THE

ANIMAL KINGDOM

ARRANGED IN CONFORMITY WITH ITS ORGANIZATION,

BY THE BARON CUVIER,

MEMBER OF THE INSTITUTE OF FRANCE, &c. &c. &c.

WITH

SUPPLEMENTARY ADDITIONS TO EACH ORDER,

BY

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CORRESPONDING MEMBER OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, &c.

AND OTHERS.

VOLUME THE TWELFTH.

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THE

MOLLUSCA AND RADIATA.

ARRANGED BY THE

BARON CUVIER,

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BY

EDWARD GRIFFITH, F.L.S., A.S., *&c.*

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known; but it is only by conjecture that we can judge of the functions of their singular organs.

The POLYPI, which compose the fourth class, are all those little gelatinous animals, whose mouth, surrounded with tentacula, conducts into a stomach, sometimes simple, sometimes followed by intestines in the form of vessels. It is in this class that those innumerable composite animals are found, with a fixed and solid stem, which for a long time were regarded as marine plants.

It is customary to place subsequently to them the thethyæ, and sponges, although no polypi have yet been discovered in them.

Finally, the INFUSORIÆ, or fifth and last class of the zoophytes, are those little beings which have been discovered only by the microscope, and which swarm in stagnant waters. The majority of them present nothing but a gelatinous body, without viscera. Nevertheless, we have at their head some more complex species, possessing visible organs of motion, and a stomach. Of these, too, in all probability, at some future day, a separate class will be formed.

THIRD CLASS OF THE ZOOPHYTES.

THE ECHINODERMATA.

THE Echinodermata are as yet the most complicated animals of this division. Invested with a well organized skin, often supported by a sort of skeleton, and armed with points, or with articulated and mobile spines, they have an interior

cavity, in which distinct viscera are floating. A sort of vascular system, which, in truth, does not extend to the whole body, keeps up a communication with divers parts of the intestine, and with the organs of respiration, which, most generally, are also very distinct. We even observe in several species, some filaments which might perform the nervous functions, but which are never distributed with the regularity, and in the fixed order, which exists in the other two divisions of invertebrata.

We divide the echinodermata into two orders: those which have feet, or at least vesicular organs, to which this name has been given, and those which are destitute of them.

FIRST ORDER OF ECHINODERMATA.

THE PEDICELLATA

ARE distinguished by organs of motions altogether peculiar. Their envelope is pierced by a great number of small holes, placed in very regular series, through which pass some cylindrical, membranaceous tentacula, terminated each by a small disk, which performs the office of a cupper. The part of these tentacula which remains in the interior of the body is vesicular. A fluid is spread through all their cavity, and is carried, at the will of the animal, into the external cylindrical part, which it extends, or it re-enters into the internal vesicular part, and then the external part sinks in. It is by elongating and contracting in this manner, their hundreds of little feet, or tentacula, and fixing them by the cuppers, which

terminate them, that these animals execute their progressive movements. Some vessels proceeding from these little feet, repair to the trunks, which correspond to their ranges, and which end at the mouth. They form a system distinct from that of the intestinal vessels which are observed in some species.

Linnæus makes of these animals three genera, very natural, but sufficiently numerous, and comprehending species sufficiently varied to be considered as three families.

ASTERIAS, *L.* Vulgò, *Sea-stars*, or *Star-fish*.

