formation, have often proved a stumbling-block in the way of the systematic naturalist, who, from their anomalous characters, was unable to refer them to any part of his system; and although their true nature, which has more recently been discovered by a British naturalist, was partially suspected by Lamarck, (without, however, any definite idea on the subject,) we have still placed them immediately after the Conchifera, although, as we shall presently show, they ought more properly to be arranged with the Crustacea, that is, the crab and lobster tribes, and in future systems, this, no doubt, will be the case.

After noticing their resemblance in many respects to the Crustacea, Lamarck thus expresses himself. "In fact, when I established the CLASS of Crustacea, I formed the *last order* of this class, (the *Cirrhipeds*,) under the name of *sightless crustacea;* but a few years afterwards I separated them, and placed them at the beginning of the Mollusca; but this was no better. If, for example, we consider those characters which furnish their most important organs, we shall find that the Cirrhipeds, without any doubt, most nearly resemble the Crustacea, for

they have the same system of nerves, they have jaws analogous to those of the Crustacea, and their tentacula resemble the antennæ of the shrimps." To prove that they really were Crustacea, was a task that fell to the lot of a British naturalist, I. V. Thomson, Esq., a surgeon in his Majesty's forces. The manner in which this discovery took place, we shall notice further on.

The Cirrhipeds have obtained their name from the hairy feelers, or tentacula, with which they are provided; the name Cirrhipeda being derived from two Latin words,—*cirrhus*, hair, and *pes*, the foot; these appendages, being figuratively called feet, although they have, in reality, but little relation to those organs of motion.

They have been separated into two orders; namely, *Cirrhipeda pedunculata*, which are attached to any object by a tube of a leathery nature, as, for instance, the Barnacle,—and *Cirrhipeda sedentaria*, which are fixed directly to the rock, like the Acorn-shell.

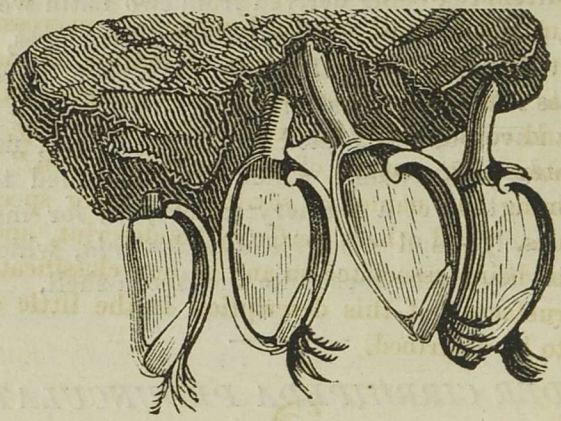
ORDER CIRRHIPEDA PEDUNCULATA.

(*Cirrhipeda with a Footstalk.*)

The Smooth Barnacle, (*Anatifa lævis.*)

The curious popular error, that the Barnacle contained the young of a species of goose, which was thence called the Barnacle Goose, has lasted for many ages, and still prevails among the uneducated, on the shores of many of the European seas. One reason of the continuance of this error, in several Roman Catholic countries, is the permission granted by the priest to its members, to eat

this goose on fish days, because it is considered, on account of its supposed watery origin, to partake more of the character of a fish than a fowl. To show the extent to which an erroneous belief may be carried, we may quote the following notice sent by Sir Robert Moray to the Royal Society, and *printed* by them in their *Transactions*. He says, "The pedicle seems to draw and convey the matter which serves for the growth and vegetation of the shell and the little bird within it."



Anatifa lævis.

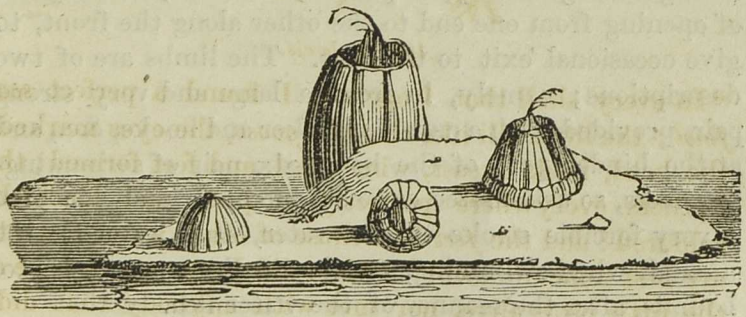
"In every shell that I opened, I found a perfect *sea-fowl;* the little bill like that of a *goose*, the eyes marked; the head, neck, breast, wings, tail, and feet formed; the feathers everywhere perfectly shaped, and blackish-coloured: and the *feet* like those of other water-fowl, to my best remembrance!" "Nor did I ever see any one of the little birds alive, nor met with anybody that did; only some credible persons have assured me that they have seen some as big as their fist!!"

ORDER CIRRHIPEDA SEDENTARIA,

(*Sedentary Cirrhipeds.*)

The Acorn-Shell, (*Balanus.*)

Mr. Thomson describes his discovery of the real nature of the Cirrhipeds, in these words. "On April 28, 1823, which the author had devoted to the investigation of some marine productions, he was returning home without any addition to his stock of his knowledge, when, casually throwing out a small muslin towing-net, on crossing the ferry at Passage, such a capture of marine animals was made, as furnished a treat which few can ever expect to meet, and could hardly be excelled for the variety, rarity, and interesting nature of the animals taken." After mentioning the names of several very rare species, he continues, "and others perfectly nondescript, and incapable of being associated in any of our classifications of the Crustacea; of this description is the little animal about to be described.



Balanus, (The Acorn-Shell Barnacle.)

"There is a small translucent animal, one tenth of an inch long, of a somewhat elliptic form, moderately com-

pressed, and of a brownish hue. When in a state of perfect repose, it resembles a very minute mussel, and lies upon one of its sides at the bottom of the vessel of sea-

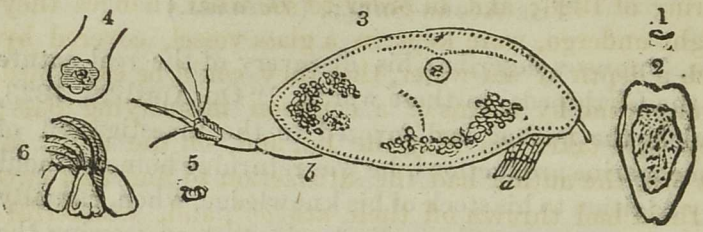


Fig. 1. Larva of Barnacle, natural size.
2. ——————— magnified, seen from above.
3. ——————— highly magnified, seen from side: *a* swimming-members; *b*, front limb, with sucker-
4. Eye, much magnified
5. Perfect Young Barnacle, natural size.
6. ——————— full grown.

water in which it is placed. At this time all the members of the animal are withdrawn within the shell, which appears to be composed of two valves, united by a hinge along the upper part of the back, and capable of opening from one end to the other along the front, to give occasional exit to the legs. The limbs are of two descriptions; namely, in front a large and very strong pair, provided with a cup-like sucker and hooks, &c., and at the hinder part of the body, six pair of swimming-members, so articulated as to act in concert, and to give a very forcible stroke to the water, so as to cause the animal, when swimming, to advance by a succession of bounds, after the manner of the water-flea.

"The greatest peculiarity, however, in the structure of this animal, is the eyes; which, although constantly shielded by the valves of the shell, are placed on foot-

stalks, as in the crab and lobster, in front, at the sides of the body.

"Some of these curious creatures were collected in the Spring of 1826; and, in order to see what changes they might undergo, were kept in a glass vessel, covered by such a depth of sea-water, that they could be examined at any time by means of a common magnifying glass; they were taken on May the 1st, and, on the night of the 8th, the author had the satisfaction to find that two of them had thrown off their *exuviæ**, and, wonderful to say, were firmly adhering to the bottom of the vessel, and changed into young Barnacles! such as are usually seen intermixed with grown specimens, on rocks and stones, at this season of the year. The eyes were still perceptible, although the principal part of the black colouring-matter appeared to have been thrown off with the *exuviæ*. On the 10th, another individual was seen *in the act of throwing off its shell*, and attaching itself, like the others, to the bottom of the glass."

* The skin or shell with which the animal is covered before transformation.

CLASS ANNULATA.

We cannot better describe the Annulose animals than in the words of Lamarck; he calls them,

"Animals with soft bodies, lengthened, worm-shaped, naked, or inhabiting tubes, with the body divided into segments, or at least transverse wrinkles, often without head, without eyes, and without antennæ, unfurnished with articulated limbs, but the greater number having, instead, small protuberances, bearing spines, and capable of being retracted at pleasure, disposed in rows along the sides, though not continued quite to the extremity of the body, and assuming various forms. They have also red blood circulating by veins and arteries; this separates them from the Worms, properly so called, which

Shells of various sedentary Annulose Animals.

have white blood. This colour of the blood is a singular fact, since the animals are much less complex in their organization than the Mollusca, which have

colourless blood. The Class of Annulose animals has been separated into three Orders, namely, *Annulata sedentaria*, which are fixed to other substances; *Annulata antennata*, possessing antennæ, or feelers; and *Annulata apoda*, without projecting members answering as feet, serving solely to attach the animal to rocks, stones, &c.

ORDER ANNULATA SEDENTARIA.

(*Sedentary Annulose Animals.*)

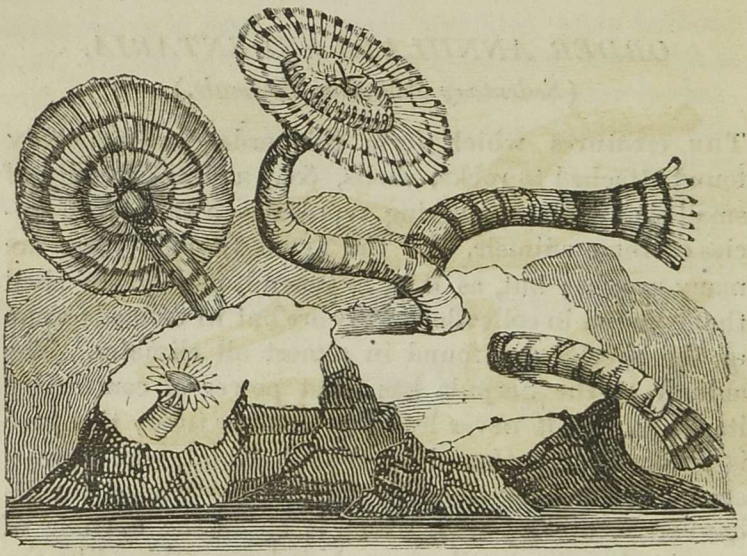
The creatures which form this order are generally found attached to rocks, shells, &c., and are usually of small size. The engraving represents a variety of species of these animals. Of the genus Serpula there are many species; but, as it is, in general, merely the shell that is found in collections, they are but ill defined; some of the species are found in almost all climates. The animal of the Serpula has great power of contracting its body, but it never leaves its shell or tube; this tube is gradually lengthened by the inhabitant, who always occupies the most recently-formed portion of it; its *operculum*, the lid with which it closes the opening of its tube, is very prettily formed; it is something like the mouth-piece of a trumpet, but of course not perforated, and it closes the opening with great accuracy.

