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THE ANNALS  
AND  
MAGAZINE OF NATURAL HISTORY,

INCLUDING  
ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'MAGAZINE OF BOTANY AND ZOOLOGY,' AND OF  
LOUDON AND CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY  
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VOL. IV.—SECOND SERIES.  
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“Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exulta; malè doctis et barbaris semper inimica fuit.”—  
**LINNÆUS.**

. . . . . The sylvan powers  
 Obey our summons; from their deepest dells  
 The Dryads come, and throw their garlands wild  
 And odorous branches at our feet; the Nymphs  
 That press with nimble step the mountain thyme  
 And purple heath-flower come not empty-handed,  
 But scatter round ten thousand forms minute  
 Of velvet moss or lichen, torn from rock  
 Or rifted oak or cavern deep: the Naiads too  
 Quit their loved native stream, from whose smooth face  
 They crop the lily, and each sedge and rush  
 That drinks the rippling tide: the frozen poles,  
 Where peril waits the bold adventurer's tread,  
 The burning sands of Borneo and Cayenne,  
 All, all to us unlock their secret stores  
 And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.



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ERRATA.

Page 162, 4 lines from top, for *Podopikumnus* read *Notopocorystes*.  
——, 12 ———, for *Notopocorystes* read *Basinotopus*.

THE ANNALS  
AND  
MAGAZINE OF NATURAL HISTORY.

[SECOND SERIES.]

No. 23. NOVEMBER 1849.

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XXXI.—Notice of the occurrence on the British coast of a  
*Burrowing Barnacle belonging to a new Order of the Class*  
*Cirripedia.* By ALBANY HANCOCK, Esq.\*

[With two Plates.]

I HAVE recently procured a very curious little animal belonging to the class *Cirripedia*, interesting not only on account of its modification of form, but also from its habit of burying itself in the substance of dead shells. The first individuals obtained were concealed in a broken specimen of *Fusus antiquus* procured by the Rev. G. C. Abbes from the fishing boats at Whitburn in the county of Durham, and fortunately preserved on account of the fine specimens of *Cliona gorgonioides* which it contained. Since then I have got this Cirripede alive from the boats at Cultercoats, also in *Fusus antiquus*: it has likewise occurred in *Buccinum undatum* from the same locality. And on breaking an old specimen of the former, which has been many years in my collection, it was found to have been extensively attacked by this novel parasite. Indeed almost every dead specimen of the large *Fusus* brought in by the fishermen from deep water is more or less affected by it; and the only wonder is that it should have remained so long undetected. This perhaps may be explained by the fact that this animal only attacks dead shells, and always, as far as I have yet observed, from the inside, so that it is scarcely to be seen until the shell is broken. The columella is the chief seat of the ravages of this creature, though the sides of the whorls do not by any means escape, especially if the individuals are numerous. When quite young they enter the sound shell, and as they grow enlarge their residence, which is always of the exact size and form of the tenant.

It is interesting to remark how completely this animal, toge-

\* Read at the Meeting of the British Association for the Advancement of Science held at Birmingham, Sept. 12, 1849.

ther with *Cliona*, destroys the shells of the larger mollusks of our coast. *Cliona* enters by the outer surface of the living shell, and rapidly spreads over the whorls; but it is not until after death that the inner surface becomes much affected by it. Then this Cirripede commences its ravages on the columella, which it soon deprives of more than half its substance, and afterwards so reduces it and the inner surface of the whorls, that this once secure retreat of the mollusk, losing all power to resist external forces, speedily becomes a crumbling ruin.

Little is to be seen externally,—a small slit in the shell or matrix marks the position of the head (Pl. VIII. figs. 1 & 2 *b*). This slit, which is one-eighth of an inch long, is rounded and gradually enlarged towards one end, and tapers to a tolerably fine point at the other, which is generally a little bent. At this extremity the shell is mostly stained of a reddish hue (Pl. VIII. figs. 1 & 2 *a*)—the stain being well-defined and of an ovate or fan-like form, increasing in size for about  $\frac{2}{3}$ ths of an inch backwards, and having a few pale radiating lines, which converge towards the slit; on these lines there are a few minute punctures irregularly distributed; but whether for functional purposes, or merely accidentally resulting from the close approximation of the animal to the surface, could not be determined: they are not unfrequently partially closed up with calcareous matter.