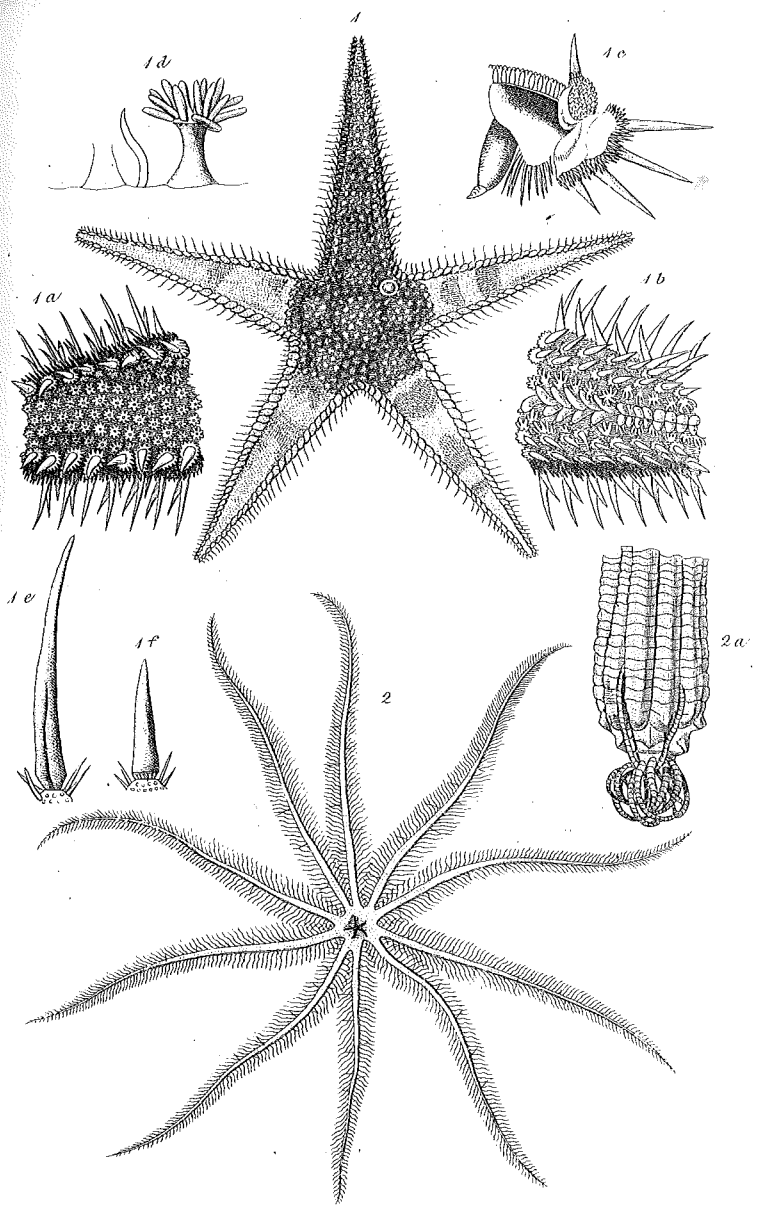
Have received this name, because their body is divided into radii, most frequently five in number, at the centre of which, underneath, is the mouth, which at the same time serves as anus.

The frame-work of their body is composed of small osseous pieces, variously combined, the arrangement of which would merit investigation. They have a very great power of reproduction, and not only reproduce the radii, which have been taken away separately, but a single ray with the centre being preserved can reproduce the others, which is the cause that we so frequently find them irregular.

In the

ASTERIAS, *Lam.*,

Or Asterias, properly so called, each ray has, underneath, a longitudinal furrow, on the sides of which are pierced all the little holes which allow the feet to pass. The rest of the inferior surface is provided with small mobile spines; the entire surface is also pierced with pores, which allow some tubes much smaller than the feet to pass, which probably serve to absorb the water, and to introduce it into the general cavity for a kind of respiration. On the middle of the body, a little towards the side, is a small stony plate, to which corresponds



1 *Asterias aurantiaca.*

2 *Comatula carinata. Lam.*

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internally, a canal filled with calcareous matter, which is believed to contribute to the growth of the solid parts. Internally, is seen a large stomach immediately upon the mouth, from which proceed, for each ray, two cœca, ramified like trees, and each suspended to a sort of mesentery. There are also two ovaries in each ray, and it appears that the asteriæ fecundate themselves. A peculiar vascular system corresponds to their intestine, and there is another for the feet.

M. Tiedemann considers as their nervous system, a very fine filament which surrounds the mouth, and sends a branch to each arm, which proceeds externally between the feet, and gives forth two ramuscula internally.

Their osseous frame-work consists principally, for each branch, in a sort of column predominating along the inferior face, composed of vertebræ, articulated one with the other, and from which proceed the cartilaginous branches, which support the external envelope. Between the roots of these branches are the holes through which the feet pass. Other osseous pieces, to which mobile spines are frequently attached, furnish, in many species, the lateral edges of the branches.