The Magnificent Amphitrite.

(*Amphitrite magnifica.*)

This beautiful species is perhaps the largest of the whole tribe as yet discovered. It is found in various parts of the coast of Jamaica, adheringto, or, rather,

imbedded in, the rocks. Its irritability is exceedingly great, and, on being approached, it instantly retreats into its elastic tube: this tube is of a leathery consistence, unlike that of the Serpula. Specimens of this elegant species can only be obtained by breaking off such parts of the stone as contain them. These, being put into tubes of sea-water, may be kept for months in perfect



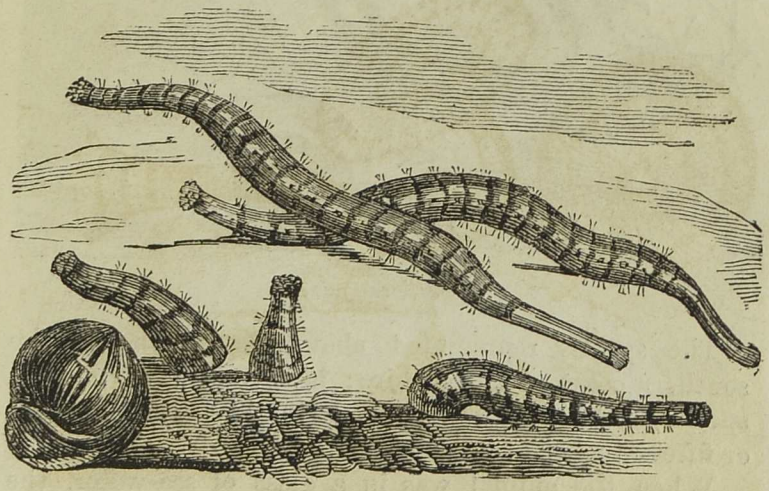
Amphitrite magnifica.

health. That part of the body which is so beautifully spread out, like an umbrella, consists of the *branchiæ*, or organs of breathing; these are of a yellowish colour, beautifully marked with pink. The Amphitrite, although perhaps it never entirely leaves its tube, is not attached to it, and frequently draws out nearly the whole of its body.

ORDER ANNULATA ANTENNATA,
(*Annulose Animals possessing Antennæ.*)

The Sand-Worm of the Fishermen, (*Arenicola piscatorium.*)

This Worm forms its nest in the sand on the sea-shore and is much sought after by fishermen as bait for fishes.



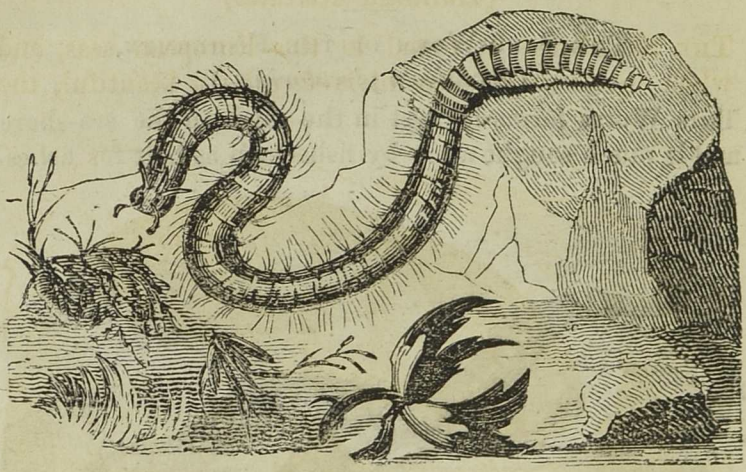
Arenicola piscatorium.

It is found in all the European seas. There appears to be but one species, but that is met with in great abundance.

Blood-coloured Leodice, (*Leodice sanguinea.*)

The antennated Annulata differ materially from those which are enclosed in a case; they possess, in addition to their antennæ, organs of motion, like the false legs of a caterpillar, and two or four well-formed eyes; they

are all marine animals, and altogether they bear a strong resemblance to the *scolopendra*, or centipede.



Leodice sanguinea.

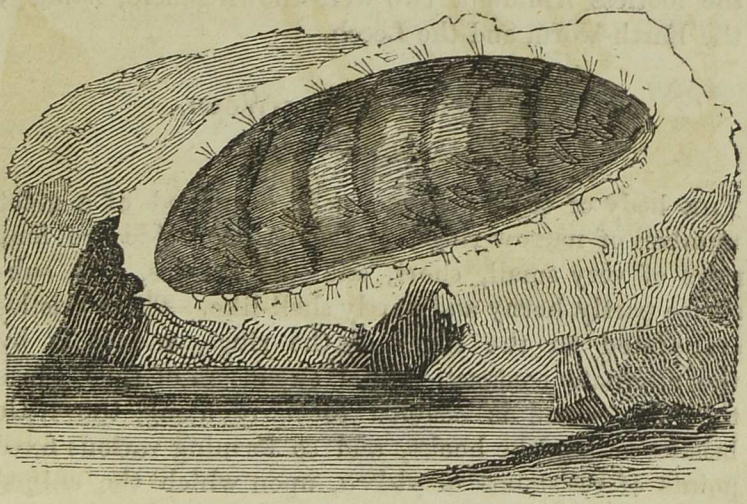
The species represented above was taken on the southern coast of Devonshire; it is the largest English species, extending sometimes to the length of fourteen or fifteen inches.

When the animal was in a glass of sea-water, the circulation of the blood through the bristle-like appendages on each side of the body was a curious object, and appeared to be effected at the will of the animal, but when it became sickly, the circulation was slower, and as soon as it expired all the colour from those parts vanished.

The mouth is large, and placed beneath, concealing most formidable jaws, or complicated fangs, which were put forward occasionally as the animal became sickly, or in the agonies of death. The figure beneath the worm shows the shape of this singular apparatus.

The Spinous Sea-Mouse, or Sea-Caterpillar, (*Halithœa aculeata.*)

The Sea-Mouse is found in the European seas, and when in its native element is singularly beautiful, the



Halithœa aculeata.

hair with which it is partially covered being equal in splendour to the colours on the tail of a peacock.

ORDER ANNULATA APODA.

(*Footless Anulose Animals.*)

The greater portion of the Annulose animals, namely those already described, are furnished with small projecting points on the sides of their body, which assist

them in their motions, and which may, consequently, be considered as supplying the place of feet; but those we have yet to notice have no similar appendages, and, therefore they are called footless. They are all very lively in their movements, and live either in moist earth, or the mud at the bottom of ponds. We find among the footless Annulata two well-known genera, namely, the Earth-worm and the Leech.

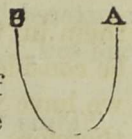
The Common Earth-Worm.

(*Lumbricus terrestris.*)

The body of the Earth-worm is composed of a great number of narrow rings, and along each side are four rows of very small, short, silk-like bristles, of a substance partly horny and partly shell-like. These bristles are placed on the edges of the rings, and it is by the alternate contraction and expansion of these rings that the worm is enabled to move along, the little bristles acting like hooks, and so forming various fixed points of resistance or *fulcra*, upon which the animal can rest at each movement forwards. The organization of the Earth-worm is very simple, the intestinal canal for the food being a simple straight tube, except in one part of its length, where a kind of gizzard is found, which answers the purpose of a stomach. It is supposed to feed upon the vegetable substances it finds in the earth.

The hole, or burrow, formed in the earth by the worm, has always two openings, one by which it enters, and through which it throws out the dirt which is removed during the progress of its excavation, and the other by which at times it leaves its burrow, so that the hole

made by the animal would be much in this form, descending at A, and reaching the surface by B. It has been said that the Earth-worm, if divided by the spade, or otherwise, will unite again and live; the foundation for this appears to be the more probable fact, that, when divided, that portion of the animal in which the head is placed may, perhaps, survive the mutilation, and ultimately again become a perfect creature.



Although worms, after wet weather sadly disfigure our gravel walks, they are at the same time, useful gardeners, loosening the earth round the roots of plants, and thus rendering it more capable of receiving the small fibres of the roots. During the Winter they penetrate very deeply into the ground, and remain, according to Latreille, rolled up in a kind of nest, protected from injury by the discharge of *mucus*, which is furnished by the pores of their body.

The Earth-worm appears to have been a considerable favourite of the author of the *Journal of a Naturalist;* among other remarks, he observes, "There is another creature, and that a very important one in the operations of nature, that is surrounded by dangers, harassed, pursued incessantly, and becomes the prey of all; the common Earth-worm. This animal, destined to be the natural manurer of the soil, and the ready indicator of an approved staple, consumes on the surface of the ground, where they soon would be injurious, the softer parts of decayed vegetable matter, and conveys into the soil the more woody fibres, where they moulder and become reduced to a simple nutriment, fitting for living vegetation. The parts consumed by them are soon returned to the surface, whence dissolved by frosts and

scattered by rain, they circulate again in the plants of the soil,

Death still producing life.

"Thus eminently serviceable as the Worm is, it yet becomes the prey of various orders of the animal creation, and perhaps is a solitary example of an individual race being subjected to universal destruction. The very emmet seizes it when disabled, and bears it away as its prize. It constitutes throughout the year the food of many birds: fishes devour it greedily; the hedgehog eats it; the mole pursues it unceasingly in the pastures, along the moist bottoms of ditches, and burrows after it through the banks of hedges, to which it retires in dry seasons. Secured as the Worm appears to be by its residence in the earth, from the capture of creatures inhabiting a different element, yet many aquatic animals seem well acquainted with it, and prey on it as a natural food, whenever it falls in their way: frogs eat it, and even the great water-beetle I have known to seize it, when the bait of the angler, and it has been drawn up by the hook. Yet notwithstanding this prodigious destruction of the animal, its increase is fully commensurate to its consumption, as if ordained the appointed food of all.