The stain is caused by the animal appearing through, which lies immediately below the surface of the matrix. This must be broken before the animal (Pl. VIII. figs. 3, 4, 5) can be removed, and then it is found to be  $\frac{1}{2}$ ths of an inch long, and  $\frac{2}{12}$ ths of an inch wide at the broadest part, of an irregular ovate form considerably depressed behind, *b*, where it expands into a broad circular disc; and narrow and compressed in front, *a*, forming a sort of produced neck or head with a longitudinal slit, *c'*, on the upper surface;—the general form resembling considerably a Roman lamp, the slit representing the orifice for the passage of the wick. The produced portion or head corresponds to the valvular part of the pedunculate Cirripede, and contains the body and arms or feet,—the slit being analogous to the usual opening for the passage of these prehensile organs: there are, however, no shelly plates whatever, the mantle being soft, fleshy and highly contractile, having the surface distinctly marked with fine longitudinal muscular fibres below; this part arches deeply into the matrix, and joins rather abruptly the under surface of the depressed disc-like portion of the animal considerably behind the posterior end of the longitudinal slit. The margins of this slit are perfectly straight, thickened, and have somewhat the appearance of horn, but cannot be considered as forming distinct plates, though they compose, as it were, two valvular lips (figs. 3 & 5 *c*),

which can be closed or opened at the will of the animal; in front they gradually blend with the mantle, behind they are deeply notched, and each terminates in a projecting, slightly curved point, *d*. The external surface of these valvular lips is furnished with numerous, minute, irregularly disposed, rather stout, curved spines, very transparent and of a crystalline appearance. The circular, depressed, disc-like portion of the animal, corresponding to the pedicle of the pedunculate Barnacles, is slightly arched below, where it is pale, soft, fleshy, and as highly contractile as the anterior portion or head: the upper surface is flat, and has in the centre a broadly ovate, horny plate (figs. 3 & 5 *e*), most distinct in old individuals, but never entirely covering the part, the margins always extending beyond it. This plate is of a reddish horn-colour, and is generally furnished with a few indistinct radiating ridges and tubercles corresponding to the radiating lines and punctures seen on the surface of the matrix.

The animal, as before stated, lies immediately below the surface of the matrix, and is entirely free except at a point just behind the slit, *g*, and in front of the horny plate where there is a strong muscular attachment to the upper wall of the chamber. The longitudinal opening of the animal corresponds to the slit on the surface of the matrix: this opening is kept pretty accurately plugged by the thickened valvular lips of the animal, except when it is in watch for its prey, at which time a slight opening in front permits the passage of the prehensile arms (Pl. VIII. figs. 3, 6 & 7 *f*, *d* & *e*, and Pl. IX. fig. 1). These occupy the same position within the head or neck as they do in the valvular part of the pedunculate Cirripedes, being placed immediately in front of the mouth. They differ however considerably from those of all other Cirripedes. The arms of this animal are only six in number; they are short and set in a circle on the extremity of a soft, fleshy, cylindrical pedicle (fig. 6 *c*), which is undoubtedly a prolongation of the true body of the animal; the circle opens a little behind in the direction of the mouth. The arms are each composed of three articulations, the first or lowest being much the longest, the last the shortest; they are all furnished with a few hairs on the margins and extremities: the four arms next the mouth have attached to their inner margins at the junction of the first and second articulations an oval cushion-like body (Pl. VIII. fig. 9, and Pl. IX. fig. 1 *δ b*) placed longitudinally, and wrinkled transversely, most probably for the purpose of prehension. Immediately behind the arms projects a large conical body (Pl. VIII. fig. 6 *f* and fig. 7 *a*) containing the mouth (fig. 6 *e* & fig. 7 *e'*), which is placed near the base in front towards the circle of arms. The greater portion of