Certain asteriæ have the form of a pentagon, with rectilinear sides, rather than that of a star. The radiation is marked externally only by the sulcus of the feet. (*Asterias discoïdea*, Lam.)

Others have, on each side of the pentagon, a slight re-entrant angle. (*Asterias membranacea*, Link.)

In others, the sides are concave, which begins to give them the figure of a star. (*Asterias tessalata*, Lam., &c.)

In these different species, the cœca and the ovaries are not as much elongated as in the majority of the others, which have their radii elongated, and separated by well marked re-entrant angles.

Such are

Ast. rubens, L. Encyc. cxiii. 1, 2. which is exceedingly

common on all our coasts, so much so, that in some places it is employed to manure the grounds.

Ast. glacialis, L. Link. xxxviii. 69. Encyc. cvii. and cviii. is frequently more than a foot in diameter; the spines which invest the upper part of its body are surrounded with a multitude of little fleshy tubes, which form sorts of cushions around their bases.

Ast. aurantiaca, L. Link. vi. vii. xxiii. Encyc. cx. Echin. pl. iv. 1., is our largest species. The edges of its branches are furnished with pieces, like mosaic work, on which some strong mobile spines are articulated. All the upper part is covered with some other small spines, terminating in truncated and bristling heads.

Some have a number of rays above five. Their cœca and ovaries are very short. (*Ast. paposa*, Link.)

We must separate from the other asteriæ, the species in which the rays have no longitudinal furrows underneath, for the purpose of lodging the feet; in general, these rays are not hollow, and the stomach is not prolonged into cœca, but its prominences remain in their intervals. Locomotion is effected principally by the curving and the movement of the radii, and not by the feet, which are too few in number.

M. de Lamarck names *Ophiures* those which have round a central disk five radii not branched. But we should still distinguish

Those in which these radii are furnished on each side, with mobile spines. The small fleshy feet also issue forth on each side from between the basis of these spines. (*Ast. nigra*, Müll., &c.)

And those in which the radii, having no lateral spines, but being furnished with imbricated scales, resemble the tails of serpents. The central disk, has, in each interval of the rays, on the side where the mouth is, four holes which penetrate into the interior, and serve, perhaps, for respiration, or, according to others for the issue of the eggs. There are no feet, except in five short furrows, which form a star around the mouth. (*Ast. ophiura*, Lin., &c.)

The GORGONOCEPHALA, *Leach*, named *Euryale*, by M. de Lamarck, are those in which the radii are divided into a double point. There are some in which this division commences from the base of the radii, and which present the appearance of a parcel of serpents. They have been vulgarly named *heads of Medusa*. The base of each ray has two penetrating holes. (*Asterias caput Medusæ*, &c.)

But there are also some in which the division commences only at the end of the ray, and is but little repeated. (*Euryale palmiferum*, Lam.)

We should still separate from the other asteriæ

The ALECTO of *Leach*, which M. de Lamarck calls *Comatula*. They have five large articulated radii, divided each into two or three, which support two ranges of articulated filaments. These five radii are attached to a stony disk which again supports, on the side opposite to the mouth, one, two, or three ranges of other articulated filaments without branches, shorter and thinner than the large radii, and which, it is said, enable them to hook themselves to bodies. The sac which contains the viscera is at the centre of the large radii, opened by a star-formed mouth, and another tubular orifice, which may be the anus. (*Asterias multiradiata*, &c.)

It is near the comatulæ that we should place

ENCRINUS, *Guett.*,

Which may be defined to be comatulæ, with a disk prolonged into a stem divided into a great number of articulations. Their branches themselves are articulated, and divided into pairs of branches, supporting a range of filaments, all articulated, and the stem itself supports some smaller ones, at

various heights. In the centre of the radii is the mouth, and the anus on one side.

There is in the seas of Europe but one very small species, *Pentacrinus Europæus*, Thomson, Monogr., which is attached to divers lithophytes.

