X. *Deſcription of the Cancer ſtagnalis of Linnæus, by George Shaw, M. D. F. R. S. Fellow of the Linnean Society.*

Read January 6, 1789.

THE Cancer ſtagnalis of Linnæus being certainly one of the moſt curious animals of the genus to which it belongs, and being not yet ſo generally known as the reſt of the Britiſh ſpecies; I hope the following obſervations, which I have had frequent opportunities of making on this inſect, and particularly thoſe which relate to its infant ſtate, or firſt appearance from the egg, may be not unacceptable to the Linnean Society.

The Cancer ſtagnalis is generally found in ſuch waters as are of a ſoft nature, and particularly in thoſe ſmall ſhallows of rain-water which are ſo frequently ſeen in the ſpring and autumn, and in which the Monoculus Pulex of Linnæus, and other ſmaller animalcula abound. At firſt view this inſect bears ſome reſemblance to the inſect which ſome writers have called Squilla aquatica, or the larva of a Dytiſcus; but when viewed nearly it is found to be of a much more curious and elegant appearance than that animal. The legs, of which there are ſeveral pair (eleven) on each ſide, are flat and filmy, and have the appearance of ſo many waving fins, of the moſt delicate ſtructure imaginable. The whole animal is extremely tranſ-

tranſparent, and the general colour of the males is a very light brown, with a tinge of blueiſh green, particularly on the head and legs. The females have leſs of the blueiſh tinge, and incline more to brown, except on the ſpine of the back, which is of a deep dull blue, and which part in the males is of a deeper brown than the reſt of the body. The head of the male is armed with two fangs of a very ſtrong appearance, and which end in two long hooks bending inwards; and between the fangs lies a very curious apparatus, which will be more particularly deſcribed hereafter. The eyes are very protuberant, and, as it were, furniſhed with a ſtalk, as in the reſt of the genus Cancer. The female is deſtitute of the two long fangs which are ſo conſpicuous in the male, and, inſtead of them, is only furniſhed with a ſtrong, thick, ſhort pair of forceps: but what principally and immediately diſtinguiſhes the female, is a large, oval, ſharp-pointed bag of ova, which is ſituated underneath the lower part of the body where the tail commences. It is remarkable that the ſmaller ſized females are frequently furniſhed with this bag of ova, as well as the larger ones. The tail, which is perfectly alike in both ſexes, is of a red colour, more or leſs deep, from the middle to the very end, which is forked into two very ſharp points. Theſe creatures ſhould ſeem by their appearance to be of a predaceous nature, and I have no doubt that they really are ſo; the ſtructure of their fangs ſeeming to be particularly adapted to the purpoſe of ſeizing their prey: yet I never obſerved thoſe which I kept, to attack any of the animalcules which were in the ſame water: on the contrary, the Monoculus conchaceus very frequently aſſaults them, and adheres with ſuch force to their tails, or legs, as ſometimes to tear off a part in the ſtruggle. The C. ſtagnalis delights much in ſunſhine, during which it appears near the ſurface of the water, ſwimming on its back, and moving in various directions by the ſucceſſive undulations of its numerous fin-like legs, and moving its tail in the manner

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of a rudder. On the leaſt diſturbance, it ſtarts in the manner of a ſmall fiſh, and endeavours to ſecrete itſelf by diving into the ſoft mud. It changes its ſkin at certain periods, as is evident from the exuviæ or ſloughs being frequently found in the water in which theſe animals are kept.

Linnæus, as appears by his deſcription in the laſt edition of the Fauna Suecica, had obſerved this inſect; but though he particularly mentions the appearance of the ovarium in the female, he propoſes a moſt extraordinary doubt, whether it may not prove to be the larva of ſome ſpecies of Ephemera. He alſo repeats the ſame queſtion in the Syſtema Naturæ.

The only writer who has given a very ample deſcription of the Cancer ſtagnalis, is Schæffer, who has called it Apus piſciformis. He does not allow the parts on each ſide to be genuine legs, but rather a ſort of branchiæ; and as the animal has no other parts which can be called legs, he therefore gave it the name of Apus. He has given a very good magnified view of the male inſect, and figures of both male and female in their natural ſize; but theſe figures ſeem to have been taken from ſmall ſpecimens, and are by no means calculated to give a clear idea of the elegant appearance of the animal itſelf.