this body is composed of the upper lip, which differs considerably from that of the other Cirripedes. In this it is delicate and horny, being enormously developed and surmounted by a sort of rostrum (figs. 6 & 7 *g* & *h*), which projects upwards and forwards and terminates in a slightly produced obtuse point; the dorsal margin (fig. 7 *c*) is carinated and minutely denticulated. There are three pairs of mandibles as in the other Cirripedes: the outer pair, *f*, are each apparently composed of three articulations, the third or terminal one being much compressed, forming an irregular oval plate, with the upper end terminating in a tooth-like process curved inwards; the two other articulations are much narrower, but on account of their minuteness and delicacy their form could not be determined with accuracy. Only two articulations were observed in the second pair of mandibles, *g*; the inner or first articulation is long, thin and straight, with the extremities enlarged, and of an irregular form; the outer or second joint is very similar to that of the outer pair; it is however provided with two incurved teeth or spine-like processes at the upper extremity. The innermost or third pair of mandibles, *h*, are rather wide, squarish plates with three or four stoutish hairs on their upper margin.

At each side of the mouth there is a stout arm or palp (fig. 6 *h* & fig. 7 *d d*) which stands erect and reaches a little above the ridge of the rostrum; the anterior margin of these arms is a little convex, the posterior a little concave; and they are furnished with stout, rather soft pincers about half the length of the arm, covered with numerous long hairs: at the root of the pincers there is an articulation, so that they can be either bent forward or carried erect; there is also apparently an imperfect joint at the point where the arm joins the side of the mouth, but this could not be determined with certainty, as the horny membrane of the limb is so delicate that it is impossible to say whether the occasional flexure at this part is owing to its flexibility or to an articulation. It is difficult to say whether these arms represent what Dr. Martin-Saint-Ange names the jaw-feet in the pedunculate Cirripedes, or the two minute processes that are closely attached to the sides of the mouth in these animals, and which are considered palps by some writers. They seem to occupy the place of the latter, though from their form they have much the appearance of rudimentary anterior feet of the higher *Crustacea*.

On each side of the rostrum, extending backwards and a little way below the carinated ridge, there is a series of rather close-set, transverse plates or hairs (figs. 6 & 7 *i i*) which taper towards their points, and are stout at their origin, where they are slightly

bifid, and exhibit for some distance upwards the appearance of two channels (fig. 8). There can be little doubt that these organs are for branchial purposes.

The chamber in which the animal is lodged is partially lined with calcareous matter secreted by the tenant; this lining is very thin, and principally confined to the side walls of that part in which the anterior portion of the animal is lodged: here the lining gradually thickens as it approaches the margins of the slit, and passes a little beyond them, particularly towards its posterior termination. On looking down upon the slit this shelly lining (fig. 2 c) is seen distinctly projecting inwards from the margins, and exhibiting two or three longitudinal ridges marking periods of growth, narrowing the opening backwards as the increase of the animal requires the advancement of the aperture in front. Shelly granules, *d*, may also occasionally be seen filling up the curved posterior extremity of the slit.

Notwithstanding the abundance of this animal I have not yet been able to investigate the internal anatomy, many specimens having necessarily been destroyed in making the external examinations, and others suffered in attempts to remove them from their abode. This important part of the description must therefore for the present be left almost untouched.

The cloak below is free for a considerable way backwards; above, immediately behind the slit, it is united in front with the true body of the animal, and behind, where the broad disc-like expansion is covered with the horny plate, it blends with a thickish layer of parenchymatous matter. The stomach is long and narrow, and passing downwards and backwards from the mouth bends rather suddenly forwards, and gradually tapering is continued into the cylindrical, fleshy pedicle which supports the arms, near to which it probably terminates. No caudal prolongation of this part was observed similar to that which is common to all the other Cirripedes; the generative organs are therefore probably modified in this animal.

Adhering to the parenchymatous matter beneath the horny plate the eggs are found spread out into a leaf-like expansion co-extensive with this part of the animal; but whether or not this is really the ovarium could not be determined. It may be that the eggs have reached this position in some such way as they are supposed by certain writers to arrive in the pedicle of the pedunculate Barnacles. However, in this animal it is certain that the ova are never arranged in laminæ at the base of the arms as in the other Cirripedes, but that they are hatched in the position in which they have just been described. Of this I have had ocular proof.