The seas of the warmer climates produce larger and more complex species, such as *Encr. asterias*, Blum., *Isis aster.*, Linn.

But the fossil encrini are very numerous, and vary sufficiently in detail to be divided into several subgenera, according to the composition of the central body, placed at the summit of the stem, and from which the large radii proceed.

This body may be formed of pieces articulated with the stem, and supporting radii by similar articulations. Then if the stem is round and enlarged at the top, these are the APIOCRINITES, *Mill.*

If it is round, but not enlarged, the ENCRINITES.

If it is pentagonal, the PENTACRINITES.

Or this body may be formed of angular laminæ, joined together by their edges, and forming several ranges.

Among those

The PLATYCRINITES have but two ranges, one of three laminæ, the others of five.

The POTERIOCRINITES have three ranges, each of five plates.

The CYATHOCRINITES have also three, each of five, but the last has some intercalary laminæ, which may increase it even up to ten.

The ACTINOCRINITES have several ranges, the first of three, the second of five, the others more numerous. The first two have radiated crests.

The RHODOCRINITES have also several ranges, the first

of three, the second of five, the third of ten, all three with crests; then follow some with more numerous laminæ.

Finally, the central body may be all of one piece, but which appears to be composed of five cemented together. These are the EUGENIACRINITES.

The fossil productions, known under the name of Entrochi, are pieces of the stem and of the branches of animals of this genus.

ECHINUS, *Lin.* Vulgò *Sea urchins.*

Have the body clothed with a testa, or calcareous crust, composed of angular pieces, which join exactly, and are pierced with several very regular ranges of innumerable small holes, through which pass the membranous feet. The surface of this crust is armed with spines articulated on little tubercles, and moveable at the will of the animal, to whose motions they administer, conjointly with the feet, which are situated between them. Other membranous tubes, much finer, and often divided at their extremity, probably serve to introduce and to expel the water which fills the interior of their shell. The mouth is furnished with five teeth, enchased in a very complicated calcareous frame-work, resembling a lantern with five panes, furnished with divers muscles, and suspended in a large aperture of the testa. These teeth, in the form of long bands, grow hard towards their root, in proportion as they are worn at the point. The intestine is very long, aud attached spirally to the interior parietes of the testa by a mesentery. A double vascular system runs along this canal, and extends partly over the mesentery, and there are also particular vessels for the feet. Five ovaries situated around the anus empty themselves each by a particular orifice. They form the eatable part of these animals.

The echini subsist more especially on small testacea, which they seize with their feet. Their motions are very slow.

Their testæ are preserved in great abundance in ancient strata, especially those of the chalk formation, when they are usually filled with silex.

The echini should be divided into regular and irregular.

The regular

ECHINI, (properly so called) *Lam.* CIDARIS, *Klein.*

Have the testa generally spheroidal, the mouth at the middle of their inferior face, and the anus precisely opposite. The little holes are ranged there on six bands approximated by pairs, which proceed regularly from the mouth to the anus, like the meridians of a globe.

Certain species have large and thick prickles of very various forms, supported on thick tubercles of the testa, and the bases of which are surrounded with other smaller prickles. (*Echinus mamillatus*, L., &c.)

