1837

ART. XVIII.—*Description of the* ARGULUS CATOSTOMI, *a new parasitic Crustaceous animal,* (with figures.) By J. D. DANA and E. C. HERRICK, Members of the Yale Nat. Hist. Soc.

Read before the Yale Nat. Hist. Soc. June 2, and Aug. 4. 1836.

FOR our knowledge of the existence of the interesting animal which we have attempted to describe in the following paper, we are indebted to Mr. PHILOS BLAKE of this city. Early in the spring of 1835, this gentleman, whom we have always found ready to do a service to the cause of science, very kindly brought a specimen for our examination. This was accidentally destroyed before it had been fully investigated, and nothing further was done concerning the matter for that year. During the past season however, through the attention of the Messrs. BLAKES, and of several of the intelligent workmen engaged in their establishment, we have been liberally supplied.

A slight examination sufficed to show that the animal was closely related to that singular crustaceous parasite, which has attracted so much deserved attention, the *Argulus foliaceus* of JURINE, Jr.* The resemblance is so great that a hasty observer might conclude that the two are specifically identical; but after considerable study we are convinced that they are not. The correctness of this result, we hope to make apparent in the following pages.

The animal before us has been found at various times in the waters of Mill river, near Whitneyville, just below the fall at the manufactory there established. We have discovered none above the fall, but have been told that for a mile above, they are occasionally seen. It may not be irrelevant to mention that the tide-water of New Haven harbor flows up as far as the fall, so that the stream here has a large admixture of sea-water. It infests the fish here called the *Sucker*. The fish evidently pertains to the genus *Catostomus* of LE SUEUR, a monograph of which is given by him in the Journal of the Academy of Natural Sciences of Philadelphia, Vol. I, (8vo. 1817.) We cannot satisfactorily determine whether it is his *C. Bostoniensis* or *C. communis*, and are somewhat inclined to think that on further examination they may prove varieties of one species.

* The elaborate memoir of this author contained in the *Annales du Muséum d'Hist. Nat. de Paris*, 4to. tome VII. (1807,) has been our chief source of information concerning this species.

We were at first informed by several persons, that the parasite was found adhering to the outside of the fish when taken from the stream, but our own experience has never furnished a solitary case where this was the fact. We have universally detected it within the branchial cavities; usually on the operculum or gill-cover, and not on the substance of the gills. On immersing the fish in a vessel of fresh water, the Arguli desert their habitation, and after swimming about a few moments, often attach themselves to the anterior part of the fish, but never, as we could discover, for the purpose of feeding. Not unfrequently they also attach themselves to the sides of the vessel, and there remain many hours. This parasite has hitherto been discovered in the Sucker only: and we therefore call it the ARGULUS CATOSTOMI, a name which cannot be inappropriate even if the animal should hereafter be found on other fish. The *Argulus foliaceus*, according to all the accounts we have seen, is never observed on the gills, but always on the exterior of the fish.

The body is covered for the most part by a shell so transparent that the principal organs below may easily be seen. The shell is nearly circular, somewhat broader transversely, slightly convex, with the clypeus extending a little beyond the general curvature. Posteriorly, it is divided into two broad lobes by a deep sinus, which gradually widens from its origin and extends as far as the line of junction between the first and second pair of natatory legs, leaving free the three latter joints of the abdomen. The shell is membranous and flexible; above glabrous. Its color is a light sea-green. The border of the shell and a small spot over each pair of antennæ are highly diaphanous. *Beneath*, the duplicature of the shell forms a wide band around the marginal portions, and leaves open a large reniform area on each side, and also another open spot of an irregularly circular form about the central parts of the wings of the shell. The wide marginal band is thickly set with minute reflexed spines.

The *eyes* as viewed from above, present twelve or thirteen dark reddish-brown facets, disposed in two concentric curves on a grayish convex receptacle, surrounded, except on the interior side, by a series of colorless facets.