In the early stages of development the eggs (Pl. IX. figs. 5

& 6) are of a yellow ochre colour, and the yolk is round and much smaller than the shell; the yolk gradually assumes an elliptical form and soon fills the shell, it afterwards becomes a little flattened on one side (figs. 7 & 8), and by-and-by (figs. 9 & 10) three processes develop themselves from this part; these processes are the rudimentary arms: about this time a black spot, the eye, makes its appearance towards one end, and at the other the tail is seen to be forming; afterwards these parts enlarge and gradually put on their perfect forms, while the egg mass assumes a full rose-colour.

On examining an individual in which the eggs had been exposed, they were all found to be in a high state of development; on applying a powerful lens, I was delighted to find that nearly all the little creatures were alive, and most of them struggling for liberty. I soon had the satisfaction to observe several disengage themselves, and launch forth into the surrounding fluid—free, natatory Crustaceans. In the course of a few hours nearly the whole were hatched, and the wine-glass in which they were, exhibited a most animated scene. On holding it up to the light they were quite visible to the unassisted eye as white points; but with the aid of a magnifying-glass their motions could be accurately observed, and they were seen to resemble some of the *Enlomostraca*; their large, single eye and general conformation showing their relationship to the genus *Cyclops*. They hung as it were suspended in the water, and every now and then dashed rapidly upwards with a fluttering, jerking motion. They commenced their ascent with great abruptness, and as abruptly became quiescent again; and once more hanging in the water were seen to descend slowly and gradually with their feet spread out above and their back downwards. They seldom or never moved horizontally, their chief object apparently being to ascend either perpendicularly or diagonally, and always in an inverted position.

On placing a few of these minute beings (Pl. IX. figs. 2, 3 & 4) under the microscope, each was found to be provided with a tail, the body being ovate, broad and depressed, having on the back an ovate shield tapering a little backwards and with a broad interrupted line (figs. 2 & 4 a) of bright rose-colour towards the margins; it is to this line chiefly that the general mass of eggs has a rosy hue as they approach maturity. The eye is large and placed in the centre of the forehead; it is of a very deep rose-colour,—almost black in some lights. The tail is more than half the length of the body, and passes from below the shield, and appears to be composed of two or three articulations: at first it is very stout, but rather suddenly narrowing, tapers gradually to a tolerably fine point and arches upwards; on the under surface, at the point of contraction, there is a small curved spine. There

are three pairs of natatory legs placed well forwards and indistinctly articulated; the anterior pair are simple and furnished with a few long setæ at their extremities; the other two pairs are bifid, the anterior portion being much the stouter, and marked with several indistinct close-set articulations towards the extremity; each articulation bearing on its posterior margin a long seta: the posterior branch of the limb is also furnished with setæ at its extremity. On each side of the head there is a stout process a little arched backwards with the point obtuse; these I am inclined to look upon as antennæ, for they appear to arise from the head beneath the shield, though this could not be determined with certainty. It is possible enough that they are lateral prolongations of the shield, similar to the "anterior horns" of the larva of the pedunculate Cirripedes. Whether so or not, the larva of this new animal may at once be distinguished from that of this division of the Barnacles by the absence of the long spine projecting from the posterior margin of the shield. In other respects it evidently shows a strong general resemblance to the larva of these animals.

The larva, then, as well as the characters of the animal itself, proves it to be a true Cirripede, while, in the former, we see a confirmation of the relationship shown by Thompson to exist between these creatures and the Crustaceans. Indeed this animal in several particulars exhibits a very close approximation to them. The shape of the arms or palps by the sides of the mouth resembles not a little the mandibles of the Nymphs or the anterior feet of some of the higher forms; and the horny shield overlying the expanded portion of the animal gives somewhat the idea of a rudimentary carapace; the rostrated upper lip, too, and setaceous branchiæ have likewise a very crustacean appearance.