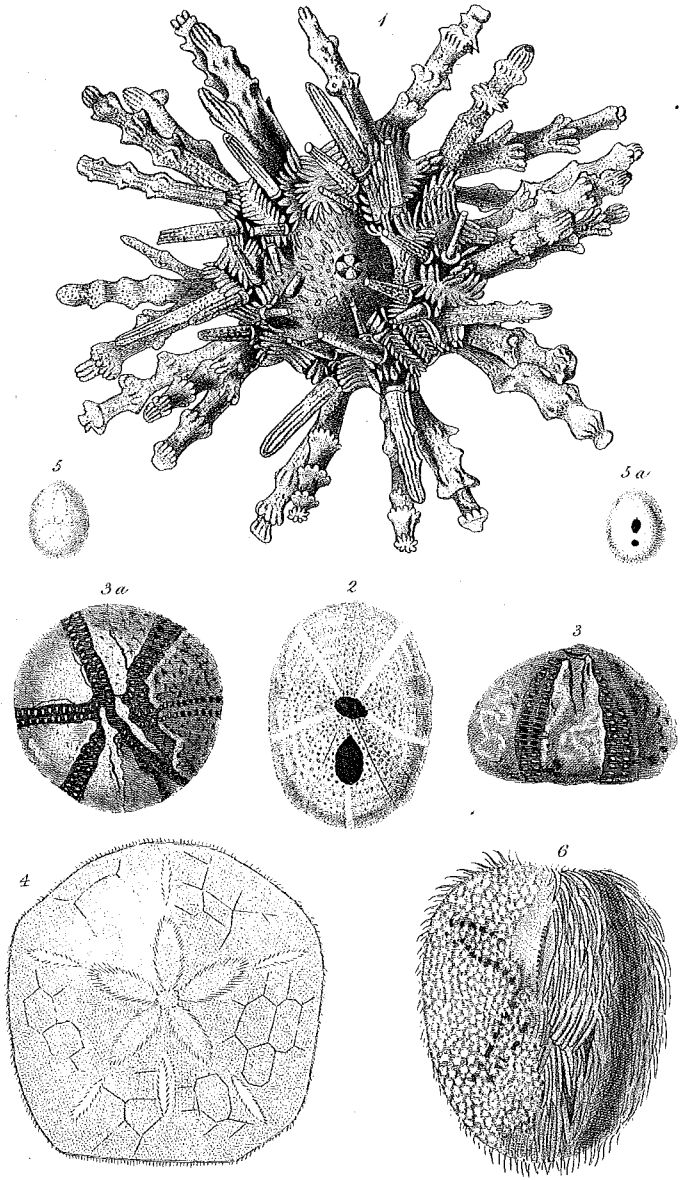
It is among these species that are ranged, as M. de Luc has discovered, those whose prickles, in the form of olives, are frequently found petrified in chalk or other ancient formations, and have received the name of *Judaic stones.*

The most common species, and especially those of our coasts, have only slender spines, articulated on small tubercles, much more numerous. Such is

ECHINUS ESCULENTUS, *L., Klein., Lesk.*, I. *A. B., Encyc.* 132.

Of the form and size of an apple, all covered with short, striped tubercles, usually of a violet colour. Its ovaries are eaten in spring uncooked, they are reddish, and of a flavour sufficiently agreeable.

The neighbouring species are difficult enough to distinguish, being marked by the greater or less approximation of the bands of holes, by the equality or inequality of the tubercles, &c. (*Ech. miliaris*, Kl., &c. &c. &c.)



1 *Echinus verticillatus.*
2 *Echi. semilunaris.*
3 *Galerites scrasciata.*
4 *Scutella hexapora.*
5 *Fibularia ovulum.*
6 *Spatangus pilosus.*

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Some round and depressed echini lose something of their regularity by a wide sulcus, with which they are furrowed on one side. (*Ech. sinuatus*, Kl.)

There are also some of these echini with mouth and anus opposite, which, instead of having the spheroidal form on a circular plane, are transversely oval, that is to say, one of their horizontal diameters is larger than the others. (*Ech. lucunter*, Kl.)

They also differ among themselves by the equality or inequality of the prickles, and by the relative proportions of the tubercles.

One species should be distinguished,—*Echinus atratus*, L. Encyc. 140. 1—4, in which the prickles, widened, truncated, and angular at their extremity, touch each other there, like pavement. Those of the margin are long and flatted.

We call irregular, all the echini in which the anus is not opposite to the mouth. It appears that they are furnished only with short and slender prickles, almost like hairs. Among them some still have the mouth at the middle of the base. They may be subdivided, according to the extent of the bands of holes for the feet. Sometimes these go, as in the preceding, from the mouth to a point directly opposite, or they unite after having embraced the entire testa. In the former, the

ECHINONE, *Phelsum* and *Leske*,

Have the round or oval form of certain regular echini, the mouth at the middle of the base, and the anus between the mouth and the margin, or near the margin, but underneath; oval species, *Echinus cyclostomus*, Müll., &c.; round species, *Ech. depressus*, Walch, &c.