The *antennæ* are situated in front of the eyes. The *anterior* pair is short and stout, two-jointed; basal joint broader transversely;—terminal joint nearly at right angles with the first, gradually tapering from a broad base, and ending in a large, brown corneous recurved spine. This joint is hollow and contains a retractile spine of a brown color, capable of being projected into the terminating spine of the joint. From the middle of the posterior surface arises a jointed transparent process directed outward, extending beyond the main branch of the antennæ and terminated by three or four terminal transparent spines. This process is also furnished with a spine near its extremity.—The *posterior* pair of the antennæ is one third longer than the anterior, to which they are at base closely approximate. They are four-jointed, slender and diaphanous. The basal joint is large and sub-cylindrical, with a few minute spines on its posterior basal portion; second joint one third the diameter of the first, with a few spines at its apex. Similar spines are observed on the apex of the first, which is one half the length of the preceding. Apical joint half the penultimate in length and diameter, terminated by three or four transparent spines. From the base of the first pair of antennæ arises a short, fleshy cone, directed backwards and downwards, having at its apex a stout, corneous tooth. The insertion of the muscles moving the antennæ may be observed near the base of the sucker.

The *organs of manducation* are complex. The anterior organ is a sucker, inserted in a three-sided membranous transparent retractile sheath, having free motion in any direction from its insertion in the fleshy parts below. While at rest it is directed forward and extends to the base of the antennæ. When the sucker is retracted within the sheath, a long ligulate muscle is observed lying loosely on the right, extending from the upper part of the sucker to the parts below its base.

Below the insertion of the sucker arises a convex oval mass (Figs. 1 and 4,) containing the rest of the mouth apparatus. It has a motion to some extent in every direction. Its lower half is covered by a lip, or thin transparent veil, capable of a backward movement; its upper limits are marked by the line *aba'*, (Fig. 4.) At *b* is a conical fleshy protuberance, inserted on the interior surface of the lip, and extending a little beyond its upper limits. Anterior to this lip lies transversely a bony arch (*cc'*,) of a brownish yellow color, curved forward and giving off obliquely downward on each side two bones, connected by a membrane. The extremities of this arch are gradually lost in the parts above. This arch is the lower limit of the membrane that covers the anterior portion of the oval mass. This anterior membrane is connected laterally with a slender bone

de, *d'e'*, which near the center of the sides of the oval mass (at *e*) curving suddenly inward and downward and at the same time enlarging tends to the base of the maxillæ. This bone at its angle *e* forms an ear-like projection to the oval mass. On each side of the center arises a curved, corneous and slightly colored maxilla (*f*, *f'*, Figs. 4 and 5,) which extends forward beneath and beyond the arch; the broad inner edge of each is serrated. An indistinct line near the apex appears to separate a short apical joint. These maxillæ approach at their extremities and are each connected at their base with one of the forks of a long, narrow, furcated bone *g*, which extends outward and as far forward as the attachment of the sucker sheath to the body, where it appears to be loosely connected with the surrounding muscles. The other fork of this bone is connected with the lateral bones before described as tending towards the base of the maxillæ after forming an ear-like projection. Between and connected with the maxillæ near their base, are two horizontal united processes, (*h*, Fig. 5,) which become visible on the retraction of the lip.

The maxillæ are capable of a slight motion back and forth in connection with the ear-like projections, which is effected by means of muscles extended nearly in the direction of the bones just described, and inserted near the anterior part of the base of the suction feet.