In these particulars our new animal differs from the typical Cirripedes; but not more than in general form, which is very unlike that of either of the two great divisions of the class. The prehensile arms or feet, too, are highly characteristic in this, having, in fact, more the appearance of true feet than the cirri of the other Cirripedes; there are only six, or three pairs, while in all the other Barnacles there are double that number, or six pairs. In our animal the last or terminal joint is shortest and is simple, having few and comparatively short setæ: the arms or feet indeed appear to be merely prehensile organs laying hold of prey by the aid of the cushion-like swellings before described as attached to their inner margins.

The cirrigerous feet of the other Cirripedes are also undoubtedly prehensile, but in a very different manner. In these each terminates in a pair of slender, much-elongated and curled cirri composed of numerous, minute articulations, furnished with a

multitude of very long setæ arranged in double rows along the surface next the mouth. These setæ diverge, so that when the cirri are spread out, the tips of the setæ of the adjoining cirri cross each other, making a very complete net which the Cirripede is for ever spreading out and sweeping through the water in the direction of the mouth. Its prey is thus secured, and nothing can escape that comes within the range of this simple and beautiful apparatus. It is not then by currents produced by the cirri, as usually asserted, that these creatures obtain their food; the feet form a prehensile net of the most efficient nature, and the only currents produced result from its action.

In habit, too, this animal differs from all known Cirripedes; none I believe but this species bury themselves in hard calcareous bodies: some indeed partially conceal themselves in foreign substances, and all may be said in a certain sense to be parasitical. *Tubicinella* and *Coronula* are well known to sink deep into the skin of whales; but in both cases the whole of the valvular or upper portion of the animal is exposed; and as both are well protected by their shells, it is evident that this habit is not for defence, the object apparently being to avoid that resistance of the surrounding element occasioned by the rapid movements of this huge animal, and the consequent difficulty there would be of maintaining their hold of its smooth, contractile surface. Other genera, *Prygona*, *Crusia* and *Acasta*, are found concealed in corals and sponges; none of them however excavate: these bodies simply grow round the Cirripede, and as it augments in size, which it does by increasing upwards, so does the coral or sponge advance with it. *Lithotrya* is the only genus of the class that has been described as actually excavating a habitation in hard calcareous bodies; there is reason however to doubt the fact, as we shall see by carefully examining Mr. Sowerby's own figures in his 'Genera of Shells.' This creature is a pedunculate Cirripede, and is stated to have at "the base of the peduncle a shelly appendage." For the moment granting this to be true, it is evident that the holes it occupies, if made by itself, can only have been formed by either this appendage, or by the base of the pedicle before the shelly appendage was secreted. But on referring to the figures just alluded to, it would appear that neither hypothesis is correct. In one of these figures there is very correctly delineated a couple of *Serpulæ* adhering to the under surface of the basal appendage. Now it is pretty clear, that were this appendage used as a rasping surface, no *Serpulæ* could exist as represented; and were the excavations effected before the formation of this appendage, it must necessarily partake of the shape of the base of the newly-formed chamber to which it would be closely adherent, as in the parallel case of *Hipponyx*: it would

therefore be physically impossible for *Serpulae* to develop themselves on the under surface of such appendage. It is probable, then, that the basal plate of *Lithotrya* is nothing else but a broken valve of either *Clavagella* or of some small oyster that has been growing in the deserted abode most likely of *Clavagella* or perhaps of *Lithodomus*\*

*Clitia verruca*, which is unprovided with a shelly base, certainly sinks slightly into the shells to which it adheres; but this cannot be considered a burrowing Cirripede. *Alcippe lampas*, the name by which I propose to designate our new species, is the only one of the class, which, according to our present knowledge, can be so considered. It is the only one, at least, that entirely conceals itself in chambers of its own making in hard calcareous bodies.

I have not been able to examine into the method by which the excavations are effected; a fresh and numerous supply of specimens will be required for this purpose. I shall now only observe on this interesting part of the subject, that in this Cirripede we have a proof that an animal as highly organized as the *Mollusca* can bury itself in hard calcareous substances without the aid of shelly plates; and that the walls of the burrow of this animal exhibit in a peculiar manner the structure of the shelly matrix. This however might result either from a solvent, or from the application of minute cutting bodies on a highly contractile, soft, and pliant surface.