NUCLEOLITES, *Lin.*,

Have, with these characters, the anus near the margin, but above.

The known species are all fossil. (*Spatangus depressus*, Leske.)

Others,

GALERITES, *Lam.* CONULUS, *Kl.*,

Have a flat base, on which their body is raised like a cone, or a semi-ellipsoid figure. The mouth is at the middle of the base, and the anus near its margin.

They are very common in rocky strata, but no living species are known.

The most extended is *Ech. vulgaris*, L. Encyc. 153. 6—7. Klem. Ed. Fr. VII. D. G.

Some have not their bands of holes distributed in the quinary number. *Ech. quadrifasciatus*, Walch, &c.

SCUTELLA, *Lam.*,

Have the anus between the mouth and the margin, the testa exceedingly depressed, flat underneath, and of a form approaching to orbicular.

Some have it entire, and without any other holes than the series of little pores which are seen in all the echini.

Others have the testa equally, without large holes, but divided by two emarginations. (*Echinus auritus*, Seb., &c.)

Others have it entire, and pierced from interval to interval, by some large holes which do not penetrate into its cavity. (*Echinus hexaporus*, Seb., &c.)

Others have it at once emarginated, and pierced with three large holes. (*Echinus tetraporus*, Seb.)

There are some, in fine, ROTULÆ, *Kl.*, in which a part of the posterior margin is festooned, like a dentated wheel, and these are divided according as they have large holes. (*Ech. decadactylus*, Encyc.;) or according as they want them, (*Echinus orbiculus*, Encyc.)

CASSIDULUS, *Lam.*,

Are oval, and have the anus above the margin, like the

nucleolites, but they are distinguished by their incomplete bands of pores, that is to say, not proceeding from one pole to the other, and figuring a star. (*Cassidulus Caribæorum*, Lam.)

Other irregular echini have not the mouth at the centre of their base, but it is towards one side, often transversely, and directed obliquely. The anus is towards the other side. They are subdivided according to the extent of their ranges of holes.

Thus the ANANCHITES, *Lam.*, GALEÆ, *Kl.*, have a little the form of the Galerites, and their complete bands, their greatest difference, consists in the position of the mouth. They are only known in the fossil state. Such is

ECHINUS OVATUS, *L.*, *Cuv. et Brong.*

(Envir. de Paris, 2d. edit. f. v. 7. A. B. C. D.)

A species extended in innumerable quantities in the chalk formations of our environs.

Some have four bands. (*Ech. quadriradiatus*, Kl.)

We may make a particular subgenus of certain species, in which the four lateral bands are disposed by pairs, and do not rejoin at the same point. (*Ech. bicordatus*, Kl.)

At other times these irregular echini, with central mouth, have bands of pores which do not lead to the mouth, but which form on their back a sort of rose. Such are

CLYPEASTER, *Lam.* ECHINANTHUS, *Klein.*,

Which have the anus near the margin, and whose body is depressed, with oval base concave underneath. They have sometimes the contour a little angular. (*Ech. rosaceus*, and its varieties, *Kl.*)

Sometimes their back is elevated in the middle. (*Echinus altus.*)

There are some also whose contour is not angular. (*Ech. oviformis*, Seb.)

And even where it is almost orbicular. (LAGANUM, *Klein. Echinus orbiculatus.*)

FIBULARIA, *Lam.* ECHINOCYAMUS, *Leske.*,

Have, with the rose of the clypeaster, the body almost globular, and the mouth and anus approximated in the middle of the under part. They are usually very small. (*Echinus nucleus*, Kl., &c.)

On the contrary, SPATANGUS, *Kl.*, have, with the lateral mouth of the ananchites, some incomplete bands of pores, forming a rose on the back. There are usually but four; that which is directed from the side of the mouth is obliterated.

Some, BRESSOIDES, *Kl.*, have the testa oval, without furrows. (*Ech. teres*, Seb.)

Others have a large sulcus more or less marked, in the direction of the obliterated band. (*Ech. spatangus*, Seb., &c.)