Between the two maxillæ laterally, the bony arch above, and the lip below, appears the orifice of the mouth, (above *b*, Fig. 4.) Beyond the maxillæ is frequently observed an internal longitudinal fissure, the opening of which is always accompanied with a retraction of the lower lip. On withdrawing this lip, and forcibly severing and uplifting the bony arch with the membranes, and the maxillæ with the long narrow bones to which they are attached, a second set of organs, similar to the first, presents itself. The maxillæ of the inner mouth, which may, for distinction, be called the *inner maxillæ*, are in shape, situation and structure, like the outer. They are dimly seen from without, just in front of the external maxillæ, (Fig. 4.) The longitudinal fissure above described appears to be situated in the upper membranes connected with the inner mouth, and extends forward from the bony arch of the inner mouth between the maxillæ. In endeavoring to trace analogies between this mouth apparatus and that of the more highly organized Crustacea, we are led to believe that the sheath of the sucker represents the *labium*, which may be supposed to be greatly elongated, and by the union of its lateral

margins to become tubular; and that the enclosed spicula represents the mandibles. The part which we have called the lower lip, is analogous to the *languette;* and the maxillæ with the long bones thereto attached are not unlike these organs as usually observed.

In the Argulus foliaceus the entire oval mass, which we have above described, is assumed by JURINE to be the heart; which we are compelled to consider a total error. The palpitation, or alternate contraction and dilatation, which he speaks of, appears to us nothing more than the motion of the maxillæ, which just before death often becomes incessant, and in the instance mentioned by him was probably caused by the "alcoholic asphyxiation."

The anterior legs are short, hollow, flexible cylinders, containing four tumid membranes attached near the center of these legs at the bottom and extending up along the sides. By means of these the animal is enabled to exhaust the cavities and thus attach itself to its prey. The extremity terminates in a broad, circular, horizontal rim, with a margin nearly entire, provided with about eighty bony rays, each composed of eleven joints, (Fig. 6.) When the animal is nearly dead, this rim assumes a vertical position, and from the relaxing of the membrane appears to have a crenated margin.* These legs in their natural position are at right angles with the body and consequently the lower portions are concealed by the terminating border. On fig. 1, may be seen lines proceeding from between the base of the anterior antennæ which probably mark the limits of a muscle connected with these legs.

The prehensile legs arise below and on each side of the mouth, and are six-jointed. The thigh or second joint, is short, massive and irregular, and its posterior margin is occupied by three broad and flat teeth, with interstices about equal to half the average width. These teeth are irregularly quadrilateral with rounded angles. In this respect this species differs from the A. foliaceus, in which there are four narrow, acute, and incurved teeth about the base of this joint.

On the lower surface is a triangular, subconvex elevation, covered with papillæ. The third joint gradually tapers towards its apex, where it is papillose; the fourth joint is shorter than the third, and

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* Jurine's figure of this rim or disk errs in exhibiting it in the vertical position as that which appears during life: this is never observed except when the powers of life are nearly exhausted.

flattened on the under side, which is also papillose; the fifth is similar to the fourth, and about one third its length; the terminal is provided with two apical hooks.

The natatory or branchial legs arise in a series on each side of the abdomen. The three anterior pairs are composed each of *three*, the fourth of *two*, large fleshy joints, and are terminated by two long pinnulæ. Along the posterior edge of the second and third joints of the two anterior natatories, is a ciliated ridge; a corresponding ridge is observed on the third joint of the third pair, while on the second joint there is substituted a ciliated lamina: similar laminæ are situated on both joints of the fourth pair, which on the basal joint is large and cultriform, and covers the termination of the abdomen. The edges of the pinnulæ are provided each with a row of transparent plumose ciliæ. These rows are inclined to one another at an angle of about 120°, and in the usual position of the pinnulæ, one is invisible, it being directed towards the shell.

The outer pinnula of the first pair of natatories is three-jointed; (Fig. 7.) the first joint occupies nearly its whole length, the other two are very short and destitute of ciliæ: at the apex are two minute setæ. Along the centre of these pinnulæ runs a dark vessel, which is probably connected with the branchial ciliæ. At the base of the pinnulæ of the first and second pairs of legs on the upper side, arises a *recurved* pinnula, composed of two nearly equal joints, and ciliated like those above described.* During life, the legs are extended a little forward, and the pinnulæ are wholly covered by the shell. At death they are inclined backward, as in Fig. 9.

