ON THE SEXES, ORGANS OF REPRODUCTION, AND MODE OF DEVELOPMENT, OF THE CIRRIPEDS. ACCOUNT OF THE MAIDRE OF THE FISHERMEN, AND DESCRIPTION OF SOME NEW SPECIES OF CRUSTACEANS.

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SECT. I.—ON THE MALE OF THE BALANUS.

It has hitherto been a question whether the sexes in the Cirripeds are distinct as male and female, or are combined in the same individual; and the opinions which have originated from this, are both very numerous, and at the same time contradictory. No two authors agree as to the anatomy and physiology of the generative organs of these animals. The various and contradictory nature of the opinions regarding this question in relation to the organs of generation, is sufficient to cast a doubt upon the correctness of any one of them. The Cirrhipeda have, until lately, always been looked upon as mollusca, and this is, without doubt, the cause of so much confusion and uncertainty.

Mr Hunter, who was the first author that examined the anatomy of these animals with any degree of care, states his opinion concerning the organs of generation in the following terms. "It is most probable that all Barnacles are of both sexes and of the first class, viz. self-impregnators, for I never could find two kinds of parts, so as to be able to say or even suppose the one was male the other female." He describes what he supposes to be the tubular portion of the testicle, the vasa deferentia, and the penis, but at the same time makes no mention of an ovary. The erroneous conclusions to which Hunter came in regard to the true nature of these organs, must have arisen from the circumstance of his having examined unimpregnated specimens only. 44. 10. 12. 2.

Cuvier has the same opinion as to the hermaphroditic characters of the Cirripeds, but differs from Hunter as to the anatomy and physiology of the generative organs. What Hunter supposes to be the testicle, Cuvier considers the ovary; the vasa deferentia as the oviducts, and the penis as the ovipositor; at the same time stating his belief that the ova are impregnated as they pass through the ovipositor. He was led to form these opinions from finding what he considered to be the ovary filled with small granules which he supposed were ova.

Some other authors again, along with whom we find Sir Everard Horne, consider that these organs already spoken of, and thought by Hunter and Cuvier to be the only organs of generation, are merely the male organs, and that the ovary is situated in the peduncle; also that impregnation takes place by means of the organ which Hunter termed the penis. This opinion relative to the existence of the ovaries in the peduncle of the animal is incorrect. The mistake has evidently arisen from the ova being found in this part of the body after their escape from the ovaries. They are deposited in this place by the ovipositor until they are sufficiently matured to be expelled from the body of the parent animal. Likewise, there is no appearance whatever of any glandular structure in this part of the animal, which could be addueed in support of this opinion.

In looking over these various opinions, we find that Cuvier's is the one which approaches nearest to fact in regard to the female organs of generation. If a common Balanus (*Balanus balanoides*) is taken from the rock during the month of April, and the enclosed animal examined, the oviducts, or what Hunter termed the vasa deferentia, will be found filled with an immense number of minute yellow granules. These are the ova. After a period, they pass along the oviducts and ovipositor; the organ which Hunter termed the penis; and are introduced in this way into the interior of the shell, or rather into the cavity which exists between the body and mantle of the animal. The ova are arranged in irregular layer-like masses at the bottom of this cavity, and sometimes it is completely filled with them. At this season the ovipositor is constantly bent downwards and inwards along the right side of the body

of the animal. The ova, when within the oviducts, as has been already stated, are of a globular shape; but as they escape, or shortly after they are lodged in the cavity of the mantle, they assume an ovoid shape, sharper at the posterior extremity than the anterior. When sufficiently matured to be expelled from the body of the mother, which may be either immediately before or after the young animal bursts through the ovisac, they are carried out in successive currents at each retraction of the cirri.

From the above statements it will be seen that Cuvier's opinion as to the nature of the granules which he observed in the ovary was correct, viz. that they were ova. So that the organ which Hunter considered as the male secreting organ, is in fact the ovary. The only other part, then, which could act as an impregnating organ, was the tubular proboscidiform organ, which, according to some authors, has a glandular structure near its base, and which is considered by them to be analogous to the testicle. Nothing, however, will be found in this organ having a glandular appearance or structure, so as to allow us to maintain this opinion.

From the above observations, then, it will be seen that the animal which has heretofore been considered as a hermaphrodite, has organs of generation essentially female, and that impregnating organs are altogether awanting. The conclusions, therefore, which we are bound to draw from these observations, are, first, that the Cirripeda are not hermaphrodites, that the sexes must be separate; and second, that the male must exist as a separate and distinct individual.