"Worms, generally speaking, are tender creatures, and water remaining over their haunts for a few days drowns them. They easily become frozen, when a mortification commences at some part, which gradually consumes the whole substance, and we find them on the surface a mass of jelly. Their retiring deeper into the soil is no bad indication of approaching cold weather; but no sooner is the frost out of the ground than they approach the surface.

"Earth-worms do considerable mischief to the floriculturist by drawing the young plants, immediately after they are transplanted, into the earth. In the drainage of lands they are of essential service, penetrating the clay that lies beneath the vegetable mould in every direction, and thus forming numerous small canals to carry off the water into the deep trenches dug by the agriculturist." The author we have already quoted, after concluding this account of the Worm, says, "I would advocate the cause of all creatures, had I the privilege of knowing the excellency of them; not willingly assigning vague and fanciful claims to excite wonder, or manifesting a base pride, by any vaunt of superior observation; but when we see, blind as we are, that all things are formed in justice, mercy, truth, I would tell my tale as a man, glory as a Christian, and bless the gracious Power that permitted me to obtain this knowledge."

The Medicinal Leech, (*Hirudo medicinalis.*)

The medicinal utility of the Leech seems, even in very remote times, to have been acknowledged by mankind, and accordingly we find it noticed in the writings of many ancient physicians. It was not simply applied to the cases in which it is at present employed, but was recommended to be used in many singular ways: a paste made of the ashes of a burnt leech was said to have the property of removing the hair from any part of the body. It was also employed to suck the blood from a wound occasioned by a mad dog, or any other rabid animal.

At present the employment of this useful creature is confined to the operation of drawing blood from inflamed

parts of the surface of the body, for which use it is eminently adapted.

There are as many as twelve or fifteen species of these creatures, but only two have been employed in medicine, namely, the *Hirudo medicinalis*, which may be known by having six yellowish lines, or striæ, on its back, while the under part is of a grayish hue, spotted with black, but, as we shall presently see, these markings are not uniformly found; and the *Hirudo troctina*, of a brownish colour, the upper part of the body marked with black spots, each of which is surrounded with a golden-coloured ring, the sides of a dingy yellow, and the under-part of a yellowish green, with black spots.

The first of these species, the medicinal leech, is common throughout the whole of Europe, but is much more abundant in the southern parts: it is generally about three inches in length. Formerly it abounded in Great Britain, but the improvements in agriculture, and the consequent drainage of the land, together with the great use made of it in medicine, have of late years rendered it of less frequent occurrence. On this account great quantities of leeches are imported: these chiefly come from Bourdeaux and Lisbon. On a moderate calculation it appears that in England, on an average, out of every hundred leeches employed, ninety-nine may be considered of foreign production: these differ from the English leech in being somewhat larger, and having the under-part of a uniform colour, without spots. Some idea may be formed of the number of leeches used in medicine by the statement that in the hospitals of Paris alone 300,000 were employed in one year. The prevailing colour of the medicinal leech abbears to vary according to the nature of the soil on

which it is found. In winter the leech retires to waters of considerable depth, and seeks shelter in the mud at the bottom; but in the summer it appears to delight in shallow pools, basking, as it were, in the warmth of the sun: but if the water it frequents is in danger of being dried up by the summer-heat, the leech buries itself in the mud at a considerable depth. Just before a thunder-storm leeches appear much agitated, and rise frequently to the surface of the water: this, therefore, is considered by the *leech-gatherers* as a favourable time for collecting them.

The property by which a leech anticipates thunder has induced some persons to employ it as a species of barometer: for this purpose a leech is enclosed in a glass vessel, half filled with water, and the following is supposed to be the result. When the weather is about to be serene and pleasant, the leech will remain at the bottom of the vessel without the least movement: secondly, if it is about to rain, the animal will rise to the surface, and there remain until the approach of fine weather; thirdly, before boisterous weather it will appear in a state of great agitation; fourthly, on the approach of thunder, it will remain out of water for several days, appearing agitated and restless, and so on.

This natural barometer *appears* to answer tolerably well, if there is sufficient belief in its virtues on the part of the possessor, and if one leech only is employed; but when several of these creatures are enclosed in the same vessel, they do not appear to obey the same laws, and, consequently, their movements do not correspond with sufficient accuracy to render their indications of the weather of much use.

The medicinal leech appears during its whole life to

exist on the blood or other juices of the creatures on whose body it fixes itself: this is not the case with the horse-leech, which lives entirely on the *larvæ* of aquatic insects, worms, &c., so that the common idea of the danger of the bite of the horse-leech is without foundation.

The horse-leech is exceedingly voracious, not only swallowing worms, tadpoles, &c., but even preying upon its own species. Sixty-five horse-leeches were placed in a glass vessel, and in five days the number was reduced to fifty-two, and not a vestige of those that were missing was to be discovered.

The usual slowness of action of the digestive powers in all animals of cold blood was curiously illustrated in the case of a horse-leech, which, after swallowing two small leeches of a different species disgorged one of the two at the end of three days, in a living state, and apparently not much injured from its sojourn in so unusual a lodging; but it enjoyed its liberty only for a few hours, its more powerful companion swallowing it a second time at the end of that period.

A number of this species of leech, inhabiting the water that supplied a trough in which a tench had been placed, fixed themselves to different parts of the body of the fish, and so effectually was the poor tench annoyed that it was soon deprived of life. "The leeches then tore it (previously breaking the line of connexion between the various parts of the body, by inflicting a vast number of bites or wounds) into such pieces as they could readily receive into the stomach, and so diligent were they, that in a few days nothing remained of the fish but the mere skeleton."

From these habits it would appear that the name of Hirudo *sanguisuga*, (the blood-sucking leech,) has been

improperly applied to the horse-leech: on this account a recent author has suggested the name of Hirudo *vorax*, (the voracious leech,) as being more suitable to its nature.

Leeches are supposed to be very long-lived: two were preserved in confinement for eight years before they died, and the well-ascertained slowness of their growth seems to place their length of life beyond a doubt.

On the head of the medicinal leech ten points are arranged in the form of a horse-shoe, thus— These are considered, by some authors, to be organs of sight, or eyes, while, on the other hand, it is stated by others, that they are merely tubercles. Lamarck was of this opinion, and consequently, in describing their character, says they are without eyes.

The teeth, or rather piercers, with which the leech is furnished are three in number, of a hard gristly substance, and so placed, with regard to each other, as to meet in the centre at equal angles: these piercers are thrust into the skin when the animal attaches itself; not by one plunging effort, but by constantly scratching or sawing upon the surface (assisted at the same time by the sucking action of the lips): in this manner they gradually become buried in the skin, and there remain as long as the creature retains its hold: this movement of the piercers occasions the gnawing pain felt for the first two or three minutes after the leech has commenced operation.

Leeches are at times so scarce and valuable that great care has been taken in preserving them in a healthy state and fit for use. The principal art in managing them consists in placing them in vessels

sufficiently large, keeping the water clear, and in removing those which are unhealthy as soon as they are discovered.

Leeches, when applied to the skin, frequently show little inclination to bite, and many plans have been resorted to, to induce them to commence operations, such as bathing the part with milk, &c.; but these methods may be considered useless, and the best plan appears to be to wash the part clean, and this is the more necessary when any embrocation has been previously applied; but the surest way is to puncture the place slightly, so as to cause the blood to appear. If the little surgeon, before it is fully gorged, appears lazy and unwilling to proceed, it can be usually roused by being sprinkled with a little cold water.

After a leech has fallen off, it is usual to sprinkle salt on it, to induce it to disgorge the blood it has swallowed; but as the salt frequently blisters its body, it has been recommended by Dr. Johnson of Edinburgh, from whose work on the leech, we have obtained most of the preceding information, to apply a small portion of vinegar to the head of the leech instead of salt.

The necessity for obliging the leech to dislodge the blood it has swallowed arises from the fact that it would remain in the body of the animal for some months before it could be all digested; but the most singular thing is that during the whole of this time the blood remains in nearly as fluid a state as when it was newly swallowed*.

* It has been quaintly said on the subject of depriving the leech of its food, "Those persons do not consider that blood is the most favourite and salutary nourishment of this extraordinary creature; and I would ask such inconsiderate persons how they would feel themselves, if, immediately after eating a hearty dinner, any person was to give them a violent emetic."

The stomach of this creature is very curiously formed, being composed of a number of chambers, each chamber having a separate connexion with the intestinal canal, in such a manner that, at the will of the animal, the contents of each chamber can be emptied singly into that canal, through a distinct opening.

It was long a matter of dispute as to whether leeches were produced from eggs or born alive, but it is now ascertained that the ova are developed in a singular case, having some resemblance to the cocoon of a silk-worm. The following engraving represents this case, of its natural size: fig. 1 shows the perfect case or cocoon, and fig. 2 the same opened, with the young leeches con-

Fig. 1. Fig. 2.

tained within it: it is said that at times there are as many as thirteen or fourteen in one case. This cocoon is formed by the parent animal, and by it deposited in the mud or clay which composes the bed of the pool it inhabits.

The fact of the young leech being produced from these cocoons, although only latterly ascertained by naturalists, was long since well known to the dealers in leeches on the French coast, who avail themselves of this knowledge of their habits to multiply them for the purpose of sale.

"It was by these means the leech-dealers of Bretagne

and particularly in Finisterre, replenished the ponds in which they preserved those leeches which were intended for the Paris market.

"About the month of April or May, according to the nature of the season, they send out labourers, provided with spades and baskets, to the little muddy marshes, where they are known to exist in abundance. These workmen then set about removing those portions of mud that are known to contain cocoons, which are afterwards deposited in sheets of water previously prepared for their reception; here the young leeches quit the cocoons, and are allowed to remain for six months, when they are removed to larger ponds." While they remain in these ponds, the cattle and other animals are driven to the water, for the purpose of allowing the young to feed upon them, as it is supposed that they grow much more rapidly after having partaken of blood.

There is a small species of leech in the island of Ceylon, which is more dreaded, and, from its great numbers, produces more evil, than even the venomous reptiles which are found in the island, including the terrible hooded snake itself.