The abdomen is somewhat depressed and composed of four joints, each of which gives rise to a pair of natatory legs; the fourth joint extends mostly beyond the shell. From its extremity proceeds a broad rounded lamina, bilobate posteriorly, and provided with two minute projecting ciliated plates, at the base of the terminal sinus. This caudal lamina or tail has an entire and diaphanous margin, and is destitute of ciliæ.

Extending from the termination of the abdomen, and partially covered by the cultriform plates on the fourth pair of natatories, are two narrow laminæ, (Fig. 1. ss.) near the base of which are the organs

* In the Argulus foliaceus, the first outer pinnula is not stated to be articulated; neither is mention made of any joints in the fleshy part of the natatory legs, or in the recurved pinnulæ.

of reproduction. Two oval yellowish vesicles or *pouches*, (Fig. 1. rr.) are situated in the tail on each side of these laminæ.*

The anal orifice is situated between the laminæ at the base of the caudal sinus: the fæces are conveyed through a duct lying along the central line of the tail, and pass out on the lower side of the laminæ.

The *brain* is situated near the upper surface of the shell over the sucker, and at its posterior extremity is composed of three connivent elliptical masses, of which two are nearly longitudinal, and the anterior transverse. The central portion between these elliptical masses, is of a deep reddish black. From the brain, nerves are given out, which proceed down the abdomen, and supply the natatory legs; below, another nerve is visible, passing to each eye.

Posterior to the *oval mass*, and within the body, are observed four imbricated laminæ, of which the three anterior are cordate. Long slender cords appear to proceed from the sides of each lamina, and extend into the natatory legs; those from the *first* lamina extending to the *first* pair of natatories, &c. These cords have much the appearance of muscles. No blood is seen circulating in them, though it is very discernible, in a broad backward current over them. This current appears to arise from beneath the imbricate laminæ, and thus renders it probable that they have some connection with the heart, if they do not actually compose it. The blood is limpid, and holds suspended numerous egg-shaped particles, (Fig. 8,) and is propelled by distinct pulsations, which occur about once in a second. The length of these particles is about $\frac{1}{100}$th of an inch, and the greatest breadth about $\frac{2}{3}$ths of the length. The current above referred to, cannot be traced along the abdomen; but in the tail there are distinctly apparent two parallel currents, which diverge at the base of the terminating sinus, and curving around the transparent margin, return into the body. Numerous subordinate currents ramify throughout the tail, dividing it into minute areolas.

In an upper view of the animal, a strong current is observed above the heart, proceeding towards the brain, (Fig. 9. r.) where branches are given out to the antennæ and eyes. The antennary current, after reaching the antennæ, is soon lost in the surrounding parts of the shell. Just below, however, on each side, appear minute branching

* All the specimens we have seen (about thirty) have been provided with these vesicles. It is possible that we have not seen any of the male sex.

vessels, in which the blood has a returning course. These minute vessels discharge themselves in a broad channel, (Fig. 9. n.) which enters the body near the base of the abdomen.

The ophthalmic current, which is most distinctly seen in an under view, curves at the eye and passes backward, enters the suction legs, is seen again between those legs and the prehensile, and also for a short distance posterior to the latter, after which it disappears.

Another current (Fig. 9. k.) goes out laterally, a short distance behind the brain, to the anterior margin of the reniform area before described. It passes just within the exterior margin of the same area, and returns into the body after a final course along the inner edge of each lobe of the shell.

Near the base of the abdomen arises a fourth current, which running downward and outward is diffused through the lower portions of the shell, and probably returns into the body by the same current with the preceding.

It is impossible to trace the passage of the blood into the branchial legs. It is probable that the above currents, after returning to the body, pass to these legs for aeration, and thence to the heart to be again diffused throughout the animal. Pulsation is frequently observable along the whole abdomen, and often with great distinctness in the tail. The currents of blood are not apparently confined within vessels of definite limits.