Mr J. V. Thompson, whose opinion is of the greatest weight in regard to the history of these animals, says, when speaking of the small crustaceous-like animal which he afterwards found to be the larva of the Balanus,—"Circumstances induced a belief that they were the larva or disguised state of some crustaceous animals, or (as it had been previously ascertained, that the Cirripedes were crustacea), that they were the *males* of these, not being disposed to believe that the two sexes were united in the same individual. In favour of this idea, too, it may be observed, that the males of many crustacea are remarkably less in size and different in aspect, as in the Caligi and

Bopyri, and also that in some they are rarely met with, and only at a particular season." Again, the same author says, "From a consideration of the whole history of these animals, are we to conclude that they have the *sexes united?* A fact so much at variance with what we see in all the rest of the Crustacea may authorize a degree of scepticism."

Having then satisfied myself that the Cirripedes were not hermaphrodites, and seeing, at the same time, that, in as far as the young or larva were concerned, these animals were really crustaceous, and having also these statements of Mr J. V. Thompson's before me, I was led to suppose that the sexes were distinct, and that the male animal would be found to resemble that of the lower Syphonostomous Crustacea, such as the Lernæa, &c.* The male of the Lernæa is always found attached near to the external oviducts, and in some cases upon that part of the body in which the ovary is situated, as in Anchorella uncinata. This being the case, it was thought that the male of the Balanus would be found in an analogous position. Under this supposition the ovipositor was carefully examined in a very great number of cases, at all seasons of the year; but nothing in the shape of a separate animal could be observed.

During the beginning of the month of May (1843), however, while engaged in examining specimens of the *Balanus balanoides*, in the hopes of still finding my supposition correct, a small fleshy body was observed, not on the ovipositor, but on the body of the animal, immediately over the ovaries. This body was adhering with a considerable degree of firmness, and on being placed in a separate vessel of sea-water by itself, it was found to be alive, and to bear a great resemblance in its external appearance to a Lernæa.

On making a more minute examination, the anterior part of the body was found to be minute and crustaceous, consist-

* Professor Edward Forbes of the King's College, London, in a course of lectures on Zoology delivered by him in Edinburgh during the years 1840–41, drew an analogy between the Lernææ and the Pedunculated Barnacles, in so far as regards the external oviducts of the former, and the pedicles of the latter, both of these organs being considered by him as parts of the organs of generation,—receptacles for the purpose of bringing the ova more safely to a state of maturity.

ing of six articulations. The eyes are two in number, black, shining, and pedunculated. The antennæ are four in number, and are generally in constant motion. Owing to the apparent disproportion of the two divisions of the body, this animal is entirely unfitted for locomotion; but the crustaceous or anterior division is constantly moving backwards and forwards.

We shall proceed, then, to describe in detail this animal, being of opinion that it cannot be other than the male of the Balanus. (Plate IV. Fig. 10.)

The whole animal is of a straw colour, the anterior or crustaceous portion being of a lighter shade. The body, as already stated, consists of two parts, an anterior and a posterior; the former of which is minute, crustaceous, and composed of six articulations; the latter is unarticulated, large, fleshy, lobulated, and contractile. It has also a number of fleshy extremities, which apparently represent feet. A long, fleshy, tail-like appendage also arises from the mesial line posteriorly. The anterior part of this portion of the body is trilobate, and projects above and beyond the crustaceous portion of the body, altogether concealing it from view when the animal is lying in the natural position.

The first segment of the crustaceous portion is the largest of all the six, and is of a semicircular shape. It supports the masticatory apparatus, two pairs of antennæ, the two eyes, a pair of strongly pectinated organs, and a pair of long, sharp, claw-like members. (Plate III., Fig. 3, *a*.)

The eyes are large, shining, black, and pedunculated, and, as far as could be made out, were to a certain extent mobile.

The first or anterior pair of antennæ are each composed of a single large, flat, scale-like joint, which has its extremity armed with seven or eight long, delicate filaments, the two first of which are biarticulate. Each of the external antennæ consist of nine joints, the two first of which may be considered as peduncular; the last seven are much more delicate and slender, and have each of them a spine at the distal and anterior extremity; the ninth has the extremity armed with two or three long and very delicate spines.

The mouth is situated at the posterior part of this segment. It appears to be suctorial; but, from the extremely minute

size of this portion of the body altogether, this has not as yet been made sufficiently out.