The largest of these leeches are seldom more than half an inch in length, and the smallest are minute indeed. This leech is a very active animal; it moves with great rapidity, and is even said occasionally to spring. It is supposed to have an acute sense of smelling, for no sooner does a person stop where leeches abound, than they appear to crowd eagerly to the spot from all quarters. In rainy weather, it is shocking to see the legs of men on a long march thickly beset with these creatures, gorged with blood, and the blood itself trickling down in streams. It might be supposed there

would be little difficulty in keeping them off; but they crowd to the attack, and fasten on more quickly than they can be removed. Their bites are much more troublesome than would be imagined, being very apt to fester and become sores, and in persons, of a bad habit of body, to degenerate into extensive ulcers, and ultimately cause the loss of a limb, if not that of life itself.

Many plans have, of course, been resorted to, to avoid this pest, such as anointing the legs with tobacco-water, grease, &c., but all to very little purpose, the only successful mode appearing to be, the enclosing the lower part of the legs in boots and pantaloons, fitting very closely to the limb, a very unpleasant dress in so sultry a climate.

CLASS CRUSTACEA.

THE arrangement of the Crustacea in systems of natural history has undergone numerous changes; they were placed by Linnæus among the insects:—others considered them to have more analogy to the spiders. Lamarck was the first who made the Crustacea an independent CLASS forming two *orders*, which he has named after the arrangement of the branchiæ, or gills, by which they breathe, namely,—the *Crustacea homobranchiæ*, the distinguishing marks of which he describes in this manner: branchiæ hidden under the lateral margins of a kind of cuirass, covering the body of the animal, with the exception of the tail; the mandibles always furnished with feelers, the eyes placed on footstalks, the head not distinct from the trunk, and possessing ten feet to assist them in their movements, Secondly, the *Crustacea heterobranchiæ*, in which the branchiæ are external, in various situations, but never under the lateral margin of a cuirass; they are either under the belly or the tail, adhering to the feet, or confounded with them; the eyes are in general fixed, *sedentary, not on foot-stalks.*

ORDER CRUSTACEA HOMOBRANCHIÆ,
(*Shell-Fish with concealed gills.*)

THE first of these orders, the *homobranchial* Crustacea, includes most of the larger kinds of shell-fish, as for instance, crabs, lobsters, and cray-fish; shrimps and prawns are also in this division.

Their organization is much more perfect than that of the other order, and according to Lamarck, it is among these animals that the last appearance of the organ of

hearing is seen, in tracing the animal kingdom from the most perfect animals to those whose formation is apparently less complex.

The body of these creatures appears to be composed of only two principal parts, the body and the tail; for the head is so intimately united and confounded with the trunk, as to appear to be merely a portion of it. The two eyes are fixed at the top of two moveable supports, and are placed in a hollow prepared for their reception, on each side of a projecting portion of the shell that covers the head. The antennæ, which are usually four in number, are placed about this spot; they are inserted beneath the stems that support the eyes. The two outermost of these antennæ are generally the longest.

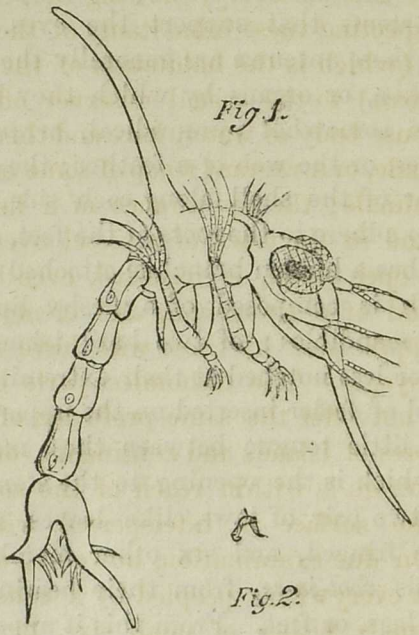
The branchiæ, or organs by which they breathe, assume a form somewhat pyramidical, arranged like a series of leaves, or the web of a feather; they are placed in the interior of the shell along each side, and are so arranged as to adhere to the roots of the feet, so that each of these feet has a hidden branchiæ attached to its base.

The mouth is composed of a fleshy lip projecting between the mandibles; of two hard triangular mandibles, more or less notched at their extremity, and each having a kind of feeler inserted on the upper part; they also possess a little tongue between these mandibles, at the root of which is the opening to the stomach: they have besides two pair of jaws, like leaves, the borders of which are fringed, and six other members, which Lamarck calls *foot-jaws*, from their bearing some resemblance to legs, or feet. From this it appears that the parts of the mouth in the Crustacea form a complicated apparatus, and accordingly we find the whole tribe exceedingly voracious, the Crabs in particular, feeding

upon any animal substance, putrid or not, that may come within their reach. Some of the species are well known as articles of food, but they are not equally wholesome at all seasons of the year.

THE CRAB TRIBE.

THE genera of the Crustacea are so extremely numerous and the knowledge we possess of their natural history is so scanty, being generally confined to their form and colour, that we shall limit ourselves to a description of some of the best known and most useful species.



THE ZOEA OF THE COMMON CRAB.

The Crabs are a very numerous tribe, and contain many singular species, as far as regards their form,

which assumes an endless variety of curious shapes sometimes elegantly decorated with the most brilliant colours; this more particularly applies to those which are found in the seas of hot climates.

The singular little animal represented in the preceding page, was placed by naturalists among the *Crustacea*, and considered a perfect animal of a distinct species; it was named Zoea. Mr. Thompson, the experienced naturalist we have already noticed, was the first to discover the real nature of this little creature. We cannot do better than to introduce the subject by the following observations of the author of this discovery, showing the reason so little is known respecting these inhabitants of the deep.

"The sea (which is the habitation of the greater part of the *Crustacea*) to the casual observer offers nothing but an immense body of water, here and there presenting a solitary whale, or a vagrant troop of some of the smaller cetaceous animals; the appearance of a fish of almost any other kind in the track of a vessel over a vast expanse of the open ocean, is regarded, even by the mariner, as a kind of phenomenon, and creates an interest not to be appreciated by those who have not engaged in distant voyages. The fathomless parts of the ocean certainly do not offer the same profusion of inhabitants with the shores of islands and continents, or those parts where the bottom is within reach of the sounding-line, or where the surface is interspersed with fields of Sargosa*. On due examination, however, we shall not fail to find it everywhere peopled by a considerable variety of animals, either of small size, or possessed of such a degree of translucency as to render them invi-

* A kind of sea-weed, (*Fucus natans.*)

sible, or scarcely perceptible, even when on or near to its surface; that it should possess its share of the organized beings which we see spread over every other part of the surface of our globe, is a conclusion we might arrive at indirectly, from the consideration of oceanic fishes and birds being observed in those parts of the ocean most distant from the land, and the provident care of the Deity, which we invariably witness throughout the domain of nature, to furnish food for all, even the meanest of his creatures; the more minute and invisible inmates of the sea, then, must constitute the food of oceanic fishes and birds.

"Few of these marine animals, except some of the larger and most conspicuous, have as yet been observed, so that the investigation of them holds out a promise of a rich harvest to the naturalist, and a vast field of exploration, replete with novelty and interest; to accomplish this, however, he must use the greatest diligence, seizing every opportunity, when the way of a ship does not exceed three or four miles per hour, to throw out astern a small towing-net of gauze, bunting, or other tolerably close material, occasionally drawing it up, and turning it inside out into a glass vessel of sea-water, to ascertain what captures have been made. When a ship goes at a greater rate, and in stormy weather, a net of this kind may be appended to the spout of one of the *sea-water* pumps, and examined three or four times a day, or oftener, according to circumstances."

Although naturalists were decided in calling the Zoea a crustaceous animal, they were still far from agreeing as to the place in the system it ought to occupy, for the different species were so unlike each other; but it will be no longer a matter of surprise, when it is known, that

this singular creature is not a perfect animal, but merely the larva, or imperfect state of the Common Crab. This fact is perfectly new, and interesting in a double point of view, not only proving their real nature, but also that the Crustacea are not as described in most systems, animals undergoing no metamorphosis, and on that account to be separated from the insects, but that they do undergo a metamorphosis, and that of a most wonderful nature.

It was in the Spring of 1822 that Mr. Thomson first met with Zoeæ, in the harbour of Cove, and that in considerable abundance; the year following, at the same season, one of considerable size occurred; this was considered a fit object for experiment, and was carefully supplied with fresh sea-water, from May 14th to June 15th, when it died in the act of changing its skin. That portion of its new form which it had been able to disengage was sufficient to show that it bore a great resemblance to the division of the Crustacea, in which the crabs and lobsters are placed. "This proof," says the author, "might be considered incomplete, if I had not had the good fortune to succeed in hatching the *ova* of the Common Crab, during the month of June, which presented exactly the appearance of the *Zoea taurus*."

The Common Crab, *Cancer major*, is so well known, that any description of its appearance would be useless.

One singular part of the history of these creatures is, the power that is possessed by them of changing their shell once in every year; this power is providentially bestowed upon them, to enable them to increase in size, a thing that would otherwise be utterly impossible from the peculiar nature of the hard coat in which they are enclosed.

The Crab, in order to prepare for the extraordinary change it is about to undergo, when shifting its shell, chooses a close and well-secured retreat, in the cavities of rocks, or under great stones, where it creeps in and remains during the operation. The time of the year when this occurs is about the beginning of the Summer, at which time their food is in plenty, and their strength and vigour in the highest perfection. But soon all their activity ceases; they are seen forsaking the open parts of the deep, and seeking some retired situation among the rocks, or some outlet where they may remain in safety from the attacks of their enemies. For some days before their change, the animal discontinues its usual voraciousness; it is no longer seen laboriously harrowing up the sand at the bottom, or fighting with others of its kind, or hunting its prey; it lies torpid and motionless, as if in anxious expectation of the approaching change. Just before casting its shell, it throws itself upon its back, strikes its claws against each other, and every limb seems to tremble; its feelers are agitated, and the whole body is in violent motion; it then swells itself in an unusual manner, and at last the shell is seen beginning to divide at its junctures, particularly at those of the belly, where it was before seemingly united. It also seems turned inside out; and its stomach comes away with its shell. After this, by the same operation, it disengages itself of its claws, which burst at the joints; the animal with a tremulous motion, casting them off, as a man would kick off a boot that was too big for him.