The pairs of muscles by which the animal moves the various parts of the shell are four. The *first*, or that acting on the clypeus, arises each side of the brain and accompanies the antennary blood vessels. The *second* (oo) arises just below the base of the preceding, and is directed outward and upward. Between this and the third is a suture, which is apparent when either muscle is in action. The *third* accompanies the current of blood (k) which passes to the anterior part of the reniform area. The *fourth* accompanies the current (m) which flows to the posterior portion of the shell, and is attached near the central part of this portion. Several of these muscles are easily mistaken for the courses of the blood. The muscles of the legs are for the most part visible, and are given in the plate. Two muscles extend from their insertion, near the base of the prehensile legs, on each side of the abdomen, and appear to cross near its extremity.

The entire abdominal region below of the gravid female, is occupied by eggs. The number of eggs which may be laid by one female, cannot be stated with certainty. On the 18th of June, 1836,

one of them deposited on the sides of the vessel in which she was contained, about one thousand five hundred, and a considerable mass of eggs still remained within. The eggs have an oval form, are white when first laid, but soon become of a dirty yellow, and finally assume longitudinal crenated ribs. They are attached to each other and to the object on which they are placed, by a glutinous substance, and are disposed end to end, in single rows of about four or five, sometimes however of ten or fifteen. These rows have a somewhat promiscuous arrangement.

Thirty five days after deposition, the young animal appeared, through a longitudinal fissure in the shell, the eyes and some of the darker parts having been visible about ten days previous. Its length is $\frac{1}{16}$ of an inch, and the general shape of the shell an oval, somewhat broader anteriorly. Beyond the shell, extend the three terminal joints of the abdomen, ending in a broad tail, with two terminal elongated protuberances, from each of which proceed three unequal setæ.

The *eyes* are of a reddish brown color, and proportionally much larger than in the adult animal. The anterior pair of antennæ have a general resemblance to the corresponding pair in the perfect animal, except that here the posterior branch is proportionally much larger and constitutes the chief part of the organ.

Behind these arise two pairs of oars; the anterior pair have a basal joint in common with the posterior antennæ which extend downward and outward from the oar. Jurine seems to have erred in supposing this pair independent of the oar. The oars are slender and cylindrical, extending beyond the shell. From each proceeds a pencil of plumose hairs; the number of these, in the anterior pair is four, in the posterior, three. These hairs may be made to approximate or diverge at pleasure. The posterior pair may possibly represent the maxillæ which are wanting; they appear to arise from the origin of the long bones which in the perfect animal are found connected with the maxillæ.

The sucker extends beyond the anterior margin of the shell and is distinct, but the organs contained in the oval mass below are extremely obscure.

The suction legs are replaced, as is the case with the A. foliaceus, by a pair of prehensile legs, which end each in a spine provided with a sheath in which it commonly lies, (fig. 11.) The next pair are somewhat like the prehensile in the perfect animal, which legs

they represent. The next pair (representing the first pair of natatory legs,) terminate in two branches, one of which is jointed, while the other ends in two setæ. The three following pairs of natatories are not developed. Instead thereof are three protuberances on each side of the abdomen, ending each in two setæ.

The internal organs of the abdomen as observed are exhibited in fig. 10.

The larve is quite active, and by means of its oars swims with great agility. Out of a thousand, none lived more than four or five days, probably for the want of appropriate nourishment. During that time they suffered no change.

From the structure of the mouth as described in the preceding article it is obvious that the name of the order (Siphonostoma) to which the animal must be referred, is not truly applicable, since the siphon is a small part only of the apparatus for manducation. It seems to be a connecting link between the Xyphosura and Siphonostoma, and may perhaps hereafter become the type of a new order.

A plain man, and quite unversed in comparative anatomy, on looking at our Argulus with a lens of moderate power, remarked that it was nothing but a young *horse shoe*. The animal to which he referred is the *Limulus Polyphemus*, (commonly called *horse shoe* or *horse foot*,) found so abundantly on our coasts. Although our opinion does not altogether coincide with his, yet we think that between the two, many analogies may be traced.