From the above general review of the characters and habits of this animal, we observe at once that it differs in so remarkable a manner from both the *Campylosomata* and *Acamptosomata*,—orders established by Leach for the accommodation of the two great divisions, the pedunculate and sessile Barnacles,—that it becomes necessary to form a new order for the reception of this curious Cirripede. This order I propose to characterize as follows:—

#### Order CRYPTOSOMATA.

Animal naked, burying itself in some foreign substance, attached by muscular adhesion to the upper wall of the chamber, and communicating with the water by an orifice: arms or feet six, composed of three articulations, the last simple: branchiae setaceous, attached to the external surface of the upper lip.

#### Genus ALCIPPE.

Animal depressed and enlarged posteriorly; anterior portion compressed, with the mantle slit longitudinally on the upper

\* Whilst this was passing through the press I have been assured by Mr. C. Darwin, and his opinion on this subject is of the greatest value, that the dorsal cup of *Lithotrya* is undoubtedly formed by the animal, and that it has the power of enlarging the cavities in which the larva takes up its abode.

surface: the four arms or feet next the mouth provided each with a prehensile cushion: palpi furnished with pincers; upper lip rostrated.

*A. lampas.* Animal with the margins of the lips thickened, each being furnished posteriorly with a curved point or process; posterior portion considerably depressed, rounded, and provided with a horny plate on the upper surface: chamber in the shell of mollusks, partially lined with calcareous matter secreted by the animal; opening narrow, enlarged and rounded in front, tapering and curved behind. Length  $\frac{4}{15}$ ths of an inch, breadth  $\frac{2}{3}$ ths of an inch.

#### EXPLANATION OF PLATES VIII. AND IX.

##### PLATE VIII.

- Fig. 1.* A portion of *Fusus antiquus* exhibiting numerous specimens of *Alciippe lampas* in the columella and sides of whorls: *a*, stain caused by the animal; *b*, slit by which it communicates with the water.
- Fig. 2.* Much-enlarged view of the external appearance of the chamber of *Alciippe lampas*: *a*, stain produced by the animal seen through the shell, exhibiting pale radiating lines and punctures; *b*, slit in the matrix or shell by which the animal communicates with the water; *c*, calcareous layer partially lining the chamber, and projecting beyond the margins of the slit; *d*, calcareous granules filling up posterior extremity of ditto.
- Fig. 3.* Upper view of *Alciippe lampas* removed from its chamber: *a*, anterior portion containing the arms and true body; *b*, broad disc-like portion corresponding to the pedicle of the pedunculate Barnacles; *c*, valvular lips; *c'*, the slit or opening; *d*, posterior terminal points of lips; *e*, horny plate; *f*, arms partially exerted; *g*, the point at which the animal is attached to the chamber.
- Figs. 4, 5.* Under and side views of the same: letters as in fig. 3.
- Fig. 6.* Anterior portion laid open to show the true body and arms: *a*, one of the valvular lips; *b*, the other cut across and laid back; *c*, fleshy pedicle supporting the arms *d*; *e*, mouth; *f*, upper lip; *g*, rostrated termination of same; *h*, arms or palpi by the sides of the mouth furnished with pincers; *i*, branchiæ.
- Fig. 7.* Portion of the true body as seen in the compressor: *a*, upper lip; *b*, rostrated termination of same; *c*, carinated margin of same; *d d*, arms or palpi by sides of mouth; *e*, prehensile arms; *e'*, the mouth; *f*, the outer or first pair of mandibles; *g*, second pair of ditto; *h*, third or innermost pair of ditto; *i*, the branchiæ.
- Fig. 8.* A few of the plates or setæ of the branchiæ highly magnified, exhibiting a double channel at the broad extremity which is bifid.
- Fig. 9.* Prehensile cushion of the arms.

##### PLATE IX.

- Fig. 1.* The prehensile arms highly magnified: *a*, fleshy pedicle; *b b*, cushion-like swelling of same.
- Figs. 2, 3, 4.* Different views of the larva of *Alciippe lampas*: *a*, interrupted rose-coloured line surrounding the dorsal shield.
- Fig. 5.* A mass of the eggs a little magnified.
- Figs. 6, 7, 8, 9, 10.* Eggs highly magnified, exhibiting different stages of development.