When, besides this, they preserve the oval form, they are BRISSUS, *Kl.*, but sometimes this sulcus grows deep, and the testa widening at the same time on this side, assumes the figure of a heart. (*Ech. purpureus*, Müll, &c.)

We have some in our seas of the last two forms. Branched tentacula, like those of the holothuriæ, have been observed round the mouth.

HOLOTHURIA, *Lin.*,

Have the body oblong, coriaceous, and open at the two ends. At the anterior extremity is the mouth, surrounded by very complicated branched tentacula, which can be completely retracted. At the opposite extremity opens a cloaca, where terminate the rectum and the organ of respiration, in the form of a hollow tree, very much ramified, which is filled with

water, or emptied at the will of the animal. The mouth has no teeth, and is furnished only with a circle of osseous pieces. Some appendages, in the form of pouches, pour a saliva into it. The intestine is very long, diversely plicated, and attached to the sides of the body by a mesentery. A sort of partial circulation takes place in a very complicated double system of vessels, exclusively relative to the intestinal canal, and in a part of the meshes of which, is interlaced one of the two respiratory trees of which we have just spoken. There also appears to be a nervous cord, but very much attenuated, around the œsophagus. The ovary is composed of a multitude of blind vessels, partly branched, which all terminate at the mouth by a small common oviduct. They assume, at the time of gestation, a prodigious extension, and are then filled with a red matter, which appears to be the eggs. Some cords, of an extreme sensibility, attached near the anus, and which are developed at the same time, appear to be the male organs. These animals must, then, be hermaphrodites. When they are disturbed, they frequently contract themselves with so much force that they tear and vomit up their intestines[1].

The holothuriæ may be divided according to the distribution of their feet.

In some, they are all situated in the middle of the under part of the body, which forms a softer disk, on which the animal crawls, elevating the two extremities where the mouth and anus are placed, which they contract more than the middle. The anus finishes almost in a point. Their tentacula are very large when developed.

We have one in our seas whose envelope is almost scaly, *Hol. phantapus*, L. Müll., Zool., Dan. cxii. cxiii. Mem.

[1] For the anatomy of Holothuriæ, consult M. Tiedemann's excellent work already referred to.

de Stok., 1767. The feet of its central disk are on three series.

Others have the inferior face altogether flat and soft, furnished with an infinity of feet, and the superior face gibbous, supported frequently by osseous scales, and pierced on the front, with a star-like orifice, which is the mouth, and from which the tentacula issue; and on the back part with a round hole, which is the anus.

We have a small one, *Hol. squamata*, Müll., Zool., Dan. x. 1, 2, 3; but there are some of these of a tolerable size in the warmer seas.

Others have the body cartilaginous, flatted horizontally; trenchant at the edges; the mouth and feet at the inferior face, and the anus at the posterior extremity.

Such is in the Mediterranean,

Pudendum regale, Fab., Column, Aquat. xxvi. 1. *Hol. regalis*, Nob., a species more than a foot in length, three or four inches broad, and crenulated all round.