In the Limulus the relative sizes of the clypeal and the thoracic segments are in inverse ratio to the same parts in the Argulus; in the former, the clypeus occupying a large portion, in the latter, but a small portion, of the shell. The prehensile legs of the latter correspond in the number and relative size of joints, and in the dentation of the haunches, to the posterior pair of manducatory legs* of the former. The semicircular membrane of the former, which is composed of a pair of united legs, represents the tail of the latter. It resembles it in containing near its origin, two seminal pouches and in being furnished with two collateral lamellæ at its terminal sinus; as well as in its general form. The natatory legs of the latter are the analogues of the branchial legs of the former; their number is however smaller by one, unless we consider the anterior pair as composed of two in union, which opinion receives much support from the fact that in the larve this organ is double.

* In this pair the number of joints is six; in the four preceding pairs, one less.

In endeavoring to demonstrate, in the Argulus, the *eleven* pairs of parts or organs which are commonly found posterior to the antennæ, in all the Crustacea, we proceed thus:—as reckoned above, there are, including the tail, six pairs of branchial members; next, two pairs of prehensile, considering the suction legs as such; then, two pairs of maxillæ; and lastly, a pair of mandibles transformed into the siphon. The bony arch, situated on the medial line, is not unlike the bony wall which in other Crustacea forms the anterior border of the buccal aperture.

J. V. Thompson, the author of many curious discoveries concerning the metamorphosis of the Crustacea, has published* a short notice of an anomalous parasite which he names *Sacculina Carcini*, found by him on the *Carcinus Mœnas*. This parasite he considers identical with the *Argulus armiger* of Müller, figured by Slabber in plate 6 of his *Natuurkundige Verlustigingen*, (Haarlem, 1769–78)—a species we cannot find recognized in any work since the time of Müller, except in the *Encyclopedie Methodique*, (*Insectes*, Art. *Argule*.) Mr. T. has not seen it in the mature state, and it is therefore at present impossible to ascertain its relations to the *A. foliaceus* or *A. Catostomi*. The larve appears to be totally destitute of all organs of manducation. We hope to hear further respecting so remarkable an animal.

The buccal apparatus of the *Pandarus alatus*† has, as from its similarity of habits might be expected, some resemblance to that of the *Argulus*, but the siphon when at rest, lies in a reverse direction. An extended comparison between the trophi of these two genera, would be of great interest.

We are well aware that the foregoing account of the *Argulus Catostomi* is not complete. Many particulars of its habits and metamorphoses, together with many important details of anatomy are yet to be discovered. Some of these deficiencies we hope to supply at a future day.

New Haven, Conn., October, 1836.

EXPLANATION OF THE PLATE.

Fig. 1. Under view of the *Argulus Catostomi*. Seminal pouches r, r.
Fig. 2. Posterior branch of the first pair of antennæ.
Fig. 3. Termination of the second pair of antennæ.

* Entomological Magazine, (8vo. London,) Vol. 3, p. 452—456. April, 1836.

† Described and figured by H. Milne Edwards, in Annales des Sciences Naturelles, (8vo. Paris,) tome 28, p. 78—86, and plate 8.

Fig. 4. Mouth apparatus—*aba'* upper limits of lower lip—*cc'* the extremities of the transverse bony arch—*de*, bone which curves at *e* and passes towards the base of the maxilla—f, f' maxillæ, the lower extremities of which are beneath the lower lip.

Fig. 5. g, g' internal bones connected with the maxillæ f, f' and situated in the animal as here represented.

Fig. 6. One of the jointed bony rays of the suction legs.

Fig. 7. First pair of natatory legs, exhibiting the two terminating pinnulæ, of which one is jointed at its extremity, and also the recurved pinnula, jointed near its middle—also the ridges of hairs which in the animal are represented near the posterior margin of the legs. These hairs are perspectively foreshortened.

Fig. 8. Particles observed in the circulating fluid.