Thus, in a short time, this wonderful creature finds itself at liberty: but in so weak and enfeebled a state that it continues for several hours motionless. Indeed, so violent and painful is the operation, that many o

them die under it; and those which survive, are in such a weakly condition for some time, that they neither take food nor venture from their retreats. Immediately after this change, they have not only the softness, but the timidity of a worm. Every animal of the deep is then a powerful enemy, which they can neither escape nor oppose; and this, in fact is the time when the dog-fish, the cod, and the ray, devour them by thousands. But this state of weakness continues for a very short time; the animal, in less than two days, is seen to have the skin that covers its body almost as hard as before; its appetite appears to increase; and strange to behold! the first object, it is said, that tempts its gluttony, is its own stomach, which it was lately disengaged from. This it devours with great eagerness. In about forty-eight hours, in proportion to the animal's strength, the new shell is perfectly formed, and as hard as that which was but just thrown aside. Previous to the time of moulting or changing their skin, a flat chalky stone is found on each side of the stomach; this is believed to form a store of earthy matter for the renewal of the shell. These stones, popularly known as *crab's eyes*, were long highly esteemed for their medicinal properties, but in reality are not superior to so much chalk.

When completely equipped in its new dress, the dimensions of the old shell being compared with those of the new, it will be found the creature has increased in size nearly one-third, and it appears wonderful how the old shell could have contained it.

Many of the cold-blooded animals have the power of reproducing a limb, or a portion of one, if, by any accident it has been lost. This faculty of reproduction is possessed by the Crab in great perfection; but it has

also a surprising power in itself, voluntarily to break off its own legs and claws. It seems this takes place when any serious injury, by bruising, has happened to any of its members. After it has received the hurt it bleeds, and gives signs of pain, by moving the wounded limb from side to side, but afterwards holds it quite still, in a direct and natural position, without touching any part of its body or its other legs with it. Then, on a sudden, with a gentle crack, the wounded part of the leg drops off at the next joint to the one injured; this appears to be more easily done with respect to the smaller legs, than in the case of an injury occuring to those which bear the pincers.

When the leg has dropped off, a mucus, or jelly, is discharged on the remaining part of the joint next the body, which, as a natural styptic, instantly stops the bleeding; this gradually hardens and grows callous, becoming a new leg in miniature, which at every change of the creature's shell increases rapidly in size.

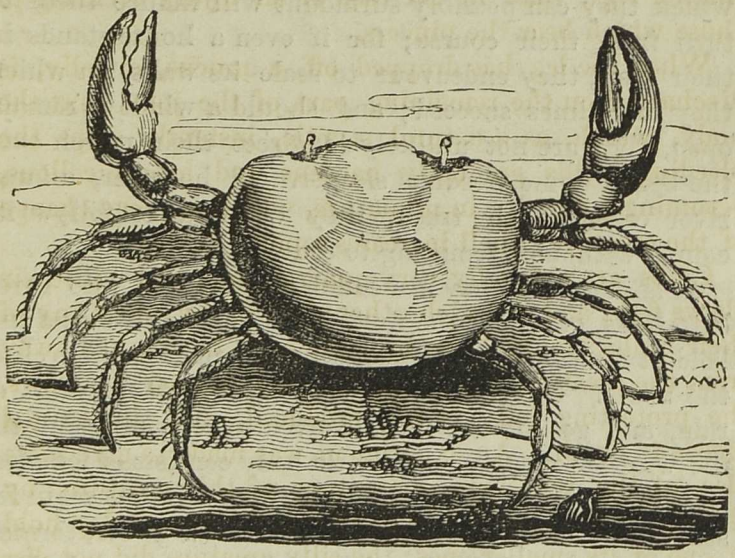
Crabs are naturally very quarrelsome, and withtheir claws fight and kill each other; and if by cance any of their limbs should be so bruised, as to have taken away from the creature the power of breaking off its claws, the protecting jelly is not produced, and the animal bleeds to death. An experiment was made to give some idea of the tenacious disposition of this creature, by obliging a Crab, with one of its great claws, to lay hold of one of its smaller ones; the silly creature did not distinguish that itself was the aggressor, but exerted its strength, and soon cracked the shell of its own small leg, which bled freely; but feeling itself wounded it succeeded in breaking off its limb in the usual manner,—

still, however, holding fast for a length of time the part of the wounded leg which had come away.

The curious shuffling walk of the Crab is well known but it does not, as it is said, walk exactly backwards.

The Land Crab, (*Gecarcinus ruricola.*)

Although nearly all the Crab tribe are inhabitants of the water, there is a species found in the West Indies, a native of the Bahama Islands, whose habits are unlike those of the rest of its class, and highly curious in themselves.



THE LAND CRAB, (*Gecarcinus ruricola.*)

Land Crabs do not, like most other crustaceous animals, live near salt-water, but take up their abode for the greatest part of the year in holes in the ground, hollow trunks of trees, and other places of the same description,

and inhabit the mountainous districts of the islands, many miles from the sea-shore; but although they make these places their usual haunt, it is necessary for them, once a year to repair to the sea, for the purpose of depositing their spawn. They prepare for their annual migration about the month of April or May, and, having mustered in immense numbers, the procession sets forward, with all the regularity of an army, under the guidance of an experienced commander.

Their destination being the sea, they instinctively move in a direct line to the nearest coast; no obstacle which they can possibly surmount will induce them to turn from their course; for if even a house stands in their way, they endeavour to scale its walls, in which they sometimes succeed; and should a window remain open, they are not unlikely to direct their march over the bed of some heedless sleeper. If, however, a large river crosses their track, they continue to follow its course without attempting to cross it.

It is said, that they are commonly divided into three battalions, of which the first consists of the strongest and boldest males, who, like pioneers, march forward to clear the route. They are often obliged to halt for want of rain, and go into the most convenient encampment till the weather changes. The main body consists of females, who never leave the mountains till the rain has set in for some time; they then descend in regular order, formed into columns of the breadth of fifty paces, and three miles in length, and so close that they almost cover the ground. Three or four days after this, the rear-guard follows, a straggling undisciplined tribe, consisting of males and females, but neither so robust or vigorous as the former parties. The night is their chief time of

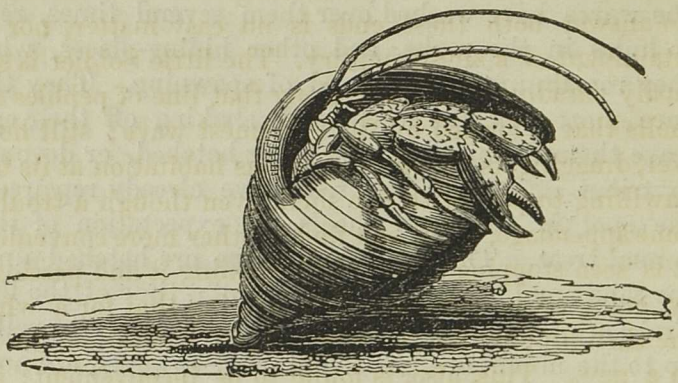
proceeding. When terrified they march back in a confused manner, holding up their nippers and clattering them loudly, to intimidate their enemies. Their general food consists of vegetables; but if any of their companions should become maimed, and unable to proceed, they are greedily devoured by the rest.

After a march of two, and sometimes three months, in this manner, they arrive at their destined spot on the sea-coast; they immediately enter the water, and after the waves have washed over them several times, retire to holes in the rocks, and other hiding-places, where they remain until the period of spawning. They then once more seek the water, and, shaking off their eggs, leave them to the chance of being hatched, or devoured by tribes of hungry fish, who have already repaired to the spot in countless shoals, in expectation of their annual treat. The eggs that escape are hatched under the sand; and, soon after, millions at a time of the little Crabs are seen quitting the shore, and slowly travelling up to the mountains. The old ones, however, are not so active to return: they have become so feeble and lean, that they can hardly crawl about. Most of them, therefore, are obliged to continue in the flat parts of the country, till they recover; making holes in the earth, into which they creep, and cover themselves up with leaves and dirt; here they throw off their old shells, and continue almost without motion for about six days, during which time they become so fat, as to be considered delicious food. In about six weeks the new shell has become tolerably hard, and the creatures may be seen slowly returning to their mountain-haunts. In some of the sugar islands, it is said they form no inconsiderable portion of the food of the negroes, who are ex-

tremely dextrous in their mode of seizing them, so as to avoid their nippers.

The Hermit, or Soldier Crab,
(*Pagurus bernhardus.*)

This singular species of Crab has obtained its name from its habit of remaining, as it were, secluded, in any empty shell or hole of a rock it may fancy.



THE HERMIT CRAB, (*Pagurus bernhardus.*)

The hinder part of its body, particularly the tail, is constantly liable to injury on account of its being naked, or at least unprotected by a hard shell like the rest of its body. The tail itself is very short, but in those which have chosen a shell for their hermitage, some hook-like appendages are observed, which enable them to maintain a secure hold of their borrowed dwelling. When the body has grown too large for the shell occupied by the animal, it is obliged to seek another of a larger size. The numerous combats they enter into when seeking a new dwelling, have caused

this animal to receive the additional name of the Soldier Crab.

"The Soldier when about to seek a new habitation, is still seen," says an amusing writer, "in its own shell, which it appears to have considerably outgrown; for a part of the naked body is seen at the mouth of it, which the habitation is too small to hide. A shell, therefore, is to be found, large enough to cover the whole body; and yet not so large as to be unmanageable and unwieldy. To answer both these ends is no easy matter, nor the attainment of a slight inquiry. The little Soldier is seen busily parading the shore, along that line of pebbles and shells that is formed by the extremest wave; still however, dragging its old incommodious habitation at its tail, unwilling to part with one shell, even though a troublesome appendage, till it can find another more convenient. It is seen stopping at one shell, turning it and passing it by, going on to another, contemplating that for a while, ane then slipping its tail from its old habitation, to try on a new. This, also, is found to be inconvenient; and it quickly returns to its old shell again. In this manner it frequently changes, till at last it finds one light, roomy, and commodious: to this it adheres, though the shell be sometimes so large as to hide the body of the animal, claws and all."

Yet it is not till after many trials, and many combats also, that the Soldier is thus completely equipped; for there is often a contest between two of them for some well-looking favourite shell, for which they are rivals. They both endeavour to take possession; they strike with their claws; they bite each other till the weakest is obliged to yield, by giving up the object of dispute It is then that the victor takes possession, and parades

in his new conquest three or four times back and forward, upon the strand, before his envious antagonist.

When this animal is taken it sends forth a feeble cry, endeavouring to seize the enemy with its nippers, which if it fasten upon, it will sooner die than quit the grasp. The wound is very painful, and not easily cured.