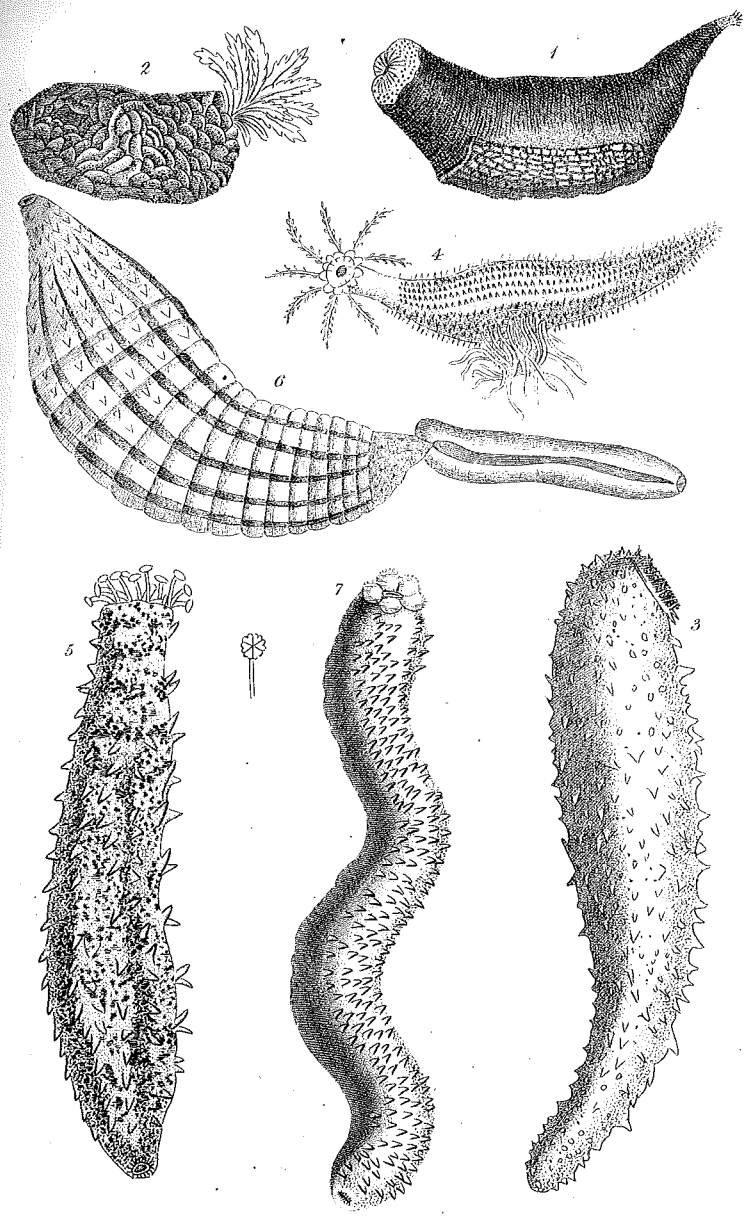
Others, again, have the body cylindrical, susceptible of enlargement in every direction by the absorption of water; all the under part furnished with feet, and the rest of the surface variously bristled.

Our seas, especially the Mediterranean, produce in great abundance one of blackish colour, which is more than a foot long in its greatest extension. Its back is bristled with conical and soft points; its mouth is furnished with twenty branched tentacula; it is the *Holothuria tremula*, Gm., Bohatch., Anim. mar. vi. and vii.

Some are found in which the feet are distributed in five series, which extend like the ribs of a melon, from the mouth to the anus, which has caused them to be called sea-cucumbers.

Such is in our seas.

Hol. frondosa, L. Gunner, Mem. de Stok. 1767. pl. iv. f. 1,



1 *Holothuria phantopus.* 4 *Hol. fuscus.*
2 *Hol. squamata.* 5 *Hol. cucumer.*
3 *Hol. elegans.* 6 *Hol. caouari.*
7 *Hol. edulis.*

London, Published by Whittaker & Co. Ave Maria Lane 1834.

2. and cxxiv. The body is brown, and a foot or more in length.

Finally, there are some whose body is equally furnished with feet all round. (*Hol. papillosa*, &c.)

THE SECOND ORDER OF ECHINODERMATA,

OR

ECHINODERMATA APEDICELLATA,

COMPREHEND but a small number of animals, which present great relations with the holothuriæ, but which want the small vesicular feet of the preceding order. Their body is clothed with a coriaceous skin, and without armature. Their internal organization is not yet cleared up on all points.

MOLPADIA, *Cuv.*,

Have, like the holothuriæ, a coriaceous body, in the form of a thick cylinder, open at the two ends, and their internal organization is pretty similar to that of those animals; but, besides that they want feet; their mouth has no tentacula, and is furnished with an apparatus of osseous pieces, less complicated, however, than that of the echini.

I know but a single species belonging to the Atlantic Ocean, the extremity of whose anus is finished in a point. (*Molpadia holothurioïdes*, Cuv.)

MINYAS, *Cuv.*,

Have also the body without feet, and open at the two ends; but its form is that of a spheroid depressed at the poles, and furrowed like a melon. I can find no armature to the mouth.