A very strongly pectinated scale arises from the base of the first pair of antennæ, one on each side. These arise almost from the mesial line, and cover the anterior antennæ. The posterior edge is armed with seven or eight long, sharp, and powerful teeth. Another pair of strong claw-like extremities arise from the base of the anterior antennæ, which last are directed backwards.

The feet are ten in number, five on each side. Each of them consists of six articulations, the last of which is armed with a strong terminal claw. The first, second, and third pairs are rather short, and have the last articulation spherical. The fourth pair are large and powerful, but the fifth are much more slender. The extremities are apparently unfitted for locomotion, and are therefore generally bent in upon the abdominal surface of the body, except the last pair, which appear to be constantly moving about.

The four middle segments of the body have their external edges inflected beneath the body to within a little of the mesial line. The posterior edges of these inflections are strongly pectinated, after the same manner as the organs at the bases of the first pair of antennæ. These are, doubtless, for the purpose of retaining a firm hold of the female during the act of copulation.

The external organs of generation are situated at the base of the last pair of feet; they are articulated, and a slender vessel, the vasa deferens, runs from the base of each round to the dorsal aspect of the segment to the testicle, which is probably situated in the soft portion of the body. (Plate III., Fig. 6, *b*).

The soft portion of the body consists of three parts; these are separated by means of neck-like contractions, which divide the portion into three equal sections. The first of these is trilobate, and has been already described. The second has two arm-like extremities arising from each side of it, representing, as it were, anterior extremities. These run backwards, and taper very gradually to a point. The third or last division of this part of the body has also two extremities of the same appearance as the last, together with a third tail-like extremity,

which arises from the mesial line, and lies between the two last described.

In looking over the above description, we cannot fail to see the points of affinity between it and the larva described by Mr J. V. Thompson, and which are of considerable importance, such as the pedunculated eyes, &c. It has also many connecting points with other crustacea—to the Lernææ by means of its soft fleshy body, and to the higher crustacea by means of its pedunculated eyes and antennæ.

From the researches of Mr Thompson relative to the metamorphosis of the Cirriped, there can be little doubt of the relation which they bear to the Crustaceans. There was only one point which could make this relation at all doubtful, viz., the hermaphroditic character of the Cirriped, seeing that one of the great fundamental distinctions between the higher and lower Articulata, is the separation of the sexes in the former, and their combination in the latter. From this circumstance, it would have been impossible to have admitted of the junction of the Cirriped and Crustaceans, which had heretofore been considered as belonging to two separate classes.

Looking upon the above described animal, then, as the male of the Balanus, we completely break down this only objection, a circumstance which must now entirely decide the question as to the crustaceological character of the Cirriped.

As to the objections which may be raised against this animal being the male of the Balanus, it may be asked, why has it not been observed before? This question may be met in more ways than one. It is a fact consistent with our knowledge of the Crustacea, that the males of many species become visible during certain seasons only; also, that one impregnation is sufficient for several generations. Now, these very facts are known, and have been proved to take place amongst the very species of Crustaceans with which the Cirriped must be arranged. These facts must serve to strengthen our opinion as to the natural arrangement of the Cirripeds in the animal kingdom.

The male of the Balanus becomes visible, without doubt, at certain seasons only. During the season of love, the posterior portion of the body which seems to contain the organs of gene-

ration, is much enlarged; and after the act of impregnation has been fulfilled, these organs become atrophied for a season. Looking upon this suggestion, then, as the true one, it cannot be wondered at that the anterior part of the body, which is so very minute, should escape observation within the body of the female animal. It is also a curious fact, and supports the above suggestions, namely, that in those specimens where the ova have reached the mantle, the male is not seen, having only been found in those as yet apparently unimpregnated. Since there are many points of similitude between this animal and others of the Crustacea, it may be well to direct attention to some of these.

To the Lernææ, in general, it has many points of connection, but to none so nearly as to those belonging to the "Tribes des Ergasiliens" of M. Edwards, and to the only species of the genus Nicothoa of that tribe it has a most striking likeness. The Cirripeds, however, are analogically connected to this tribe in many respects. The larvæ of the Lernææ and Cirripeds resemble one another very closely in their internal as well as external structure. The larvæ of both are free animals; but as they arrive at maturity, the females become permanently fixed and monstrous, and the males are attached to the body of the female, upon or near to the organs of generation. The organs of locomotion are situated round the mouth, and to a considerable extent act as organs of respiration. The young of both are endowed with organs of vision, which in after life become extinct—in all cases in the Cirripeds, and in almost every instance in the Lernææ.