On the English coasts the Hermit Crab is generally found in the shell of the whelk, or when of a small size in that of the periwinkle: they not unfrequently, however, remain in some cranny of a rock, or under the protecting cover formed by a group of pebbles, in the interstices of which they hide themselves.

The ancients were well acquainted with the Soldier Crab, as is evident from the following translation of the lines of one of their poets:

> The Soldier Crabs, unarmed by nature, left
> Helpless and weak, grow strong by harmless theft.
> Fearful they crawl, and look with panting wish
> For the cast crust of some new-covered fish;
> Or such as empty lie, and deck the shore,
> Whose first and rightful owners are no more.
> They make glad seizure of the vacant room,
> And count the borrowed shell their native home;
> Screw their soft limbs to fit the winding case,
> And boldly herd with the crustaceous race.
> But when they larger grow they fill the place,
> And find themselves hard-pinched in scanty space,
> Compelled, they quit the roof they loved before,
> And busy search around the pebbly shore,
> Till a commodious roomy seat be found,
> Such as the larger shell-fish living owned.
> Oft cruel wars contending soldiers wage,
> And long for the disputed shell engage;
> The strongest here the doubtful prize possess,
> Power gives the right, and all the claim confess.

The Lobster, (*Astacus Europœa.*)

The well-known and delicious shell-fish, the Lobster, is found in great abundance in all the northern parts of Europe. The north of Scotland is famous for the Lobster, but it is still more plentiful on the coast of Norway. The crab is more frequently found in shallow water, but the Lobster prefers those spots where the water is of considerable depth. The methods of taking Lobsters are various: the most usual is by means of what are called Lobster-pots: these are a sort of trap, formed of twigs, and baited with garbage: they are made like a wire mouse-trap, so that when the Lobsters get in there is no possibility of returning. These pots are fastened to a cord, and sunk in the sea, their place being marked by a buoy. Another method of taking them is by means of a kind of bag-net, baited with animal substances. This fishery is only carried on in the night. They are brought in vast quantities to the London markets from the Orkneys and from the Norway coast.

Lobsters are much alarmed at the noise of thunder, or any other sudden shock; the consequence of which is that in their fright they frequently cast their claws. This also often happens when the poor creatures are thrown into the boiling-pot. As these animals frequent clear water, their habits have been more noticed than those of the crab. Their mode of feeding is sufficiently curious. In general, the pincers of one of the large claws are furnished with knobs, while the other large claw is more like a saw on its edge: holding, then, its food in the knobbed claw, it dexterously pulls it to pieces

with the other. Their movements in the water are exceedingly graceful and lively, and they are capable of darting forward to a considerable distance with the rapidity of the flight of a bird. Their colour, when in their native element, is not black, as might be imagined, but a beautiful deep blue.

A whimsical idea of the horror Lobsters are said to have of pigs seems to have prevailed in some parts of the Continent. It is said that in Brandenburgh, where the fishery is very abundant, the wagoners who transport them by land are obliged to keep watch during the night, to prevent swine from passing the wagon, for if one only was to go by, they say, not a single Lobster would be alive in the morning!

The River Cray-Fish, (*Potamobius fluviatilis.*)

The fresh-water Cray-fish very much resembles the lobster in appearance, but is considerably broader in its proportions. It is commonly found in the tributary streams of large rivers, inhabiting the banks, in which it burrows, and feeding on any animal substance that may happen to come in its way.

The Cray-fish, is taken in various ways, sometimes by the hand, which is thrust into the holes in which they burrow. Another method is thus described:—

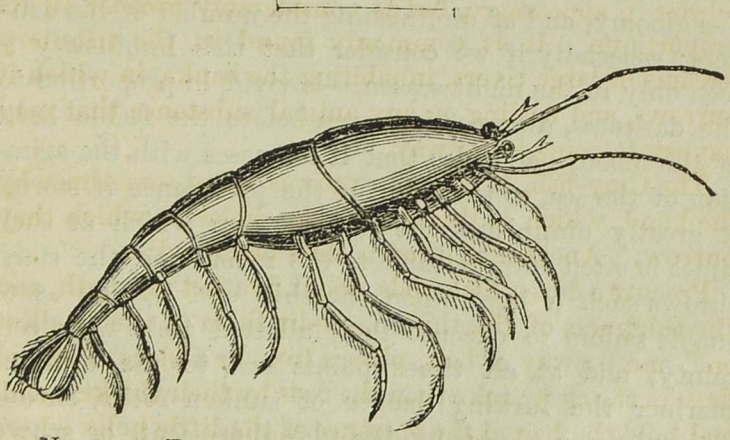
Procure a dozen little rods, about five feet in length, and the thickness of the thumb,—split them at the smallest end, and by way of bait, place a frog, or a piece of putrid flesh in the cleft: take then the rods by their thickest end, and hold the bait at the entrance of the little holes where you suspect your prey to be: if they are there they will generally come out to seize the bait. As soon as you

perceive them, hold a small landing-net, underneath, and raise the bait suddenly, and the Cray-fish will either be brought up along with the bait, or will fall back into the net.

Another method noticed consists in first burying a dead cat, or a hare, in a dunghill for eight days, and then placing it in the midst of a bush of tangled thorns and brambles, which is thrown into the water, in the place frequented by the Cray-fish. After it has remained there a few hours, it may be drawn up, when the shell-fish will be found partaking of their delicate fare, and the tangled bush will effectually prevent their escape.

The Phosphorescent Shrimp.

The luminous appearance of the ocean at night is a fact well known to all who have been a voyage by sea; and it has been ascertained that the causes of this beautiful



Noctiluca Banksii, magnified. The line above shows the natural length.

phenomenon are the phosphorescent properties which are possessed by many of the smaller inhabitants of the deep. Among these the little animal figured above is very frequently met with.

The light of this creature, which is very brilliant, appears to issue from every part of the body; but in another crustaceous animal, found by Captain Tuckey, in the Gulf of Guinea, the luminous property resided in the brain, which, when the animal was at rest, resembled a most brilliant amethyst, about the size of a large pin-head: from this there started, when it moved, flashes of a brilliant silvery light.

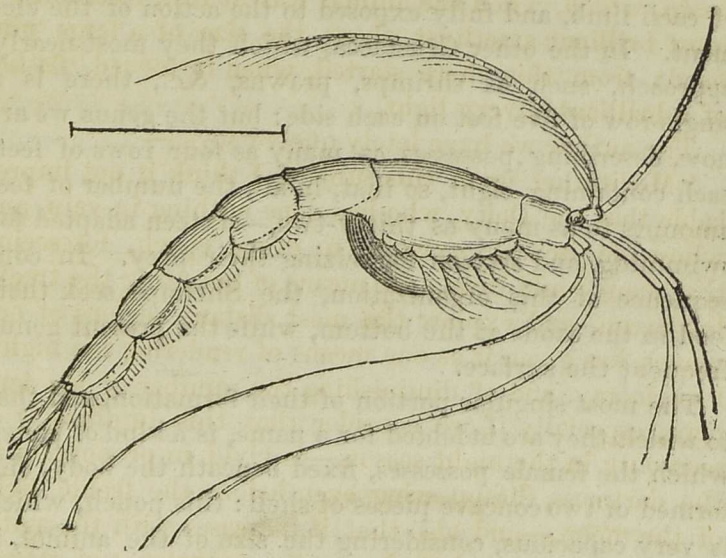
The author we have lately quoted says,—

"Meditating upon this subject, I think it not improbable that the Deity, who has done nothing in vain, and whose omniscience extends to every epoch, foreseeing that man would invent the means of tempting the trackless ocean, and explore the most distant regions of our planet, has given it as one means of rendering his nights less gloomy, and of diminishing the number of his dangers; especially if we consider that this luminosity is seen only in the night season,—is vivid in proportion to the darkness, disappearing even before the feeble light of the moon,—and also that it increases with the agitation of the sea, so that, during the prevalence of storms it greatly diminishes the dense gloom which at such times is often impenetrable to the moon, and the stars, throws such a light upon the ship and rigging as to enable sailors to execute their allotted tasks with certainty, and at all times points out to the cautious mariner the lurking danger of sunken rocks, shoals, and unknown coasts, by the phosphorescent, or snowy

appearance which it gives to the breakers, so as to render them visible at a considerable distance."

The Opossum Shrimp, (*Mysis chamæleon.*)

This small species of Shrimp, although it has much the same outward appearance as the common shrimp, except that it is considerably smaller, is, when duly exa-



Mysis chamæleon.

mined, one of the most singularly-formed creatures of the class to which it belongs. It is found in tolerable abundance along the British coasts, but the northern seas literally swarm with them: there, in spite of their small size, they are destined to become the food of the stupendous whale, whose enormous mouth encloses myriads at a time.

The Opossum Shrimp belongs to a group of crustaceous animals which have been called fissipeds, (*split-feet,*) on account of each of their feet being divided nearly throughout its whole length; the inner limb being constructed for progression and the seizing of their prey, and the outer for swimming and giving that motion to the water which is essential to the organs of breathing, which are, as it were, wrapped round the base of each limb, and fully exposed to the action of the element. In the other Crustacea, which they most nearly approach, such as shrimps, prawns, &c., there is a single row of five feet on each side: but the genus we are now describing possesses as many as four rows of feet, each containing eight, so that, in all, the number of feet amounts to as many as thirty-two,—sixteen adapted for swimming, and sixteen for seizing their prey. In consequence of this organization, the Shrimps seek their food in the sands at the bottom, while the present genus frequent the surface.

The most singular portion of their formation, and that to which they are indebted for a name, is a kind of pouch which the female possesses, fixed beneath the body, and formed of two concave pieces of shell: this pouch, which is very capacious, considering the size of the animal, is destined to receive the eggs, which are deposited in it, enveloped in a kind of jelly-like substance, most probably forming the food of the young when first hatched. As fast as the young assume the lengthened form of the perfect animals, they are found to arrange themselves in this pouch closely and regularly side by side, with their heads towards the breast of the mother. After this manner they lie closely compacted together, and present a perfectly symmetrical arrangement, easily observed

from the translucency of the valves of the pouch, and the large size and blackness of their eyes. The males of the Opossum Shrimp are not so numerous as the females, and are without the singular pouch we have described.

We have already noticed the fact of these Shrimps being the food of the Greenland whale, in the northern seas, but in these climates they serve as food for herrings.