Fig. 9. Back view of the *Argulus Catostomi*, the right hand side exhibiting the circulation, the left hand, the muscles which move the shell, and the organs below as seen through the transparent parts above—i, i, the antennary current—n, the return current of the same—h, the ophthalmic, (seen most distinctly below)—k, k, k, and m, lateral current whose direction is pointed out by the arrows they contain. The arrows in the tail mark the direction of its currents—z, z, the junction of the shell with the abdomen. On the left, i, o, k, m, represent four muscles by which the animal moves its shell. Three of the blood vessels above pointed out, i, k, m, are in the direction of these muscles—i, i, move the clypeus—o, a portion of the shell between the clypeus and x—k, and m, the lateral and posterior parts of the same.

Fig. 10. Under view of the young of the *Argulus Catostomi*.

Fig. 11. Termination of the legs corresponding to the suction legs in the perfect animal, the spine partly separated from its sheath.

ART. XIX.—*A Translation of a memoir entitled "Beitrage zur Lehre von der Befruchtung der Planzen,"* (Contributions to the doctrine of the impregnation of plants;) by A. J. C. CORDA: published in the 17th volume of the Nova Acta Physico-medica Academiæ Cæsar. Leopold.-Carol. Naturæ Curiosorum. Breslau and Bonn, 1835;—*With prefatory remarks on the progress of discovery relative to vegetable fecundation;* by ASA GRAY, M.D.

Read before the Lyceum of Natural History, New York, Oct. 24th, 1836.

THE last volume of the transactions of the Imperial Acad. Naturæ Curiosorum, just received through the kindness of the learned Nees Von Esenbeck, the president of that society, contains a brief memoir on the impregnation of plants, which will doubtless be read by the botanist and the physiologist with more than ordinary interest. M. Corda, in the paper referred to, gives an account of an original and highly curious series of observations on the structure and development of the ovules, and the mode in which impregnation is effected, in the natural family Coniferæ. The memoir is illustrated by numerous admirably executed figures.

The comparatively recent discoveries of Amici, Adolphe Brongniart, Mirbel, and Brown, having invested the subject of vegetable reproduction with unusual interest, I was naturally led to study the memoir of M. Corda with particular attention. The researches here communicated to the scientific world are the last, though by no means the least, of a series of discoveries on this recondite subject, which, taken together, may be safely said to form the most important contribution ever made in vegetable physiology. I had prepared a translation of this paper for my own private use; but, supposing that it would be generally interesting, I have been induced to lay it before the Lyceum. I have thought it advisable, moreover, to premise a cursory account of the progress of discovery respecting the fecundation of flowering plants, for the purpose of rendering the subjoined memoir more generally intelligible to those who are not particularly conversant with the present state of botanical science.

Impregnation, in flowering plants, essentially consists in the production of an embryo or rudimentary plant within the *ovule*,* or body destined to become the seed. Since the office of the stamens in vegetable reproduction was indicated by Grew and Ray, and afterwards clearly established by Linnæus, it has been well known that unless some grains of pollen come in contact with the stigma, impregnation does not take place. The seed-vessel may, indeed, continue to grow and ripen in the absence of pollen, and the contained ovules attain the size, texture, and (the embryo excepted) the structure of well-formed seeds; but in such cases a rudimentary plant, which is the essential part of the seed, is never produced. Respecting the immediate origin of the embryo in the animal kingdom, it is well known that three different hypotheses, being all that the nature of the case admits of, were advanced at an early period. These several hypotheses have been extended by analogy to the vegetable kingdom. According to one view a germ furnished by

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* The reader is supposed to be acquainted generally with the structure of the ovule, a subject upon which the limits of the present remarks will not allow me to enter, except to indicate the sources from which the requisite knowledge may be obtained, viz: R. Brown's paper on the genus Kingia, with remarks on the structure of the unimpregnated ovule; *Mém. sur la génération et le développement de l'embryon, &c.* by Ad. Brongniart in the 12th vol. of the Annales des Sciences Naturelles; and, particularly, *Nouvelles recherches sur la structure et le developpement de l'orule végétal*, by Mirbel, in the 17th vol. of the same work. The substance of these memoirs will be found in the more recent elementary botanical works.