These facts will shew the near connection which the two sets of animals have to one another, and that it is a more close relation than that of mere analogy which exists between them. In fact, the Cirripeds may be considered as Lernææ, the former being attached to animate, the latter to inanimate bodies. This last assertion, however, is not altogether correct, inasmuch as we find species of Cirripeds attached to the skins of the Cetacea.

There are some other points of similitude between the male Cirriped and the Crustaceans, but these are of less note. It is connected to the Podothalma by means of its eyes; and to the

Isopoda by means of the structure of its feet, and the anterior division of its body.

The natural size of this animal is (when the organs of generation are at their highest state of enlargement) about a line in length, and a line in breadth. In some cases, however, it is rendered much larger from being infested with a parasitic crustacean. This parasite is an Isopod belonging to the family *Ioniens* of M. Edwards, and which will form the type of a new genus in that family. (Plate III., Fig. 7).

Of this parasite, we shall now proceed to give a short description. It infests the soft part of its victim only, and sometimes in very considerable numbers. When brought under the field of the microscope, it was found to belong to that section of the Isopodous crustaceans, termed by M. Edwards, the Sedentary Isopods. It is about the fourth of a line in length, almost colourless, except in the middle of the body, where it is of a dark brown colour. The body consists of seven segments, of which the second appears to be the longest; this one, however, seems to be also articulated, although very indistinctly, and is probably composed of five segments instead of one, seeing that the five pairs of legs arise from this part of the animal's body.

A long triarticulate antenna arises from each side of the first segment near to its posterior and external angle. The two first joints are the thickest, and both of them conjoined are almost equal in length to the third, which has its extremity armed with two spines.

Five pairs of very short, but thick and powerful, legs arise from the following segments or segment:—

Each of them is three pointed; the first joint is thick and short, the second much more slender, and the third or last is spherical, armed at its extremity with a small claw.

From each side of the six following segments of the body, there arises a long flattish scale, each of which scales has its extremity armed with two, three, or four long filamentous, slender, spines, which are quite stiff and directed backwards. The two last, or terminal of these scales, are the strongest, and also the longest, the spines gradually decreasing in length as they approach nearer to the anterior extremity.

When this animal is taken from its natural habitat, its mo-

tions are very feeble, and it is apparently quite helpless. The organs of sight seem to be awanting, or are very minute, the habits of the animal being such as not to require them. The ova are large, and gradually lengthen out into the form of a double cone, as the animal is ready to burst through the ovisac.

SECTION II.—ON THE LARVA OF BALANUS BALANOIDES.

During the greater part of the months of April and May of this year (1843), the water around the Island of May has been darkened with innumerable shoals of the young of the common Balanus. These Cirripeds adhere, in vast numbers, to the sides of the precipitous rocks beneath low water-mark.

A number of these were taken from the rocks, and those which were found to be loaded with spawn were put into a separate vessel by themselves, and the water regularly changed upon them until the young animal escaped. In this way their development and structure was made out satisfactorily.

In those where the ova had but recently escaped from the ovaries, these were closely packed together in the bottom of the cavity of the mantle, in large and firm layers; but as they became more matured, these masses became more broken up and disconnected, and gradually disappeared as the young were expelled from the body of the mother.

The appearance put on by the ova, shortly before the young animal has burst from the ovisac, is that represented in Pl. IV., fig. 13; it is semitransparent, and the motions of the animal may be observed through the membranes.

The larva, shortly after its escape from the ovum, is represented in Pl., IV., fig. 15. The body is of a pyriform shape, being large and rounded anteriorly, while it is small and pointed posteriorly. It is almost colourless in some parts of its body, but the general shade is dark brown, which is deepest in the centre.

The eye is large, of a black colour, is situated in the mesial line, near the anterior edge; it is of a quadrate shape. Almost in a line with the eye, and from the lateral edge of each side of the body, there arises a short horn-like process which curves slightly forwards.

The body is composed of a number of segments, which are most numerous at its posterior extremity; the last segment is armed with three sharp strong spines which project backwards.

This animal has three pairs of extremities, the first of which is single, and the other two are double. The first extremity is composed of a greater or less number of long spines. The two following pairs of extremities are each double, or composed of two parts, which arise from a common peduncle. The anterior part is articulated, but the posterior consists of one piece only, which is almost as large as the anterior or articulated portion. Each of these divisions is armed with a great number of long spines. The third or last extremity is formed in the same way as that last described, but is not so large.