It is in looking closely into the structure of these little animals that we see the perfection of the Divine Artist. Nature's greater productions appear coarse indeed to these elaborate and highly-finished master-pieces, and in using more and more powerful magnifiers we still continue to bring new parts and touches into view. If, for instance, after observing one of their members with the naked eye, which has informed us that the part we have been examining is composed but of one piece, we employ a magnifying-glass with a low power, the same part appears jointed, or composed of several pieces articulated togother. Employing a higher magnifier, it appears fringed with long hairs, which, on further scrutiny, seem to be themselves fringed with hairs still more minute: many of these minute parts also are evidently jointed, and perform sensible motions. But what idea can we form of the various muscles which put these parts in movement, of the nerves which actuate them, and the vessels which supply them with the nourishment necessary for growth and support, and which we know, from comparison with other creatures, they must possess!

The Opossum Shrimps, we have seen, are the prey of the larger inhabitants of the deep; but they, in their

turn, destroy others that are smaller than themselves,—seizing upon every animal substance they are able to manage that comes within their reach, and, if placed in a vessel of sea-water by themselves, devouring each other.

The species represented in the engraving has been called the *Mysis chamæleon*, from its colour varying according to the substances on which it feeds, through all the gradations of gray, black, brown, and pink.

ORDER CRUSTACEA HETEROBRANCHIÆ.

(*Crustacea with Organs of Breathing variously placed, never concealed.*)

The Crustacea which form this order differ much more from each other than those which are arranged in the last order, and consequently we find among them some very singular in their outward formation. Few of the species appear to be used as food by mankind, but they constitute a great portion of the nourishment of fishes and other inhabitants of the water. They are at times used by fishermen as bait. Many of them are very minute, and form most excellent objects for the microscope. They have been divided into several sections, according to their outward form; but as so little is known of their habits, we shall confine ourselves to a description of some of the best known.

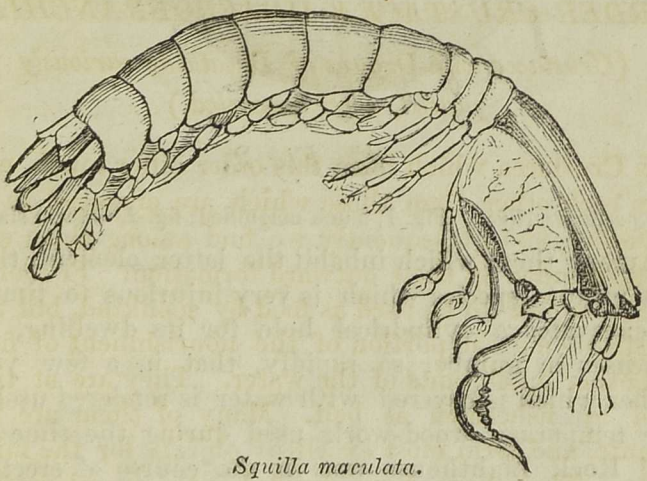
The Spotted Squill, (*Squilla maculata.*)

The Squill seems to form a connecting link between the last and present order. It is the only genus of the heterobranchial Crustacea in which the eyes are placed

on footstalks; the head, instead of being distinct, appears in a great measure drawn into the corslet. It has been called the Sea Mantis, from its bearing some resemblance to an insect of that name, on account of the singularly-formed hooks with which two of its foot-jaws are armed.

The species shown in the engraving is found in the Indian Seas; it is the largest of the genus.

The shell with which these creatures are covered, has very little consistence, more resembling hardened skin than shell. They frequent the sandy bottom of the sea.



Squilla maculata.

There is a small species which is found in fresh water, in which the young, after the eggs are hatched, remain for some time in shelter under the plates with which the body of the mother is covered.

THE COMMON CLOPORTUS, (*Cloportus ascellus.*)

THIS animal is very common upon old walls and under stones. It is somewhat like the wood louse, but more

flat; it is essentially a dweller on the land, but it cannot exist except in damp places, where the moisture is sufficient to keep its branchiæ pliable; it belongs to a group of small Crustacea known by the name *Oniscus*. Some, as we see in the present instance, frequent the land, but the greater portion inhabit the water.

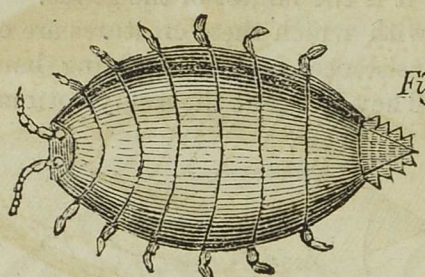


Fig. 1.

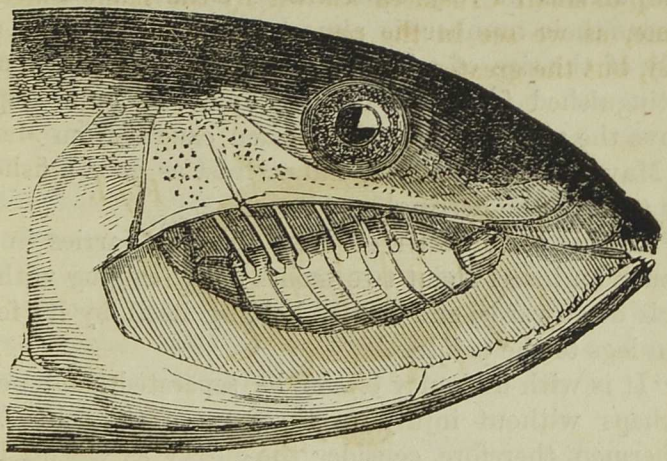
Fig. 2.

Cleoportus uscellus. (Fig. 1, much magnified; fig. 2, natural size.)

Among those which inhabit the latter element, there is a minute species which is very injurious to timber. It excavates a cylindrical hole for its dwelling, and increases in number so rapidly, that in a few years timber which is covered with water is rendered useless. The temporary wood-work used during the time the Bell Rock Lighthouse was in the course of erection, was destroyed, to a great extent, by this little creature. When the wood had been under water for three years, beams ten inches square were reduced to seven inches; at the rate of one inch a year. Another species, *Cymothoa*, attaches itself to the backs of different species of fishes, living upon the juices of their body.

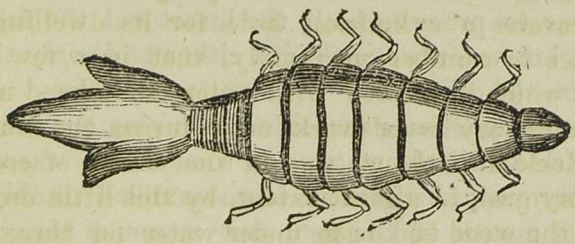
A crustaceous animal nearly allied to this last is described in the fifth volume of the *American Philoso-*

phical Transactions; it is accompanied by engravings which we have copied, but the animal is not drawn with sufficient accuracy to be referrible to any particular



Head of Alewife.

Part of lower jaw removed to show the insect.



The insect seen from above.

species; by this account it appears that, instead of attaching itself to the body of the fish, the parasite makes safe its lodgment on the roof of the mouth. The author thus describes it.

"Among the fish that at this early season of the year (February) resort to the waters of York River, in Virginia, the Alewife, the Oldwife, called also the Bay Alewife, arrives in very considerable shoals, and in some seasons their number is almost incredible. They are fully of the size of a large herring, and are principally distinguished from the herring by a bay or red spot, above the gill-fin. They are, when caught from March to May, full-roed and fat, and at least as good a fish for the table as the herring.

"In this season each of these Alewifes carries in her mouth an insect about two inches long, hanging with its back downwards, and firmly holding itself by its fourteen legs to the palate.

"It is with difficulty it can be separated, and never perhaps without injury to the jaws of the fish. The fishermen, therefore, consider the insect as essential to the life of the fish; for when it is taken out, and the fish is again thrown into the water, he is incapable of swimming, and soon dies. I endeavoured in numerous instances to preserve both the insect and the fish from injury, but was always obliged either to destroy the one or injure the other.

"I have sometimes succeeded in taking out the insect in a brisk and lively state. As soon as he was set free from my grasp, he immediately scrambled nimbly back into the mouth of the fish, and resumed his position. In every instance he was disgustingly corpulent, and unpleasant to handle, and it seemed that, whether he had obtained his post by force or favour; whether he be a traveller or constant resident, or what else may be his business where he is found, he certainly fares sumptuously every day.

"The fish whose mouth he inhabits comes about the same time with the shad into the rivers of Virginia from the ocean, and continues to travel upwards from the beginning of March to the middle of May. As long as they are caught on their passage up the river, they are found fat and full of roe. Every fish which I saw had the Oniscus in his mouth, and I was assured, not only by the more ignorant fishermen, but by a very intelligent man, who came down now and then to divert himself with fishing, that in forty years' observation he had never seen a Bay Alewife without the louse."

The Oniscus itself, as the author states, is not without its enemies, many of them being caught with two or three leeches attached to their body, and adhering so closely that their removal cost them their heads.

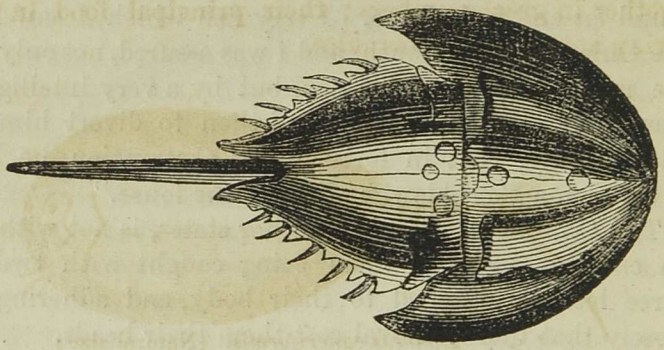
The Molucca Crab, (*Polyphemus gigas.*)

Why the singular creature here represented should have the name Polyphemus given to it, is hard to guess. Polyphemus, as every school-boy knows, was the fabled giant overcome by Ulysses, who is represented as having one eye in the centre of his forehead; whereas this creature has two eyes and one horn. It is interesting from its being so nearly allied to many very minute species.

The Polyphemus sometimes reaches the length of two feet: there are but two species, which only differ from each other in the shape of their buckler. That we have represented is found in the Indian Ocean, and has been called the Molucca Crab.

The tail, or rather the horn, of the Polyphemus is greatly dreaded by the fishermen, from the idea that its wound is venomous. The natives employ it to point

their arrows, and as they are in the habit of poisoning the points of these weapons, it is most likely from this circumstance that the idea we have noticed originated, for there is no other ground for the belief.