I alſo find it figured in the 57th volume of the Philoſophical Tranſactions, for the year 1767; where it is alſo deſcribed, but the figures are inaccurate. In the deſcription it is very judiciouſly obſerved, that ſince they are furniſhed with ovaria replete with eggs, it ſeems not probable that they ſhould ever undergo a further change, but that they are in their perfect or ultimate ſtate.

Schæffer, who is exact enough in his general deſcription, had no opportunity of obſerving the inſect in its firſt ſtate, or immediately from the egg; it is therefore this part of its hiſtory which was ſtill wanting to complete the deſcription of ſo curious an animal.

In March and April the females depoſit their eggs, without any ſettled order, and perfectly looſe in the water. They appear to the naked eye like very minute globules of a light brown colour; ſcarce, if at all, exceeding in ſize the particles of the farina in a mallow: and what makes this compariſon the more juſt, is, that each ovum, when magnified, is extremely like one of the globules of farina in that plant; for it is thickly beſet on every ſide with ſharp ſpines, the length of which is equal to about the fourth part of the diameter of the egg. Beſides theſe ſpines, the egg is coated over with a tranſparent ſubſtance, reaching juſt to the extremities of the ſpines.

This is a particularity of ſtructure which I do not remember to have obſerved in the ovum of any other inſect; and may probably be intended to aſſiſt in cauſing them to adhere to the ſubſtances on which they fall when depoſited in the water, or elſe as a ſecurity from the ſmaller water-inſects.

In the ſpace of a fortnight, or in cold weather rather more, they are hatched; and the young animals may be ſeen to ſwim with great livelineſs by means of three very long pairs of arms, or rowers, which appear diſproportioned to the ſize of the animal: and indeed it bears, in this very ſmall ſtate, not much reſemblance to the form which it afterwards aſſumes; but, in the ſhort ſpace of a very few hours, the body appears conſiderably lengthened, and it begins to acquire the remarkable character of the divided tail-fin, which ſo ſtrikingly diſtinguiſhes the parent animal. In this very young ſtate the eyes do not appear pedunculated, but like a dark ſpot on the middle of the head.

On the ſeventh day after hatching, they approach pretty nearly to the form of the complete animal, except that they ſtill retain the two firſt or long pairs of rowers or arms: the legs however, or fins, are at this period very viſible. After this time it loſes the long rowers,

and appears ſtill more like the inſect in its advanced ſtate. Its growth, however, is but ſlow; and in all probability a very conſiderable time elapſes before the inſect acquires its full ſize: but this I cannot preſume to determine, ſince thoſe which were hatched in the glaſſes in which I kept them, died before they had acquired any conſiderable ſize.

In order to obtain theſe inſects in a young ſtate, nothing more is required than to keep the females ſelected for this purpoſe in ſeparate glaſſes of the ſame water in which they naturally reſided. The glaſſes ſhould be ſmall; and, when the eggs are depoſited, the parent inſects muſt be removed, and the glaſſes kept in a temperate room.

When firſt hatched, they are very little ſuperior in ſize to a common mite.

The three microſcopic views of the young animals were drawn with the greateſt attention, and their accuracy may be ſafely depended upon.

TAB. 9. Fig. 1. Shews the young inſect very ſoon after hatching.

Fig. 2. Repreſents it ſome hours after, at which time the forking of the tail is juſt viſible, as well as the ſegments of the body; whereas, in fig. 1, the body has not yet lengthened itſelf ſufficiently to ſhew the joints of which it conſiſts, or the forking of the tail.

Fig. 3. Shews it on the ſeventh day after hatching.