After the Balani have been about a week in existence, they put on the appearance represented in Pl. III., fig. 8. They have changed in their appearance to a very considerable extent, are rather larger and much more active in their habits, than those which had escaped from the ovum more recently.

A large segment has originated at the anterior part of the body, and the horn-like processes described formerly, now form the posterior and external angles of this segment; it also supports the first pair of feet, which are constantly directed forwards, and are now apparently composed of three segments only.

The eye is large, shining, black, and quadrate.

The remaining part of the body is pyriform, composed of several segments, and having the two remaining extremities arising from each side of it. The tail consists of two long spines, which arise from each side of one of the last segments of the body. These spines are almost equal in length to the body, and they are strongly serrated on their external edges. The first pair of legs arise from the anterior part of the first segment of the body; they consist of a peduncle, which is composed of two or more segments, and of two separate portions which arise from the peduncle, and which are formed in the same way as those of the former stage. The last pair of legs is also formed in the same way.

SECTION III.—ON THE LARVA OF BALANUS TINTINNABULUM.

There is no set of animals which has caused greater annoyance to systematists than the Cirripeda.

They were first arranged by Linnæus, along with the testaceous mollusca. Cuvier at first followed this arrangement; but latterly placed them in a distinct class by themselves between the Mollusca and Articulata. Lamarck, Latreille, M'Leay, and other authors followed this latter arrangement; the two last authors acknowledging, at the same time, their closer connection with the Articulata.

The decision of this important question, however, was left to our countryman, Mr J. V. Thompson. This gentleman having obtained some minute mussel-like animals, at first considered them to be nondescripts belonging to the Crustaceans, but on a further examination, and by keeping a few of them alive in glass-vessels of sea-water, he was soon enabled to make out their nature and relations satisfactorily. To use Mr Thompson's own words—"They were taken on the 1st of May, and on the night of the eighth the author had the satisfaction to find that two of them had thrown off their exuvia, and wonderful to say, were firmly adhering to the bottom of the vessel, and changed into young barnacles." The above mentioned statements set at rest, in a great measure, the previous discussions as to the position of the Cirripeds in the animal kingdom.

In the beginning of March of the present year (1843), while Professor Reid of St Andrews and myself were watching the movements of some very large balani (*Balanus Tintinnabulum*), we observed a few of them ejecting with considerable force a great quantity of small granules every time the cirri were retracted. No great attention was paid to this at the time. Next day, however, we were astonished to find the basin in which the balani were confined swarming with an innumerable number of extremely minute but very active animals, when it immediately struck us that these must have been the young which the balani were throwing off the day before. On placing one of these animals under the microscope, we expected to find one of these mussel-like animals described by Thompson; but instead of that, it had an almost exact resemblance to the young of the genus *Cyclops*. To make sure that there had been no mistake, one of the adult balani was opened, when the large cavity of the mantle was found to be filled with the granules which we had formerly seen ejected. A few were placed

in a watch-glassful of sea-water under the microscope. They were quite motionless, of an ovoid shape, sharper at one extremity than the other (Pl. IV., fig. 12). The eye, or rather what was considered to be the eye, was observed a little before the middle line, and near to the superior edge. In the course of a short time, a few began to make some efforts to escape. After they had done so, they were found to resemble, in their external appearance, the young cyclopides alluded to above. At first, the efforts to escape were feeble, but latterly they became more violent; and by means of the tail, which was suddenly and forcibly jerked upwards and downwards, the membranes which contained them were burst on the abdominal surface, upon which the young animal escaped. It was some time, however, before the extremities were completely freed. In the course of ten or fifteen minutes after they had been taken from the body of the mother, these young animals were all free, and the empty sacs were lying amongst them. They have a striking resemblance, in their external appearance, to the larvæ of the cyclops; and if we had not had the certain evidence of having seen them taken from the body of the mother, we would have pronounced them young Cyclopides.

After many fruitless endeavours, we found it impossible to preserve them alive for any length of time, and were, therefore, disappointed in our expectations of seeing them undergo their metamorphoses. We were, therefore, uncertain whether they underwent a first and second metamorphosis, and changed first into the mussel-like form described by Thompson, and then into the parent form, or were simply metamorphosed into the parent form. Seeing that this is a distinct species from that described by Mr Thompson, it is impossible to decide this question until farther observations have been made. Having been fortunate enough, however, in making a series of observations of the same nature on the young of the *Balanus balanoides*, which are recorded above, it will now be seen that this question is already decided, viz. that the balani must undergo two changes of form, or perhaps more, before arriving at a state of maturity.