Polyphemus gigas.

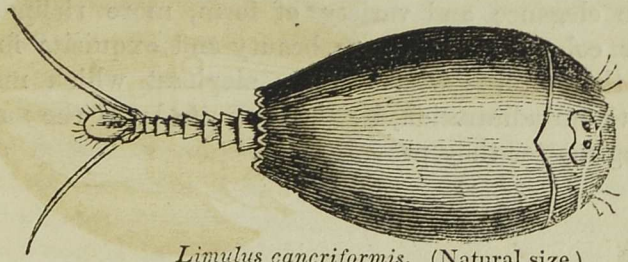
During the night-time they lie half out of the water, and are then very easily taken, as they appear to take but little notice of anything until their danger becomes imminent.

It is but a small portion of their flesh that is considered good for food, but the eggs which are very numerous, are reckoned a delicacy.

These crabs are in the habit of leaving the water and walking to a considerable distance over the wet sands,—but if incommoded by the sun, they hurry back as fast as they are able to their native element. When walking, none of their legs are visible. Most authors say that, if this Crab is laid on its back, it must inevitably perish, unless the waters return in time, but one observer asserts that it has the ower of righting itself with the assistance of its tail.

The Crab-like Limulus, (*Limulus cancriformis.*)

The Limuli are found in deep ditches of fresh water, marshes, &c.; they are frequently met with congregated together in great numbers; their principal food in the Spring appears to be tadpoles.



Limulus cancriformis. (Natural size.)

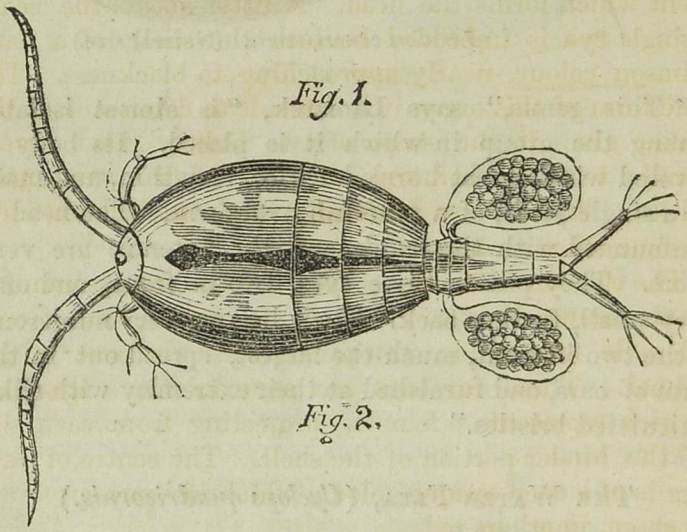
"This genus," says Lamarck, "is almost isolated among the group in which it is placed. Its body is covered with a great horny buckler, very thin, and made of a single piece, of a roundish oval form. The head is confounded with the trunk, and the antennæ are very short. They possess three eyes, two in front, and one, very small, further back. Their legs are very numerous, —the two in front, much the largest, spread out in the form of oars, and furnished at their extremity with silky articulated bristles."

The Water Flea, (*Cyclops quadricornis.*)

There are as many as twelve known species of the Water Flea. That represented in the engraving is extremely common, and forms a most interesting object for the microscope. We have availed ourselves of

Mr. Pritchard's popular description of this curious creature.

"The Author of Nature, to whom all things are alike easy of execution, as if intending to teach man a lesson of humility, and that no part of creation, however minute, is beneath his consideration, has conferred on these animals, that are barely perceptible to our unassisted vision, more elegance and variety of form, more richness in their colouring, and more beauty and exquisite finishing, than on the whale or the elephant, which mainly excite our admiration, by the magnitude of the mass of living matter they present to us.



Cyclops quadricornis. (Fig. 1, highly magnified; fig. 2, natural size.

"These little crustaceous animals may be found at all seasons of the year, near the surface of the water: they are, however, most abundant in July and August. I

have collected great numbers of them on a warm day in the latter month, with a small cloth net, immersing it about an inch below the surface. They are mostly colourless in ponds covered with herbage, but in small collections of rain-water, on a loamy soil, are of a fine rich colour.

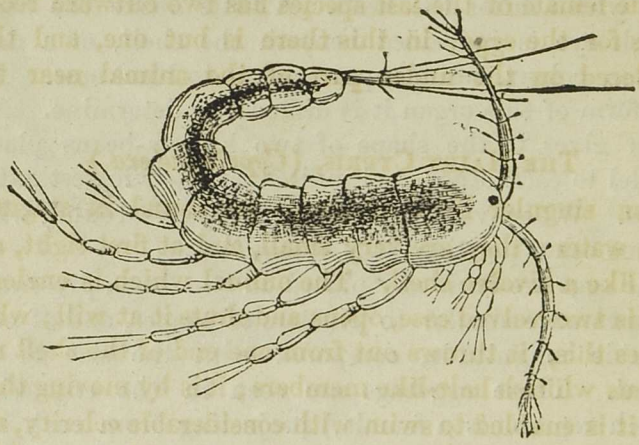
"The body of this creature is covered with crustaceous or shelly plates, which overlap each other, and admit both of a lateral and vertical motion between them. Their ends do not meet on the side, but have sufficient space between them for the insertion and play of the organs of respiration. The rostrum, or beak, is short and pointed: it is a prolongation of the first segment which forms the head. A little above the beak, a single eye is imbedded beneath the shell, of a dark crimson colour, nearly approaching to blackness. The true form of this organ it is difficult to determine. Mr. Baker gives it the shape of two kidney-beans placed parallel to each other, and united at their lowest extremities. When viewed laterally it appears round, while in some other positions it is square."

The eggs are curiously placed in two bags, presenting an appearance similar to clusters of grapes, and of considerable magnitude, compared with the size of the animal. These egg-bags are seen in the engraving, (which represents a female,) projecting from each side of the hinder portion of the shell. The centre of each egg is of a deep opaque colour, which in some specimens is green, in others red.

The young of the Cyclops, when first excluded from the egg, are extremely minute, and so different from the mother that Müller has described them as forming two distinct genera.

The Small Water Flea, (*Cyclops minutus.*)

This species of the Water Flea differs from the last, in having its body divided into a greater number of segments; it is also much smaller; it is equally active with that last described, but its form renders it more graceful in its motions. "These little creatures," says Mr. Pritchard, "seem to possess great discernment and cunning; for, if approached, they remain motionless on the plant on which they reside, in the apparent hope that they may be overlooked; but when a fit opportunity occurs, they suddenly bend the body, and spring away with a kind of vaulting leap."



Cyclops minutus, much magnified.

They inhabit the various species of confervæ, and may often be met with in great numbers on the stalks and underside of healthy duckweed, growing on the surface of the water. They are most numerous in April and May, and disappear as the heat of the season in-

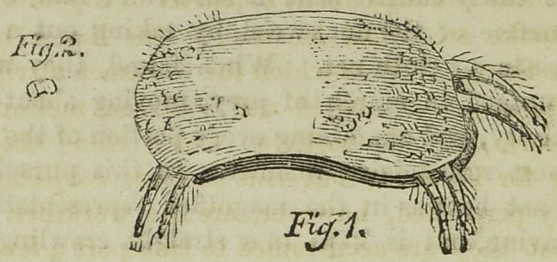
creases. They will not live in stagnant water containing much decomposed vegetation, and require, therefore, to be kept for observation in a large vessel of clean water. They are easily caught after a shower of rain, on the under surface of the duckweed, by taking out a little with a basin or cloth net. When found, they appear busily engaged in search of prey, moving about with great activity, and examining every portion of the plant in the most scrutinizing manner. In this pursuit the body is not bent as in the magnified representation in the engraving, but is kept in a straight crawling position. Their natural length is about the three hundredth part of an inch.

The female of the last species has two outward receptacles for the eggs; in this there is but one, and that is placed on the under part of the animal near the tail.

The Hairy Cypris, (*Cypris pubera.*)

These singular little creatures are found in stagnant fresh water: they are very small, and at first sight, appear like a bivalve shell. The animal which is enclosed in this two-valved case, opens and shuts it at will; when it does this, it throws out from one end of the shell numerous whitish hair-like members; it is by moving these that it is enabled to swim with considerable celerity, and it never stops until it meets with some object on which it can rest. Its two antennæ, which issue from the fore part of the shell, are long, very flexible, and bent backwards; their articulations are numerous, which gives them great freedom of motion. The movements of these antennæ contribute materially to the swimming powers of the creature.

At the place where the head is united to the body, a small black point is seen,—this is the eye of the animal.



Cypris pubera. (Fig. 1, highly magnified; fig. 2, natural size.)

The Cypris changes its shell like the rest of the Crustacea; it is found in marshes where vegetable substances are growing. Sometimes they are so numerous, that the water appears covered with them; they are more usually found in Spring and Autumn than at any other part of the year; from this it is inferred that there are two broods in the course of the year.

The drying up of marshes, during the Summer heats, destroys immense numbers every season. It appears, however, from observation, that in this case, some of these tiny creatures manage to bury themselves in the mud, where they hermetically close their shells, and remain in a kind of dormant state, until rain or other causes have again filled the marshes with water.

A species nearly allied to this, the *Artemia Salina* the Lymington shrimp, or brine-worm, is able to live in the brine of the salt-pans, which is so strongly impregnated with salt, as to destroy any other Crustaceous animal.

Myriads of these animalculæ are to be found in the salterns at Lymington, in the open tanks or reservoirs, where the brine is deposited previous to boiling. A pint of this brine contains about a quarter of a pound of salt. These tanks are called clearers, as the liquor becomes clear in them, an effect which the workmen attribute, in some degree, to the rapid and continual motion of the brine-worm, or the particles which cloud the liquor serving for its food; but this is mere conjecture. So strongly persuaded, however, are the workmen of this fact, that they are accustomed to transport a few of the worms from another saltern if they do not appear at their own. They increase astonishingly in the course of a few days.

It is observable that the brine-worm is never seen in the sun-pans, where the brine is made by the admission of sea-water during the Summer, and which are emptied every fortnight; but only in the pits and reservoirs, where it is deposited after it is taken out of the pans, and where some of the liquor constantly remains, when it becomes much diluted with rain-water. From October till May, (during which time the manufacture is at a stand,) a few only of the worms are visible; but, at the approach of Summer, young ones appear in great numbers.

THE END.

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