It is remarkable that the Cancer ſtagnalis, in its complete ſtate, though of the moſt delicate ſtructure, is yet capable of ſupporting a very conſiderable degree of cold, as is evident from the animal making its appearance in the middle of the day in very ſhallow waters, which have been almoſt entirely frozen during the night. Yet Schæffer repreſents thoſe which he found to be exceedingly impatient of cold; and adds that he has known a whole race of them completely killed in their native water by a very ſlight froſt. This is certainly not the caſe in our own country. I have ſeen great num-

bers of them in the months of December and January, even immediately before and after intenſe froſts, ſeemingly as vigorous and lively as in the ſpring and ſummer: they muſt therefore either plunge themſelves to ſuch a depth in the ſoft mud as to be ſecure from the froſt, or elſe they are not injured by being frozen for a time.

MICROSCOPIC DESCRIPTION.

IN an inſect of ſo conſiderable a ſize as this, a microſcopical deſcription might ſeem unneceſſary: this has, however, been given by Schæffer; and moſt of the parts which he has mentioned, are figured in his work with ſufficient accuracy. But it is to the laſt degree aſtoniſhing that he has entirely omitted the deſcription of the moſt curious part in the whole animal; nor does the leaſt trace of it appear in the magnified figure which he has given of the male inſect. This part is the apparatus for ſeizing its prey, and which is peculiar to the male; the female having only a very ſhort beak or mouth in the place of it.

This apparatus conſiſts of two very long flat trunks, proceeding from between the long hooked parts or exterior fangs, ſo conſpicuous in the male inſect. Theſe trunks are generally rolled up ſide by ſide, and carried in the ſame manner as the proboſcis of a butterfly, ſo as not to be externally viſible, except by a ſlight protuberance; but when extended they reach to a very conſiderable diſtance, ſo as to exceed that of the hooks or exterior fangs.

It ſhould be obſerved that, from the part whence theſe trunks proceed, the real mouth of the creature is placed, which conſiſts of two large

large concave ſcales, placed perpendicularly, and furniſhed with toothed edges, meeting each other. It is from each ſide of this mouth that the trunks proceed. The particular ſtructure of the trunks is as follows. The body of each is a long and moderately broad flat part, extended in a ſtraight line when expanded, and ending in a jagged extremity, beſet with very ſharp teeth, like thoſe of a fiſh: it is alſo divided, from the root to the extremity, into a very great number of tranſverſe ſpaces, each of which terminates in a tooth at the edge; ſo that the whole trunk is edged on both ſides with a continued row of teeth. Beſides the teeth, each trunk is alſo furniſhed with three lateral branches, or appendages, ſituated at ſome diſtance from each other, on the outward edge of the trunk. Theſe lateral branches are armed near the ends with ſeveral very ſtrong and exceſſively ſharp teeth, not only on the edge, but on the ſurface itſelf, and on the tips. Laſtly, it muſt not be omitted that the baſes of the fangs themſelves are furniſhed with a double range of extremely ſharp teeth, of a much larger ſize than any of the others: they are placed in ſuch a manner that the points of the teeth of one range look exactly contrary to thoſe of the other; and by this means muſt enable the inſect to commit the moſt ſevere depredations on ſuch animals as are its deſtined food. But why the female ſhould not be provided with a ſimilar apparatus, is an enquiry not eaſily to be anſwered.

The figure marked No. 8, is an exact ſketch of the whole apparatus of the mouth, expanded and magnified; in which the ſet of teeth at the baſe of each of the hooks of the fangs, is very conſpicuous. The upper part of the real maxillæ, or toothed ſcales, compoſing the mouth, is alſo ſeen; and the trunks, with their lateral appendages, are repreſented in their relative proportions.

It is probable that the extremities of the fangs are tubular, for at the tips there is an appearance of a narrow opening; but of this I cannot ſpeak with certainty.

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My obſervations on this inſect were made long before I had ſeen Schæffer's work. I then ſketched ſeveral parts by the microſcope, which I afterwards found had been already done by Schæffer. The annexed plate therefore contains only a few particulars which he has omitted, beſides the perfect inſect.

EXPLANATION OF TAB. 9.

Fig. 1, 2, 3. Cancer ſtagnalis in a young ſtate magnified. See page 107.

4. The perfect inſect, female, natural ſize.
5. Ditto, male.
6. Eggs.
7. An egg magnified.
8. The apparatus of the mouth.