We will now proceed to give a short description of the larva of this species (Pl. IV., fig. 11).

When viewed from above, the body of the animal is found

to be pyriform, with the anterior edge rounded, and the posterior extremity ending by means of a point. The whole body consists of three segments: the first forms the greater part of the body; the two last are minute. Two long unarticulated extremities project from the anterior edge on either side of the mesial line, arising, apparently, from the abdominal surface of the body. Two short antennæ arise also from this edge, immediately on each side of the above described extremities.

The eye is situated a little behind the anterior edge, and in the mesial line of the body.

Two very strong thick legs arise from each side of this first segment of the body. These are bipartite, each division arising from a pedicle common to both, which consists of three segments. The divisions themselves are apparently unarticulated, but are armed with a number of very strong spines.

The second segment of the body is minute. The third and last is also minute and pointed, and is armed with three strong spines, which are bent to one side (the left side), that nearest the right side being the shortest.

All of these larvæ swim after the manner of the monoculi, by short and sudden jerks. They propel themselves by means of the two pairs of spined extremities. The tail is also in constant motion.

SECTION IV.—ON THE MAIDRE OF THE FISHERMEN.

Hearing our fishermen often speak of "something" which abounded in great quantities in the Firth of Forth during the summer months, which they called *Maidre*, and of which they never could give me a clear description, I determined to examine it for myself.

It was stated to me that this *maidre* was generally found in greatest quantity round the Island of May, *only* during the summer months, and especially during the time of the herring-fishing.

I find, however, that *maidre* must abound during the spring months also, as the stomachs of the herrings caught at present are in most cases filled with it.

In frequent excursions to the Isle of May, during last year,

I found that the maidre consisted of one immense continuous body of minute animals.

The animals composing this immense body were those belonging to the Cirripeds, Crustaceans, and Acalepha.

Of these the Crustaceans existed in the greatest numbers, or rather *masses*, for it gives a faint idea to speak of numbers. The Crustacea were Amphipoda and Entomostraca, the former of which were very abundant, but the latter (Entomostraca) formed the greatest proportion of this innumerable body of animals.

The Acalepha also abounded, of which the different species of Beroce were seen in greatest numbers.

I remarked that the masses of *maidre* abounded most at the sheltered sides of the island. On looking into the water, it was found to be quite obscured by the moving masses of Entomostraca, which rendered it impossible to see anything, even a few inches below the surface.

But if, by chance, a clear spot is obtained, so as to allow the observer to get a view of the bottom, immense shoals of coal-fish are seen swimming lazily about and devouring their minute prey in great quantities. Occasionally small shoals of herrings are seen pursuing them with greater agility. It is in the deep caverns, however, in the sides of the island, where the *maidre* is found in greatest abundance; and accordingly, we find that all those animals pursuing them are found there in greater abundance also.

The fishermen, during the earlier periods of the fishery take advantage of this, and, shooting their nets across the mouths of the caves, alarm the herrings in them, either by throwing large stones from their boats or from the tops of the rocks —and in this way sometimes succeed in taking great shots.

These, however, are not the only animals which prey on the immense bodies of *maidre*.

Great numbers of cetacea often frequent the neighbourhood of the island at this time; droves of dolphins and porpoises, swimming about with great activity; and occasionally an immense rorqual may be seen raising his enormous back, at intervals, from the water, and is to be observed coursing round and round the island.

I have examined great numbers of these cetaceous animals

(dolphins and porpoises) within the last few years, and never have seen anything resembling the remains of herrings, or fish of any other kind, in the stomach, although the former fish was very abundant at the same time in the Firth. I make no doubt, therefore, that these cetacea only accompany the herring in pursuit of their common food, viz., Entomostraca and Acalephæ.

I have already stated that it was entromostracous animals which formed the great mass of the *maidre*. Among these I obtained a great number of nondescript species, one of which I shall now describe.