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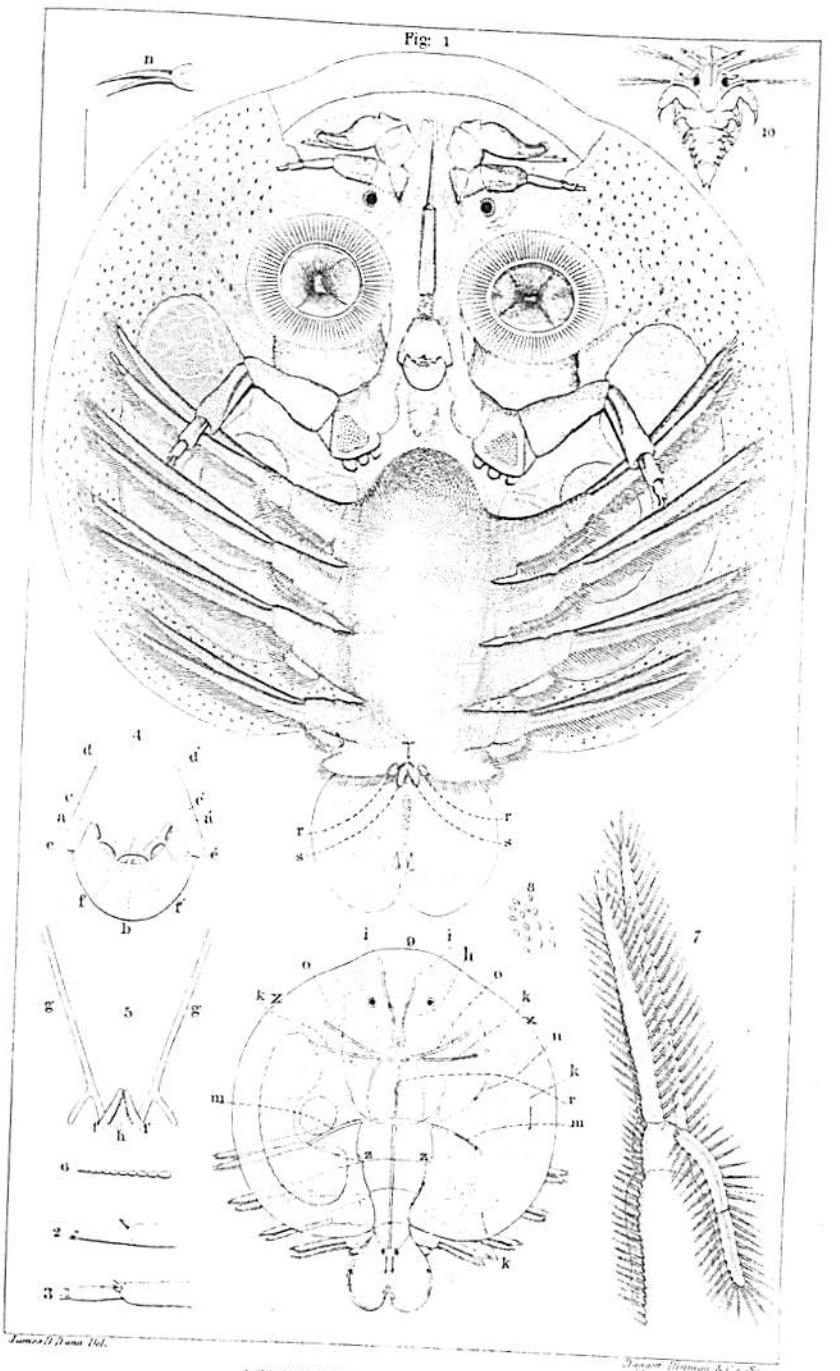
e in the midst of a cane brake, and
v of the trees that cover it.



ARCTES CATOSTOMI