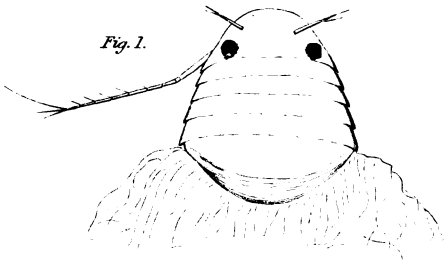
On one of my occasional visits to the Isle of May, I observed that at a considerable distance from the island the sea had a slightly red colour, that this became deeper and deeper as we neared the island; and also that the surface of the water presented a very curious appearance, as if a quantity of fine sand were constantly falling on it. I thought at first that this last circumstance proceeded from rain, but presently I found that both phenomena were caused by a great number of small red Entomostracea, which I had never before observed in such abundance. On further observation, I found that it belonged to the genus Cetochilus of M. Rousel de Vauzeme, who has given a detailed description of his species (C. Australis), the only one hitherto known, in the 1st vol. of the *Annales des Sciences Naturelle*. This author states, that it is found in the Pacific Ocean, and in the middle of the Atlantic Ocean, about 40 degrees south latitude. It forms, he says, very extensive banks, which impart a red colour to the water, and which furnish a plentiful supply of food to the whales frequenting those seas.

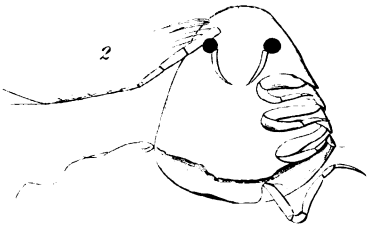
Description of Plates.—Plate III.

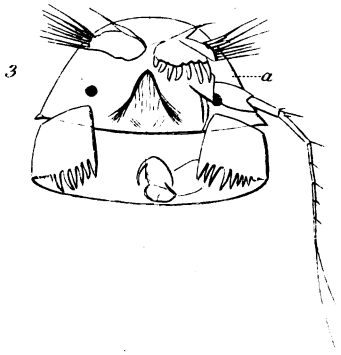
Fig. 1. Dorsal aspect of the anterior part of the body of the male Balanus. 2. Abdominal do. 3. Abdominal aspect of the first and second segments of do.; *a*, first segment. 4. Third pair of legs. 5. Fourth pair of legs. 6. Fifth pair of legs; *b*, external organs of generation. 7. Parasite. 8. Second stage of the Larvæ of Balanus Balanoides.

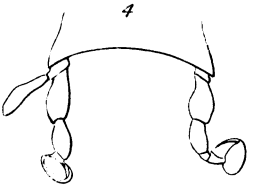
Plate IV.

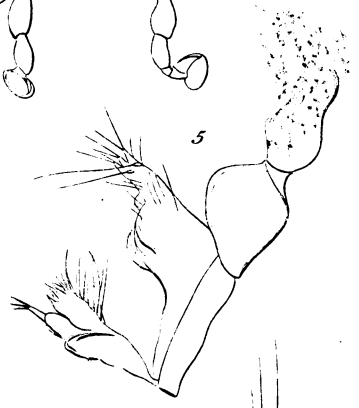
Fig. 10. Male of Balanus Balanoides, abdominal aspect. 11. Larvæ of Balanus Tintinnabulum. 12. Ovum of do. 13. Ovum of Balanus Balanoides. 14. Natural size. 15. First stage of Larva of Balanus Balanoides. 16. Natural size. 17. Larvæ of Pedunculated Cirriped, drawn after a figure of Thompson's in the Philosophical Transactions for 1835. 18. Natural size of the male Balanus.

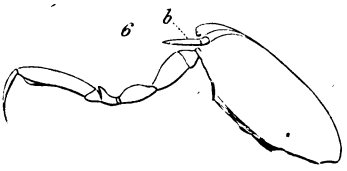


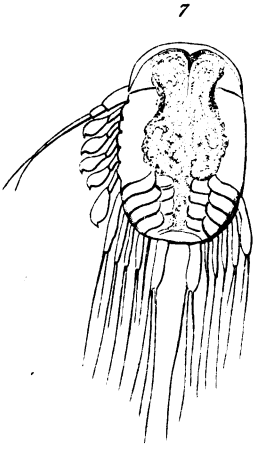


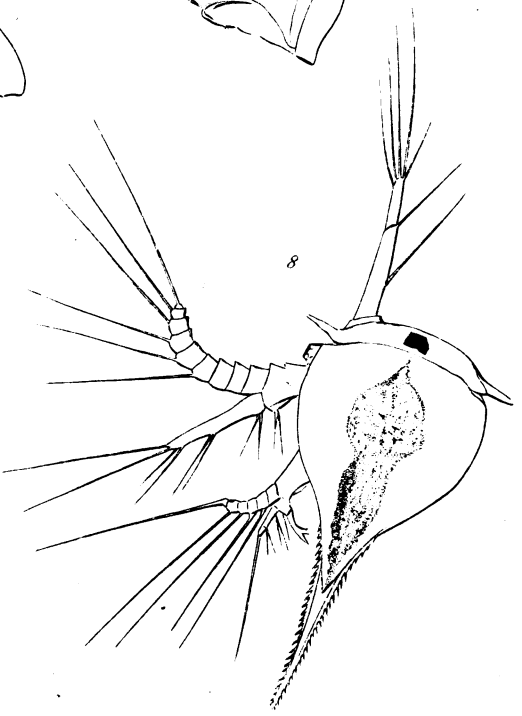






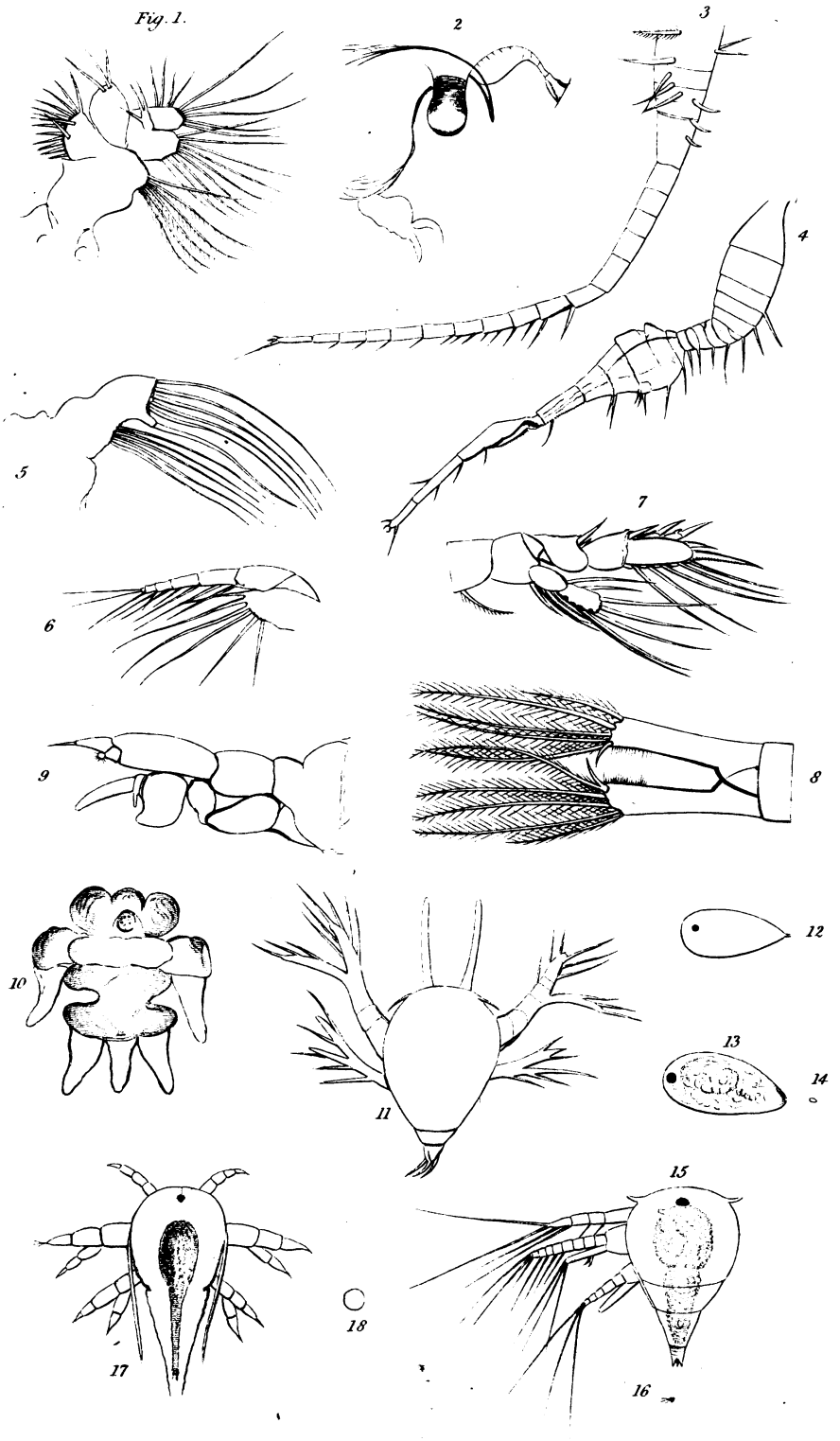






H. Goodsir. Delt

J. G. Mitchell. Sc



H. Gordair, Delt.

J. G. Mitchell, Sc.